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University of Dublin

Critical Thinking in Undergraduate General Nursing Students

A thesis submitted in fulfilment of the requirements for the Degree of

Doctor in Philosophy (Ph.D)

School of Education

Trinity College Dublin

Thomas F. Noone

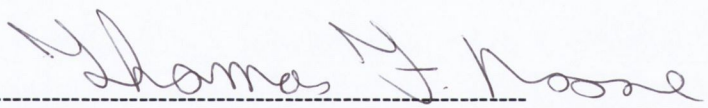
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Summary

This study investigated critical thinking in general nursing students registered in a four year undergraduate BSc. Honours degree course in nursing, at two university sites in Ireland. *A main aim* was to find out the critical thinking dispositions and skills of first and third year undergraduate nursing students. The *second aim* was to find out if there was a difference in the critical thinking dispositions and skills of the first year cohort compared to the third year cohort of nursing students.

A single embedded case study approach incorporating a concurrent triangulation mixed methods strategy and a cross-sectional design was used. Critical thinking was the *main case* and data was collected from three embedded units of analysis; a cohort of first year nursing students, a cohort of third year nursing students and eight nurse lecturers. The quantitative component of the study was dominant and the less-dominant qualitative component explored the perceptions of nursing students as well as lecturer's perceptions of critical thinking in the undergraduate nursing curriculum.

In the quantitative component of the study critical thinking dispositions were measured using the California Critical Thinking Disposition Inventory (CCTDI). The Health Sciences Reasoning Test (HSRT) was used to measure critical thinking skills. Qualitative data was collected using semi-structured interviews. The principles of case study data analysis which facilitated the incorporation of parallel mixed methods data analysis provided a strategy for data analysis. Data triangulation was used to integrate the qualitative and quantitative findings and this was facilitated by the Delphi conceptualisation and derived constructs identified by Facione (1990). The Delphi conceptualisation of critical thinking also provided the theoretical framework for this study.

The main findings for the first year cohort revealed *a positive overall disposition* towards critical thinking. A *positive* disposition was also revealed for the sub-scales of inquisitiveness, maturity of judgment, open-mindedness and analyticity. They were *ambivalent*, and considered weak, in disposition towards, critical thinking self-confidence, systematicity, and truth-seeking. In relation to critical thinking skills, the first years were *moderate in strength* for overall critical as well as for the skills of analysis and evaluation. The skill of inference was *not manifested* although bordering on moderate strength. In relation to reasoning skills, inductive reasoning was *moderate in strength*, while deductive reasoning was *not manifested* but was bordering on moderate strength. Qualitative findings revealed that analysis was the only skill prevalent in the data. The first years perceived the following as the skills for critical

thinking; *knowledge, communications, memory and recall, as well as creativity and imagination.*

The main findings for the third year cohort revealed they were *ambivalent,* and considered weak for overall disposition towards critical thinking. They were *positive* in disposition for inquisitiveness, maturity of judgment, analyticity and open-mindedness. They were *ambivalent* and as such weak in disposition towards critical thinking self-confidence, systematicity, and for truth-seeking. The third year cohort revealed *moderate strength* in overall critical thinking skill and for the skills of analysis and evaluation. Inference was *not manifested* although close to moderate strength. In relation to reasoning skills, the third years were *moderate in strength* and bordering on the strong category for inductive reasoning. They reached *moderate strength* for deductive reasoning. Qualitative findings revealed analysis and evaluation as skills for critical thinking. A theme which emerged from the qualitative data was, *'lack of awareness'* of critical thinking skills. Third year nursing students perceived the following as the skills of critical thinking; *knowledge, communication skills, being alert, confident, competent, fore-sightful, ability to self-manage and to work as a team member.*

A main finding for the differences was that, apart from inquisitiveness disposition, there was no statistically significant difference between the first and third year nursing students in overall critical thinking disposition or for any of the remaining disposition sub-scales. The third year nursing students scored slightly lower than the first years for dispositions; open-mindedness, analyticity, systematicity, self-confidence, and inquisitiveness. They scored slightly higher than the first year nursing students for truth-seeking and maturity of judgment. In relation to differences in critical thinking skills, overall critical thinking skill improved statistically significantly for the third years but did not reach the strong category. The third year nursing students revealed higher scores in analysis, evaluation, inductive and deductive reasoning compared to the first years. They were *moderate in strength* and did not reach the strong category for any of these critical thinking skills. Qualitative findings revealed the *implicit* nature of critical thinking and cr*itical thinking skills were seen as synonymous with Bloom's taxonomy, problem-solving, decision-making, literary skills and interpersonal skills.* Based on the findings of this study it is strongly recommended that *nurse educators develop their knowledge of critical thinking. It is also strongly recommended that nurse educators enhance critical thinking in the nursing curriculum and through their teaching pedagogies to promote positive dispositions and strong skills for critical thinking among undergraduate and post-graduate nursing students.*

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List of Abbreviations

ACT- COMPT- American College Testing – College Outcome Measures Programme

ADN – Associate Degree in Nursing

APA – American Philosophical Association

BSc - Bachelor of Science

BSN – Bachelor of Science in Nursing

CAO – Central Applications Office

CCTDI - California Critical Thinking Disposition Inventory

CCTST- California Critical Thinking Skills Test

CCTT- Cornell Critical Thinking Test

CTA - Critical Thinking Assessment

HEI - Higher Education Institution

HSRT- Health Sciences Reasoning Test

ICU - Intensive Care Unit

NMBI – Nursing and Midwifery Board of Ireland

NCC - Nursing Careers Centre

NQAI - National Qualifications Authority of Ireland

RNT- Registered Nurse Teacher

RN-BSN - Registered Nurse – Bachelor of Science in Nursing

SD – Standard Deviation

SJAN – Scale of Judgmental Ability in Nursing

US – United States

WGCTA-FS – Watson Glaser Critical Thinking Appraisal – Form S

WGCTA – Watson Glaser Critical Thinking Appraisal

Overview of Chapters

This study investigated critical thinking in undergraduate general nursing students at two university sites in Ireland. An overview of each chapter is provided here. **Chapter one** provides and introduction to the study and an overview of what critical thinking is and why it is needed. The need for critical thinking in nursing and an overview of the Pre- Registration Nursing Degree course is included. The rationale, significance and background to the study are explained as well as the research problem and aims of the study.

Chapter two presents the literature review in four main sections. The *first section*; a perspective on critical thinking, examines important components essential for critical thinking. Critical thinking and higher order thinking are discussed. Definitions of critical thinking and the Delphi consensus statement of critical thinking identified by Facione (1990, p. 12) and which provided the theoretical conceptualisation for this study is also analysed. In the *second section* of the literature review, critical thinking in nursing as well as models which have influenced critical thinking in nursing are analysed. In the *third section*, critical thinking is explored in the context of Irish nursing education and the undergraduate nursing curriculum. In the *fourth section,* empirical studies are analysed. The chapter concludes with implications of the literature review relevant to this study.

Chapter three presents the methodology. The methodology used was *a case study approach which incorporated a concurrent triangulation mixed methods strategy and a cross-sectional design* to address both the quantitative and qualitative research questions. Critical thinking was the main case and data were collected from three embedded units of analysis; first year nursing students, third year nursing students and nurse lecturers. A *dominant less-dominant mixed methods approach* was used in which the less-dominant qualitative data was integrated with the dominant quantitative data using data triangulation.

Chapter four explains the theoretical framework which underpinned and guided this study. The *Delphi consensus statement* and the derived constructs of the *dispositions* and *skills of critical thinking* identified by Facione (1990) were central components of the theoretical framework. Conceptual definitions of the dispositions and skills of critical

thinking provide the theoretical underpinning for the findings from this study (Facione & Facione, 2010, 2012, 2014). The theoretical framework also guided the integration of the quantitative and qualitative findings and provided the theoretical conceptualisations to interpret the findings.

Chapters five and six present the *quantitative results* for the critical thinking dispositions and skills of the first year cohort of undergraduate nursing students. **Chapters seven and eight** present the *quantitative results* for the critical thinking dispositions and skills of the third year cohort of undergraduate nursing students. **Chapter nine** presents the results for the *differences in the critical thinking dispositions and skills* of the first and third year cohorts of undergraduate nursing students.

Chapters ten and eleven discuss the main findings for the critical thinking dispositions and skills of the first and third year nursing students, respectively. Qualitative findings are integrated to add further insights about critical thinking from the nursing students' perspective. **Chapter twelve** discusses the differences in critical thinking dispositions and skills of the first and third year undergraduate nursing students. It also discusses the perceptions of nurse lecturers about critical thinking in the undergraduate nursing curriculum. The chapter concludes with a discussion around implications for critical thinking in nursing education in the Irish context as well as implications for research. **Chapter thirteen** includes recommendations arising for this study as well as the conclusion.

A **glossary** is included at the end of this thesis in which terms used in this study are defined.

Chapter 1 Introduction and Rationale for the study

1.1 Introduction

This study investigated critical thinking in general nursing students undertaking a four year undergraduate honours degree course in nursing, in Ireland. The Pre-Registration Honours Nursing Degree Programme at two university sites provided the context of the study. In this introductory chapter the need for critical thinking, the rationale and significance of the study, the research problem and aims of the study are explained. The specific research questions are also included. At the outset it is important to provide a brief overview of what critical thinking is and why we need it.

1.2 Critical thinking: What it is and why we need it?

In any investigation of critical thinking there are two important questions to consider. The first question is; *what is critical thinking?* The second question is; *why do we need critical thinking?* These two questions are relevant to all professionals, in all disciplines and this includes nursing. In relation to the first question, there does not appear to be a single accepted definition of critical thinking. Over the decades, and especially since the 1980s, Scholars in the fields of Education, Philosophy and Psychology have provided their definitions and perspectives on critical thinking and these definitions are explored later in the literature review. An early and one of the most influential writers on thinking was John Dewey (1910), an Educational Philosopher, who identified the importance of thought and reflective thinking in relation to an understanding of thinking and critical thinking. Watson and Glaser (1957), who were also early proponents of critical thinking, viewed critical thinking as requiring two main components, one, an attitude or being disposed to consider in a thoughtful way problems and subjects that come within the range of one's experience, and two, some skill in applying the methods of logical inquiry and reasoning. Dispositions and skills as components of critical thinking have also been identified as necessary for critical thinking with the work of Ennis (1985) and Facione (1990) having a significant contribution in identifying the dispositions and skills of critical thinking. This brief account identifies critical thinking as having the components of *knowledge, dispositions and skills* and each of these components is discussed in further detail in the literature review, in the next chapter.

The second question above asks; *why do we need critical thinking?* Critical thinking according to Brookfield (1987) is part of what it means to be a developing person, it is necessary for a healthy democracy, and without critical thinking our relationships become stagnant, our work places remain stagnant, and our political involvements can dwindle to the point of total non-participation. It is clear from Brookfield's perspective that without critical thinking things can become stagnant and are less likely or slow to change and this clearly identifies the importance and need for critical thinking. Critical thinking is relevant and necessary in education so that students can think and exercise good judgment (Lipman, 1988; Norris, 1985). The need for, and the relevance of critical thinking in education in the US has been extensively debated, significantly so since the 1980s, and according to Facione (1990, p. 1), 'gained momentum through the decade'. This need arose due to the recognised decline in higher level thinking and according to Facione (1990, p. 1), 'the growing accord among educationalists in the processes of, inquiry, learning and thinking rather than the accumulation of disjointed skills and senescent information'. According to Paul and Nosich (1992) such was the concern that the United States Department of Education commissioned the Centre for Critical Thinking to develop a model for the national assessment of higher order learning. The importance of the need for critical thinking in education in the North American context is clearly evident from the above. In a recent report on higher education in Ireland the need for critical thinking is also evident.

1.3 Need for critical thinking in Irish education

The need for critical thinking is now becoming a more explicit realisation in the Irish higher education setting. This realisation is acknowledged in the report of the National Strategy for Higher Education (2011) which sets the agenda for higher education reform in Ireland from 2015-2030. The executive summary states that:

> Higher education... plays a fundamental role in fostering a spirit of inquiry and a strong sense of the value of learning among students; it is the positive engagement that students have with higher education that stimulates the imagination and makes innovation possible. The quality of their learning experiences and the environment in which students learn will shape the future development of our society. The people who enter higher education in the coming decades are the job creators, policy-makers, social innovators and business leaders of the future. They are also citizens who will add to the richness of society- as parents, community leaders and teachers- and in their chosen area of work they will be the productive engine of a vibrant and prosperous economy. (National Strategy for Higher Education, 2011, p. 9)

This extract from the executive summary of the National Strategy for Higher Education (2011) heralds the need for critical thinking. The onus lies with professionals in all disciplines involved in education, including nursing, to foster a spirit of inquiry, stimulate engagement and imaginative innovation. The report also points out that, 'students entering higher education directly from school often lack the critical thinking, problem solving and independent learning skills required for successful engagement in higher education' (p.55). This criticism lies with the second level education system in Ireland which according to Hyland (1999b, pp. 5-6) has been a concern with regularity in reports over the past fifty years as it does not adequately prepare students for third level with emphasis on *'teaching-to-the-test'*. This further highlights the need for emphasis on critical thinking in higher education, now and into the future. In the report, the following fundamental question is asked; *'what are the right skills for the graduates of 2015 and of 2030 and what mix of skills should we pursue as learning outcomes of higher education?'* It is also acknowledged in the report, that to address the societal needs over the coming years, increased attention must be paid to core skills such as, quantitative reasoning, critical thinking, communication skills, team-working skills and the effective use of information technology (p.35).

The Report of the National Strategy for Higher Education (2011) acknowledges the deficit in critical thinking in college entrants; as well as the need for reform in higher education to meet the demands of an evolving society in a rapidly evolving world. In part two of the report, in the section - a mission for higher education, it is acknowledged that critical thinking, adaptability and creativity will be key characteristics required of graduates in the future labour market. The report also acknowledges that teachers will play a significant role in teaching and learning; teachers in higher education 'need to stimulate active, not passive learning; to encourage students to be critical, creative thinkers, with the capacity to go on learning after their college days are over (p.53). It is clearly evident that to address such educational requirements, in the context of higher education in Ireland, not just from 2015 to 2030, but beyond, will require critical thinking in all disciplines, including nursing.

1.4 Need for critical thinking in nursing

From an international perspective, interest in thinking and critical thinking developed a much stronger interest in the 1980s and into the 1990s and especially so in North

America. This interest also developed in the teaching of thinking in Europe (McGuinness, 1991) and strong interest also emerged in nursing. Critical thinking was considered of such importance in nursing education in the United States that in 1991 the National League for Nursing (NLN) identified critical thinking as a core outcome in nursing curricula (Stewart & Dempsey, 2005; Twibell, Ryan, & Hermiz, 2005; Vaughan-Wrobel, O'Sullivan, & Smith, 1997; Videbeck, 1997a). This emphasis led nurse educators to focus on critical thinking in nursing curricula to prepare nurses for professional practice. It also influenced a surge in empirical research on critical thinking as an outcome of nursing education. A landmark study in nursing is that of Scheffer and Rubenfeld (2000) who identified, *'habits of mind'* and *'skills'* as components of critical thinking in nursing and their work is discussed later in the literature review.

While the interest in critical thinking continues in nursing in North America, interest has developed in the context of Irish nursing with the more recent transition of nurse education to the higher education sector in September 2002. While nurse educators are ambitious to achieve critical thinking, it may be suggested that although mindful of this, they may not be fully aware of the nature of critical thinking and the influence of the curriculum experience on the critical thinking of undergraduate nursing students. While this might seem a limitation on their part they are none the less concerned and ambitious to promote critical thinking in the new undergraduate nursing degree course. The interest in critical thinking is also evident in research on the topic, although rather limited, from an Irish nursing perspective. A study by Drennan (2009) examined critical thinking in Masters in nursing students using the Watson Glaser Critical Thinking Appraisal (WGCTA). A study by Hegarty, Walsh, and McCarthy (2008) also used the Watson Glaser Critical Thinking Appraisal to investigate critical thinking in first and fourth year undergraduate nursing students as well as registered nurses at the end of a one year degree programme. The main purpose of these studies was to reveal the effects of advancing nurse education on critical thinking ability and these studies are analysed in further detail later in the literature review.

This study adds a significant and substantial contribution of knowledge about critical thinking in general nursing students undertaking an undergraduate honours degree course in nursing at two university sites in Ireland. Research at this point in time is non-existent with respect to nurse educators and critical thinking in the Irish setting. To

address the gap this study also explored the perceptions of nurse educators about critical thinking in the undergraduate nursing curriculum. The Pre-Registration Nursing Degree course provided the context which stimulated interest in critical thinking in Irish nursing education and this is examined in the following section.

1.5 The Pre-Registration Honours Degree in Nursing in Ireland

From the 1890s nurse education in Ireland evolved into an *apprenticeship model* of training. The apprenticeship model existed for almost one hundred years up to1998 when recruitment to the hospital apprenticeship-training ceased (Fealy, 2006, p. 152). Following a period of industrial unrest in relation to pay, conditions of work and promotion opportunities the Commission on Nursing was established in March 1997. A main recommendation in the Report; Recommendation 5.19, was that, 'nursing students should be educated to degree level and be fully integrated with the third-level education sector' (Government of Ireland, 1998, p. 79). The Pre-Registration Honours Degree in Nursing, referred to as *the new under undergraduate nursing degree course*, commenced in September 2002 with the first intake of students at thirteen higher education institutions in the Republic of Ireland. The thirteen higher education institutions consisted of five universities and eight institutes of technology. The new degree course is a level eight, Honours, Bachelor Degree and the academic award is at Bachelor of Science (B.Sc.) level (National Qualifications Authority of Ireland, 2007). There are four disciplines of nursing at undergraduate level which are: general, children's and general (integrated), psychiatric, and intellectual disability nursing (Nursing Careers Centre, 2013). The majority of entrants to the course enter directly from school having completed their second level education or what is called the Leaving Certificate[1].

---

[1]The Leaving Certificate is the terminal examination of post-primary education and is taken when students are typically 17 or 18 years of age (Department of Education and Science, 2004, p. 13). It is the culmination of five or six years of second level education. Students study six or more subjects at ordinary or higher level from a range of almost forty. There is heavy emphasis in the Leaving Certificate programme on the terminal or end-of-cycle examination which is marked and graded by external examiners. The State Examinations Commission (SEC) has responsibility for the administration of the Leaving Certificate (Hyland, 1999b, p. 5). The equivalent in Great Britain and Northern Ireland are A-levels (O'Hare & McGuinness, 2009)

The Pre-Registration Degree course is a four year course with the theoretical component delivered by the higher education institution and the clinical practice component taking place in an affiliated health service provider of which there are forty four (Nursing Careers Centre, 2013) (Appendix 1). The theoretical component of the new degree course consists of subjects drawn from various disciplines with biological and social sciences contributing 33% and includes subjects such as, anatomy, physiology, physics, chemistry, bio-chemistry, genetics, pathology, microbiology and pharmacology. Subject matter in social science incorporates psychology, sociology, philosophy and ethics. The art and science of nursing contributes 67% of the theoretical component and includes subject matter in, interpersonal skills, communication, health care systems, health promotion, history of nursing, individual and health and illness, person centred care, personal and professional development, theory of nursing and research as well as the development of nursing (Nursing Careers Centre, 2007, 2009, 2013).

In preparation for the transition to the higher education sector, nurse educators undertook the development of a new curriculum. The emphasis in curriculum development was on higher level learning to enable the graduate nurse deal with the complexities of modern day health care delivery. In view of the new degree course and the transition to higher education nurse educators, as curriculum planners, were guided by the Nursing Education Forum (Government of Ireland, 2000) and the Requirements and Standards for Nurse Registration Education Programmes (An Bord Altranais, 2000)[2]. Processes for higher level learning were evident in the requirements in which it is stated that:

> The registration education programme enables the student to:
> Demonstrate a knowledge base and a level of competence in clinical practice skills essential for safe practice, which are grounded in recent evidenced based nursing research, where available. ...
> Demonstrate development of skills of analysis, critical thinking, problem-solving and reflective practice.
>
> (An Bord Altranais, 2000, p. 13)

[2] An Bord Altranais; Irish Nursing Board was re-named in 2012 as; Bord Altranais agus Cnaimhseachais na hEireann; Nursing and Midwifery Board of Ireland. The term An Bord Altranais is mainly used throughout this study.

The requirements of An Bord Altranais (2000) include; *knowledge, competence, research, skills in analysis, critical thinking, problem-solving and reflective practice*. These requirements were part of the guiding principles for nurse educators in curriculum development. The knowledge component is addressed through increased curriculum content and the use of continuous assessment to determine learning outcomes. Competence is assessed in relation to clinical practice using a competency assessment tool. Research skills are taught and assessed in the course and enhanced in context of literary skills and evidence based practice. Reflection is used as a teaching and learning method in a structured approach in the fourth year of the course to facilitate the skills of analysis and evaluation and to enhance problem-solving and critical thinking. Critical thinking is considered to develop in context of the above components and is not clearly articulated and this appears to suggest a lack of knowledge about critical thinking and how it might be developed. This lack of knowledge and evidence of critical thinking in the undergraduate nursing degree course was a main reason for this study. There were also additional reasons for this study and these are explained next.

1.6 Rationale for the study

A number of motivational factors influenced the rationale for this study. The first and main reason was the limited knowledge of critical thinking in undergraduate nursing students in the Irish setting. A second reason was my own personal desire to find out about critical thinking in undergraduate nursing students and to find out if there was a difference in the critical thinking of first year nursing students compared to more senior third year nursing students in context of the nursing curriculum experiences. A third reason was a desire to compare the findings from the Irish setting with international published findings for critical thinking. A fourth reason was, to provide a starting point for further investigations and add to the body of knowledge on critical thinking in the Irish setting. A fifth reason was, to address my own curiosity and desire to find out about critical thinking as well as to contribute to a greater awareness of critical thinking among nurse educators and nursing students. The sixth and final reason was, to investigate critical thinking form both a quantitative and qualitative perspective and achieve further insights in relation to critical thinking in the undergraduate nursing students as well as in the nursing curriculum.

1.7 Significance of the study

This study is significant as it aims to provide essential knowledge of critical thinking in undergraduate general nursing students in context of an undergraduate nursing curriculum. It will inform nurse educators about critical thinking and provide empirical data about what is as the moment speculative in terms of critical thinking in Irish undergraduate nursing students. Knowledge of critical thinking dispositions and skills will provide empirical data by identifying strengths and weaknesses in the dispositions and skills of undergraduate nursing students. This knowledge has potential to inform the development of critical thinking through teaching and learning in the nursing curriculum. Empirical data will be available to provide recommendation for nurse educators in relation to curriculum development and teaching pedagogies to enhance critical thinking in the undergraduate nursing. The study is significant in that it will also provide qualitative data to compliment the quantitative data, thus providing further insights about the impact of the nursing curriculum on critical thinking. The contribution of the nurse educators will also provide insights about critical thinking in the nursing curriculum. This is an aspect which to date has not been explored in nurse education in Ireland and this study is a significant contribution of new knowledge to address this gap. This study is significant in its design in that it used *a case study approach* in which critical thinking was the main case. The study also incorporated mixed methods as well as a cross-sectional design to address the research questions. It will make a significant contribution to research on critical thinking and especially given the very limited empirical knowledge base about critical thinking in the undergraduate nursing degree course. It will also contribute to the existing body of international knowledge on critical thinking in nursing.

1.8 Background to the study

The background to this study is the undergraduate nursing degree course which commenced in September 2000. The transition to higher education resulted in the development of a new curriculum with emphasis on higher level learning. Curriculum outcomes for the new graduate nurse include increased knowledge and critical thinking (An Bord Altranais, 2000). While the knowledge component is addressed in continuous assessment with the award of a grade as evidence of achievement this is not the case for critical thinking. The outcome in terms of critical thinking in undergraduate nursing students as a result of the curriculum experience is speculative. To address this lack of knowledge an investigation of critical thinking in nursing students undertaking the

undergraduate nursing degree course is necessary. To conduct this study two similar university sites were used and the sample was pooled. The pooling of the samples is explained later in the methodology chapter. Two cohorts of undergraduate nursing students were included in the study, a cohort of first years and a cohort of third years. The undergraduate curriculum as experienced by the nursing students was the context of this study. To add a further dimension to this study, data was collected from lecturers in nursing to gain insight about their views of critical thinking in the undergraduate nursing curriculum.

1.9 Research problem

Critical thinking is an expected outcome of the undergraduate nursing degree course (An Bord Altranais, 2000). Knowledge of critical thinking is lacking and there is an assumption, that if nursing students successfully complete the theoretical component of the nursing degree course, use evidenced based practice, and if they achieve competence in clinical practice they will have developed as a critical thinker. The problem lies in the assumed expectation of critical thinking and raises the following questions: what do we actually know of critical thinking in undergraduate nursing students in the Irish nursing education setting? What is the status of their critical thinking in the first year of the course? Does critical thinking develop or change on the course as a result of curriculum experiences? Are the nursing students different in their critical thinking as they progress towards a more senior level on the course? What are the views of nurse lecturers about critical thinking in the undergraduate nursing curriculum? All of these questions are very relevant and they provide the basis for investigation in several research studies, however, to bring focus to this study it is important to clarify the aims of this study.

1.10 Aims of the study

One aim of this study was to investigate critical thinking in two different cohorts of undergraduate general nursing students to find out their critical thinking ability. The second aim was to find out if there was a difference in critical thinking of junior and more senior undergraduate nursing students in context of the undergraduate nursing curriculum. The third aim was to explore the perceptions of the nursing students and their lecturers about critical thinking in the undergraduate nursing curriculum. The

fourth aim was to generate new knowledge and provide recommendations in relation to critical thinking in an Irish nursing education context.

1.11 Research questions

To achieve the aims stated above, both quantitative and qualitative research questions were required. One set of quantitative questions focused on the investigation of *dispositions* towards critical thinking. A second set of quantitative questions focused on the *skills* of critical thinking. A third set of questions focused on the differences in the critical thinking dispositions and skills of the first and third year undergraduate nursing students. To achieve the third aim, qualitative questions explored the students and lecturers views about critical thinking in the nursing curriculum. The following research questions were addressed in this study:

- **1)** What are the critical thinking dispositions of first year undergraduate general nursing students as measured by the CCTDI?
- **2)** What are the critical thinking dispositions of the third year undergraduate general nursing students as measured by the CCTDI?
- **3)** What critical thinking skills do undergraduate general nursing students have in the first year of the nursing degree course as measured by the HSRT?
- **4)** What critical thinking skills do undergraduate general nursing students have in year three of the nursing degree course as measured by the HSRT?
- **5)** What is the difference in the critical thinking dispositions of the first and third year undergraduate general nursing students?
- **6)** What is the difference in the critical thinking skills of the first and third year undergraduate general nursing students?
- **7)** What are first year undergraduate general nursing students' perceptions of critical thinking in the nursing curriculum?
- **8)** What are third year undergraduate general nursing students' perceptions of critical thinking in the nursing curriculum?
- **9)** What are the perceptions of nurse lecturers about critical thinking in the undergraduate nursing curriculum?

1.12 Conclusion

This chapter provided an introduction to this study to investigate critical thinking in undergraduate general nursing students in context of the curriculum of the new

undergraduate nursing degree course which commenced at a national level in the Republic of Ireland in September 2002. Critical thinking was considered to be both important and necessary and the new undergraduate nursing curriculum was developed with critical thinking as an outcome. To date, there is very little knowledge available to the nursing profession and to nurse educators about critical thinking from an Irish nursing perspective. This study aims to address the knowledge gap and make what can be considered a substantial contribution to critical thinking in Irish nursing education. A literature review was undertaken to provide a perspective on critical thinking as well as a perspective of critical thinking in nursing and is presented in the next chapter.

Chapter 2 Literature Review

2.1 Introduction

This chapter presents a review of the literature on critical thinking in four main sections. In the first section, components of critical thinking, critical thinking and higher level thinking, definitions of critical thinking and the definition of critical thinking used in this study are discussed. The second section provides a perspective on critical thinking in nursing and discusses definitions of critical thinking as well as influences on critical thinking in nursing. The third section explores critical thinking in the context of Irish nursing education and includes models of nurse education which have influenced thinking and critical thinking in Irish nursing. Critical thinking in the undergraduate nursing curriculum is also discussed. The fourth section explores empirical studies on critical thinking from a quantitative and qualitative perspective.

2.2 Critical thinking: A perspective

In this section, the components of thinking and critical thinking, assumptions and critical thinking, and the use of reason are explained. Higher order thinking and critical thinking is also discussed. Definitions of critical thinking and the Delphi definition of critical thinking used in this study are also discussed.

2.2.1 Components of thinking and critical thinking

Critical thinking involves thinking and an understanding of the components of thinking is fundamental to an understanding of critical thinking. According to Beyer (1987, p. 17), 'any act of thinking involves one or more *cognitive operations, certain kinds of knowledge, and certain attitudes or dispositions'.* The first component, the *cognitive component* consists of cognitive and meta-cognitive operations and Beyer (1987) identifies three levels of cognitive operations. Level one, the highest level, is complex strategies such as decision-making, problem-solving and conceptualizing. Level two, are complex critical thinking skills, such as distinguishing what is relevant from what is irrelevant. Level three, the lowest level, are less complex skills such as, the processing skills of analyzing and synthesizing, as well as reasoning skills. According to Beyer (1987, p. 17), 'any act of thinking combines operations designed to produce meaning (cognitive operations) with those that direct how meaning is produced (meta-cognitive operations)'. The cognitive operations are, major strategies, critical thinking skills,

micro-thinking skills and reasoning. Meta-cognition is the superordinate operation which controls all the cognitive operations and according to Beyer (1987, p. 191), 'thinking becomes more effective and efficient when we think about how we are thinking as we think'. Meta-cognition, according to Beyer (1987, p. 24), 'requires individuals, in effect, to stand outside of their own heads and to be aware of how they are going about their own thinking so that they can better accomplish what it is they are trying to accomplish'. Halpern (1996) refers to meta-cognition as, meta-cognitive monitoring or our knowledge about knowledge. Meta-cognition is viewed above as a superordinate control over thinking or way of monitoring our knowledge and McGuinness (1990, p. 302) states that metacognitive activity is 'the main tool for modifying both general and domain-specific thinking' and she also states that meta-cognition is the prime target to enhance thinking. Thus, an act of thinking involves both cognitive and meta-cognitive operations.

The second important component of thinking according to Beyer (1987) is, *knowledge.* One dimension of the knowledge component consists of *general heuristics,* or *'rules of thumb',* on how to execute various thinking operations. A second dimension of the knowledge component of thinking is, knowing something about the nature of knowledge itself. Such knowing involves, for example, knowing that what we believe in as knowledge is highly selective, fragmentary, interpretative, continuously changing and thus, most tentative (Beyer, 1979). A third dimension of the knowledge component is knowledge of the subject area about which one is thinking and is usually referred to as, domain-specific knowledge. This includes knowing of various reliable sources of data in a particular field of knowledge, any special heuristics for handling this domain-specific data, and specific analytical concepts useful for generating, organizing, and making sense of information in specific fields (Doyle, 1983). Knowledge in a particular field as well as the quality of knowledge used is necessary for thinking and critical thinking. A third major component of thinking identified by Beyer (1987) is, that thinking consists of a variety of *attitudes,* or what Ennis (1985) calls, *dispositions* that support as well as drive it. The three main components of thinking identified above as cognitive operations, knowledge and dispositions are necessary for thinking and according to Beyer (1987, p. 20), 'in any thinking act these three components are so intertwined they are often impossible to separate one from the other'.

As critical thinking incorporates thinking, the three components of cognitive operations which include thinking skills, domain-specific knowledge and dispositions are inherent in critical thinking. In relation to the cognitive operations component, Beyer (1987, p. 34) states that, 'critical thinking operations are thus somewhere between major strategies and micro thinking skills in complexity, function, and inclusivity'. Critical thinking is not a major strategy of problem-solving, decision-making, or conceptualization and instead it is a collection of specific operations or skills that may be used singly or in any combination or in any order (Beyer, 1987) (Appendix 2). Another component of critical thinking is argument. According to Beyer (1987, p. 34), ' probably the most all-inclusive act of critical thinking is that of argumentation - argument making and argument analyzing' and Beyer also states that, 'argument in critical thinking terms, is an assertion or claim accompanied by evidence, a line of reasoning and general principles supporting this claim and denying any alternative claims'.

The components of critical thinking which are evident from Beyer's (1987) account of thinking and critical thinking include, a set of skills more complex than micro-thinking skills and reasoning, yet less complex than, but not synonymous with, problem-solving, decision-making and conceptualizing. Meta-cognition is seen as important as it controls all three levels of, major thinking strategies, micro thinking strategies, reasoning and critical thinking skills. Critical thinking also requires argumentation and dispositions. Dispositions as a component of critical thinking are discussed next.

2.2.2 Critical thinking dispositions

Dispositions as a component of critical thinking have been identified by authors such as Beyer (1987), Ennis (1985), Facione, Facione, and Sanchez (1994) and Halpern (1996). Attitude or disposition towards critical thinking is also referred to as, a *'habit of mind'* (Facione & Facione, 2010) or *'critical spirit'* (Norris, 1985). Thirteen important dispositions for critical thinking were identified by Ennis (1985, p. 46) and include, being open-minded, paying attention to the total situation, seeking reasons and trying to be well informed. The full list of dispositions identified by Ennis (1985) is shown in (Appendix 3). Two types of dispositions identified by Beyer (1987, pp. 18-19) are those that relate to thinking in general and those that relate to specific cognitive operations. Dispositions that relate to thinking in general are, 'a tolerance for ambiguity, a

willingness to suspend judgment, a respect for evidence and for the use of reason, a willingness to alter a judgment when reason and evidence make it appropriate to do so, a healthy scepticism and curiosity, and an objective respect for 'the truth'. Dispositions in relation to specific cognitive operations are, willingness and a desire to consider an issue from points of view other than one's own, a desire to secure as much information as possible before making a judgment, and a willingness to identify additional alternatives after an apparently acceptable alternative has been proposed (Beyer, 1987, pp. 18-19).

For Halpern (1996, p. 26), an essential component of critical thinking is developing the attitude and disposition of a critical thinker and Halpern also states that, one of the major differences between good and poor thinkers, and correspondingly between good and poor students, 'is their attitude'. The following critical thinking dispositions are identified by Halpern (1996, p. 27), 'a willingness to plan, flexibility, persistence, willingness to self-correct, being mindful, and consensus-seeking'. Willingness to plan requires the need to check impulsivity and plan a response. An attitude of flexibility is a willingness to try new options, try things a new way, or reconsider old problems, being open-minded, willing to suspend judgment, gathering more information, and attempt to clarify difficult issues. Persistence, as good thinking is hard work that requires diligent persistence. Have a willingness to self-correct which requires that instead of becoming defensive about errors, good thinkers can acknowledge them and learn from them. They utilize feedback and try to figure out what went wrong and to recognize the factors that led to the error. They recognize ineffective strategies and abandon them in order to improve the thinking process. Consensus-seeking is an important disposition which requires high-level communication skills, finding ways to compromise and to achieve agreement. According to Halpern (1996), without this disposition even the most brilliant thinkers will find that they cannot convert thoughts to actions.

Critical thinking dispositions have also been identified by Facione and Facione (2010) and include, truth-seeking, open-mindedness, analyticity, systematicity, critical thinking-self-confidence, inquisitiveness and maturity of judgement. The critical thinking dispositions identified by Facione et al. (1994) and Facione and Facione (2010) formed a component of the theoretical framework for this study and are explained in detail in Chapter 4. Disposition or attitude is an important component of critical thinking and the

dispositions identified above by the various authors reveal a broad range of dispositions, yet some commonalities are evident in terms of open-mindedness and inquisitiveness. Another important component of critical thinking is skills and these are explained next.

2.2.3 Critical thinking skills

Another important component of critical thinking are skills for critical thinking and Facione and Facione (2012, p. 65) state that, while possessing the requisite skills is necessary, 'so is being disposed to value and use those skills'. In 1985, Robert Ennis identified four general sets of abilities as, clarity related abilities, inference related abilities, abilities related to establishing a sound basis for inference, and abilities involved in going about decision making in an orderly and useful way, often called problem-solving. The critical thinking abilities identified by Ennis (1985) are shown in Appendix 3. Earlier in this section cognitive operations identified by Beyer (1987) were examined and included critical thinking skills (Appendix 2). Critical thinking skills according to Beyer (1987) are used together with micro-thinking skills such as recall, analysis, evaluation, interpretation, reasoning and the major strategies of problem-solving, decision-making and conceptualizing. Critical thinking skills according to Beyer (1987, p. 17) are 'more complicated' and require an ability to distinguish what is relevant from what is irrelevant.

Critical thinking skills have also been identified by Facione and Facione (2012) and include; analysis, inference, evaluation, inductive reasoning and deductive reasoning. These critical thinking skills identified also formed a component of the theoretical framework for this study and are explained in detail in Chapter 4. Reason has been identified as an important critical thinking skill (Beyer, 1987; Ennis, 1985; Facione & Facione, 2012). According to Sternberg and Sternberg (2012), reasoning is a form of thinking used in making a judgment and in decision-making. Two forms of reasoning are, deductive reasoning and inductive reasoning (Ennis, 1985; Facione & Facione, 2012; Sternberg & Sternberg, 2012). Deductive reasoning involves reasoning from one or more general statements regarding what is known to a specific application of the general statement, while inductive reasoning is a process of reasoning from specific facts or observations to reach a likely conclusion that may explain the facts (Sternberg & Sternberg, 2012). Deductive and inductive reasoning processes are central to

thinking, reflective thinking and critical thinking. They are the reasoning processes which assist to support beliefs and assumptions and influence the evidence we use in deciding what to believe or do which are important outcomes of critical thinking. Critical thinking dispositions and skills, as well as reasoning skills, are deemed necessary for critical thinking. Another important component is checking of one's assumptions.

2.2.4 Assumptions and critical thinking

Assessment of assumptions is regarded as another essential component of critical thinking. According to Stephen Brookfield (2012, p. 12), an Educational Philosopher, critical thinking happens when one does four things; hunt assumptions (paradigmatic, prescriptive, causal), check assumptions, see things from different viewpoints and the main reason being to take informed actions. Critical thinking happens when we search for assumptions that influence the way we think and act. Checking assumptions involves assessing whether our assumptions are valid and reliable guides for action based on convincing evidence. Evidence may be experiential, based on things that have happened, or authoritative, what people we trust have told us is the truth and sometimes derived from research and inquiry. The four aspects above are identified by Brookfield (2012) as important to critical thinking and in relation to taking informed action. Informed action involves thought and analysis in which evidence is seriously considered in support of a particular action. Challenging assumptions in terms of their assessment and evaluation of evidence is an important activity in determining the quality of critical thinking.

Critical thinking can be considered as a form of thinking, which according to Beyer (1987), requires cognitive operations which are less challenging than the complexities of decision-making, problem-solving and conceptualizing, but not as simple as micro-thinking skills of analyzing, synthesizing and reasoning. Critical thinking involves cognitive and meta-cognitive activities or what Beyer (1987) describes as meaning making. Dispositions and skills are two additional and essential components of critical thinking which are also necessary to challenge assumptions. Critical thinking can be considered to have different components and it is not uncommon for critical thinking to be considered as a form of higher order thinking. In the next section, both higher order thinking and critical thinking are analysed and discussed.

2.2.5 Higher order thinking and critical thinking

Higher order thinking and critical thinking are forms of thinking associated with what is termed, higher level learning, and it is important to gain a perspective on higher level thinking as it contributes to an understanding of critical thinking. One definition of higher order thinking is provided by Lewis and Smith (1993) who state that:

> Higher order thinking occurs when a person takes new information and information stored in memory and interrelates and/or rearranges and extends this information to achieve a purpose or find possible answers in perplexing situations. (Lewis & Smith, 1993, p. 136)

This clearly identifies that for higher order thinking, defined in this way, there is a re-arrangement of new and existing information to extend knowledge to deal with perplexing situations. Lewis and Smith (1993) derived this definition based on the work of Maier (1933), Bartlett (1958), Resnick (1987) and Newman (1990) as well as the Commission on Science Education of the American Association for the Advancement of Science, to clarify the difference between higher and lower order thinking. Clarification of the difference between lower and higher order thinking is helpful in positioning critical thinking in relation to higher order learning.

According to Maier (1933) lower order reproductive thinking is based on contiguous experiences with previous repetitions of the relationships involved in a learned behaviour pattern, and an example is learning multiplication tables through repeated practice. Higher order thinking is a form of reasoning or productive thinking based upon an integration of two or more isolated experiences and is qualitatively different. According to Bartlett (1958) thinking involves three '*gap filling*' processes of; interpolation (the filling in of information that is missing from a logical sequence), extrapolation (extending an incomplete argument or statement), and reinterpretation (re-arrangement of information to effect a new interpretation). Moving from lower order to higher order thinking therefore involves past experience in gap filling and a move through a succession of interconnected steps. Resnick's (1987) view is that, higher order thinking skills such as, 'elaborating the given material, making inferences beyond what is explicitly presented, building adequate representations, analysing and constructing relationships' are involved in elementary mental skills and that use of reading brings the lower and higher order thinking skills to play. According to Lewis

and Smith, the perspective of Newman (1990) distinguishes between lower and higher order thinking. Lower order thinking demands only routine or mechanical application of previously acquired information such as, listing information previously memorized and inserting numbers into previously learned formulas. In contrast, higher order thinking, according to Newman (1990), challenges the student to interpret, analyze or manipulate information. Lewis and Smith (1993) draw attention to the similarity between Newman's lower order thinking and Maier's definition of reproductive thinking and also the similarity between them. Another form of higher order thinking is problem-solving. The Commission on Science Education of the American Association for the Advancement of Science, according to Lewis and Smith (1993), identified problem-solving as higher order thinking and consisting of basic and integrated processes. Basic processes are, observing, measuring, inferring, predicting, classifying, and collecting and recording data. The integrated processes include interpreting data, controlling variables, defining operationally, formulating hypotheses and experimenting. The effective use of the integrated processes requires the basic processes and the integration is hierarchical. These perspectives of Lewis and Smith (1993, p. 134) led them to conclude that, 'there is a difference between lower and higher order thinking' and the difference can be considered a qualitative one in terms of utility in perplexing situations. Next is to consider the position of critical thinking.

Having a somewhat clearer view of the nature of lower and higher order thinking it assists to bring a degree of clarity to the position of critical thinking. According to Lewis and Smith (1993) critical thinking in the past was considered synonymous with problem-solving and they cite Beyer (1985, p. 276) who states that, 'critical thinking is not problem-solving and he also states that, 'it is not a cover all term for all thinking skills'. Lewis and Smith (1993) go on to state that definitions of critical thinking are becoming more broad to incorporate evaluation of statements and problem-solving and they acknowledge the more broad definitions of Ennis (1987) and Facione (1984). In contrast to that perspective, they cite the work of Smith, Peterson, Borg, Bullerman, and Underbakke (1991) who consider critical thinking and problem-solving as separate domains and also as separate from higher order thinking. Lewis and Smith (1993) state that the problem of conceptualising higher order thinking, critical thinking, and problem-solving lies in the difficulty in merging the philosophical and psychological base. Philosophy, in the humanities, prefers critical thinking while psychology is more oriented towards a scientific problem-solving approach, yet both types of thinking are

needed in all disciplines. In acknowledging conceptual difficulties, Lewis and Smith (1993) suggest a broader term than critical thinking, such as, higher order thinking to include problem-solving, critical thinking, creative thinking and decision-making. The definition of higher order thinking cited above by Lewis and Smith (1993, p. 136) is proposed as an inclusive one with 'the potential to help educators transcend the split between the sciences' 'problem-solving' and the humanities 'critical thinking'.

To add further to this perspective on higher order thinking and critical thinking, Reed Geertsen (2003, p. 1) explored higher order thinking, critical thinking and reflective thinking, and he states that, 'critical thinking and reflective thinking are distinctly different yet complimentary forms of higher level thinking'. He concluded, that some authors equate critical thinking and reflective thinking with higher order thinking (Paul & Nosich, 1992; Teays, 1996), while others (King & Kitchener, 1994), retain a distinction offered by Dewey (1910) in which critical thinking and reflective thinking are two distinguished levels of thinking. Reed Geertsen (2003, p. 7) also acknowledged the lack of conceptual clarity surrounding critical thinking and he states that, 'the frequent use of the term *'critical thinking'* to represent all types of higher-level thinking creates confusion', and he also states that this is partly due to the ambiguous meaning of critical thinking. Reed Geertsen (2003) differentiated between critical thinking and reflective thinking, with critical thinking being above everyday thought and reflective thinking extending beyond existing knowledge and standards, and being unpredictable, spontaneous, and creative. He believes that both terms include several different types of higher-level thinking, yet the types of thinking characterized by critical thought are distinctly different from those characterized by reflective thought. Reed Geertsen (2003) suggests that critical thinking is a broad category for the following types of higher level thinking: typological, foundational, researching, critical judging conceptualizing and decision-making. Reflective thinking is a broad category for higher level types of thinking such as: analogical thinking, constructional thinking, theory building, dimensionalized judging, contextualizing and problem-solving.

Based on the views of Lewis and Smith (1993) and Reed Geertsen (2003) critical thinking appears to be best considered under a broad term of higher order thinking, and therefore, not synonymous with higher order thinking. They identified the problem of conceptual clarity form exploring the range of terms and how critical thinking is

defined by various scholars. It is evident that critical thinking remains a challenging construct for academics in both education and research. While the perspectives on higher order thinking and critical thinking discussed here brings a focus to critical thinking in relation to higher order thinking it also acknowledges the lack of conceptual clarity underpinned by the divergent philosophical perspectives of the sciences on one hand and the arts and humanities on the other, thus, posing a challenge in defining critical thinking. This lack of conceptual clarity can be seen to contribute, in a way, to the different definitions of critical thinking and these are analysed and discussed next.

2.2.6 Critical thinking definitions

Many definitions of critical thinking have been proposed by academics over the decades since John Dewey wrote about thinking and reflective thinking in the 1930's. According to Dewey (1910, p. 3) reflective thinking is, 'the kind of thinking that consists in turning a subject over in the mind and giving it serious and consecutive consideration'. Dewey (1910, p. 4) also proposed thought as resting on a belief underpinned by knowledge and he stated that, 'beliefs are accepted when their grounds have not themselves been considered while others have been accepted because their grounds have been examined'. Dewey seems to point out that the grounds for our beliefs in relation to thinking are influential and would appear to have consequences for what we believe or conclude. Deciding what to believe or conclude is consequent upon our beliefs and knowledge. Although not directly addressing critical thinking Dewey (1910, p. 13) draws attention to uncritical thinking as the acceptance of a suggestion and he states that, 'if the suggestion that occurs is at once accepted, we have uncritical thinking, the minimum of reflection'.

Dewey's perspective on thinking and reflective thinking has influenced critical thinking and this is most evident in relation to the consideration of beliefs which underpin thought and as grounds for acceptance of beliefs. Dewey's perspective on thinking and reflective thinking is evident in the definitions of critical thinking. Definitions of critical thinking proposed by scholars such as Ennis (1987), Lipman (1988), McPeck (1981), Paul (1982) and Siegel (1988), and identified by Johnson (1992) as, the *'big five'*, are examined here together with Johnson's analysis of these definitions. Since Johnson presented his account of these definitions in 1992, Halpern (1996) provided her perspective on critical thinking. The work of Facione and Facione from the early 1990's

has made a significant contribution to critical thinking and their work is also analysed here.

According to Johnson (1992), Ennis in 1987 defined critical thinking as, '*reasonable reflective thinking that is focused on deciding what to believe or do'.* With respect to the definition offered by Ennis, Johnson (1992) states that Ennis equates critical thinking with rational thinking and makes a tight connection between critical thinking, creative thinking and problem solving. Lipman (1988) defined critical thinking as, '*skilful, responsible thinking that facilitates good judgment because it, (1) relies upon criteria, (2) is self-correcting and (3) is sensitive to context.'* According to Johnson (1992) Lipman's (1988) definition comes closest to bringing out the sense in which critical thinking is *'critical'.* Johnson (1992, p. 45) also states that it is not clear if Lipman's three properties define critical thinking as, 'a thinker might be engaged in self-corrective thinking, be sensitive to context, and be guided by criteria, and still fail to be critical'. McPeck, in 1981, defined critical thinking as, '*the skill and propensity to engage in an activity with reflective scepticism.'* According to Johnson (1992) McPeck is writing from the perspective of philosophy of education and the importance of curriculum and as such disciplinary knowledge is important as well as belief and actions. Johnson (1992) also states that knowledge alone does not guarantee critical thinking and he considers reflective scepticism as negative and in keeping with a negative connotation of the word *'critical'* as someone who picks fault with others. McPeck's (1981) definition is viewed by Johnson as tightly connected with problem-solving.

Richard Paul, in 1982, proposed that '*critical thinking is disciplined, self-directed thinking which exemplifies the perfection of thinking appropriate to a particular mode or domain of thinking'.* According to Johnson (1992), critical thinking from Richard Paul's perspective, as a philosopher, is concerned with how to teach critical thinking to students and is dialogical as well as heavily dependent on moral character. The issue here for Johnson is the relationship between critical thinking and a certain moral character. The inclusion of 'self-directed' in Paul's definition, according to Johnson, emphasises the capacities of the individual thinker without sufficient attention to the inter-subjective character of critical thought. Siegel (1988) defined critical thinking as, '*the individual who is appropriately moved by reasons.'* According to Johnson (1992) Siegel's definition arises from criticisms of definitions by Ennis, McPeck and Paul.

Siegel's definition includes actions, a propensity or disposition to act in accordance with reasons. The focus is reasons and the power of reasons to warrant or justify, beliefs, claims and actions. Siegel's theory forges a tight connection between critical thinking, rationality and problem-solving.

Two main concerns are pointed out by Johnson (1992, p. 48) in relation to the definitions above, one, none of the definitions captures the term *'critical'* and why critical thinking is critical and not just plain thinking or some other form of thinking like rational thinking or higher order thinking. Two, none of the definitions emphasise what Johnson (1992, p. 48) considers a defining characteristic of a critical person which he acknowledges as, 'the ability to take criticism'. *According to Johnson (1992), the 'big five' agree that critical thinking involves many cognitive skills, all require information or knowledge and all include a dispositional or affective dimension, although described and weighed differently with McPeck and Siegel relating critical thinking to problem-solving.* Johnson's (1992) account of the above definitions while acknowledging certain uniqueness identifies a consensus in relation to three main components of critical thinking as, skills, attitudes and knowledge. Another author in the field of critical thinking not included in Johnson's *'big five'* is Stephen Norris. Norris (1985)views critical thinking as, *'assessing the views of others and one's own views according to acceptable standards of appraisal'.* Norris (1985, p. 40) also views *attitude* or *'disposition'* as an important aspect of critical thinking and he also refers to the term *'critical spirit'* as relevant to critical thinking. Following on from the work of the above scholars of the 1980's Halpern in the mid 1990's defined critical thinking as:

> The use of those cognitive skills or strategies that increase the probability of a desired outcome... it is purposeful, reasoned, and goal directed- the kind of thinking involved in solving problems, formulation of inferences, calculating likelihoods, and making decisions when the thinker is using skills that are thoughtful and effective for the particular context and type of thinking task. (Halpern, 1996, p. 5)

Halpern (1996) differentiates between critical thinking as directed thinking because it focuses on obtaining a desired outcome and non-directed or automatic thinking as more mundane and the form of thinking that underlies daily routine habits such as daydreaming or brushing ones teeth. For Halpern (1996), critical thinking is having a purpose or a goal, while for Norris (1985) it is 'rationally deciding what to believe or do'.

The goal of critical thinking or deciding what to believe or do requires judgment and Lipman (1988, p. 38) states that, 'good judgment is a characteristic of critical thinking'. Emerging from the above definitions and as was also identified in the earlier discussion in relation to higher order thinking and the components of critical thinking, attitude or the disposition to think critically, as well as knowledge and skills appear as necessary components of critical thinking.

A further and significant contribution to the understanding of critical thinking influential in this study is the Delphi consensus statement of the American Philosophical Association identified by Facione (1990):

> The ideal critical thinker is habitually inquisitive, well informed, trustful of reason, honest in facing personal biases, prudent in making judgements, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and circumstances of inquiry permit. (Facione, 1990, p. 3)

The Delphi critical thinking experts while achieving consensus on a conceptualization of critical thinking also agreed on two dimensions of critical thinking as cognitive skills and affective dispositions (Facione, 1990). In relation to the critical thinking skills (Facione, 1990, p. 10) states that, 'learning and applying these skills in many contexts requires domain-specific knowledge'. The work of Facione (1990) also acknowledges the importance of knowledge, skills and affective dispositions for critical thinking. This is similar to Johnson's (1992) acknowledgement of a similar consensus from what he termed as the *'big five'* definitions of prominent scholars and identified above. The definitions analysed above are rather variable and convey different perspectives of critical thinking. In acknowledging the different perspectives of the definitions of critical thinking it is important for research purposes to identify a definition of critical thinking. The definition of critical thinking which underpinned this study is discussed in the next section.

2.2.7 Definition of critical thinking in this study

Consensus on domain-specific knowledge, dispositions and skills appear as consistent and necessary components of critical thinking. As there is no accepted single definition of critical thinking the choice for researchers in a study of critical thinking is to select

from those available such as was identified in the analysis in the previous section. The most prevalent definition in empirical research and therefore the one chosen for this study, is the Delphi consensus statement of the American Philosophical Association identified by Facione (1990). The Delphi consensus statement provided a conceptualization of critical thinking while the derived dispositions and skills components, at a mid-range theoretical level, underpinned this investigation of critical thinking. This investigation was also guided through the availability of instruments such as the California Critical Thinking Disposition Inventory (CCTDI) and the Health Sciences Reasoning Test (HSRT) which measure critical thinking dispositions and skills, respectively (Facione & Facione, 2010; 2012). The Delphi construct definition and the dimensions of critical thinking dispositions and skills also contributed to the theoretical framework for this investigation and these are explained later in Chapter 4.

In this first section of the literature review components of thinking and critical thinking such as domain-specific knowledge, cognitive operations to include major strategies and minor-thinking strategies, critical thinking dispositions and skills were analysed. These are components of thinking and critical thinking about which there appears to be consensus among scholars. Additional components of critical thinking such as, searching for and weighing up of one's assumptions, as well as the use of reason were also identified as components of critical thinking. Higher order thinking and critical thinking was discussed to provide a perspective on both of these domains of thinking and how they are perceived relative to each other. Definitions of critical thinking revealed that disciplinary knowledge, dispositions and skills to think critically are prevailing and significant components of critical thinking. The work of Facione and Facione in the 1990's conceptualized critical thinking and further clarified the importance of an affective component identified as, '*habits of mind*' or dispositions as well as the skills of critical thinking. Therefore, the Delphi conceptualisation provided the definition for this study. The perspectives on critical thinking examined to this point have provided an understanding of critical thinking and these perspectives can be seen to have influenced critical thinking in nursing which is discussed in the next section.

2.3 Critical thinking in nursing

In this section, critical thinking in nursing as well as definitions of critical thinking in nursing are discussed. The definitions discussed are those which nursing has

subscribed to in order to conceptualise critical thinking for the purpose of integration and development of critical thinking in nursing. Two important approaches which have influenced thinking and critical thinking in nursing, the Nursing Process and Benner's model of skill acquisition, are also discussed. Models of nurse education which have influenced thinking and critical thinking in Irish nursing education as well as research on critical thinking in the Irish setting is discussed.

2.3.1 Definitions of critical thinking in nursing

Critical thinking definitions were analysed in an earlier section of this literature review and featured those of prominent scholars in the 1980's in the disciplines of education, philosophy and psychology. Nursing has developed its own discipline through scholarly activity and in doing so has a history of relying on knowledge from other disciplines. The reliance on other disciplines is no different in relation to critical thinking. Nursing has engaged with critical thinking in the United States since the 1980's and significantly so into the 1990's. This is evident in the prevalence of publications on the topic and especially so in North America. In developing critical thinking in nursing, schools and colleges of nursing adopted the definitions of prominent scholars in the fields of Education, Philosophy and Psychology.

A useful starting point to examine the use of definitions of critical thinking in nursing is the work of Videbeck (1997a) in which she described the practice of fifty five (N=55) National League for Nursing (NLN) accredited baccalaureate nursing programmes in thirty states across the United States of America. In relation to definitions of critical thinking, forty three programmes specified *cognitive abilities* and *affective qualities* in critical thinking while twelve of the programmes defined critical thinking as purely cognitive in nature. The source of the definitions and frequency of their use which were clearly identifiable for fifty of the fifty five North American baccalaureate nursing programmes examined by Videbeck (1997a) are shown in Table 2.1. It is evident from the work of Videbeck (1997a) that the definitions of Bandman and Bandman (1995) and Watson and Glaser (1964) were predominant in nursing programmes across the USA up to the late 1990's. There is also evidence in published research in the 1990's and in current research of the use of the Delphi conceptualisation of critical thinking which emerged in the early 1990's (Facione, 1990) and this is analysed later in this chapter. Bandman and Bandman (1995, p. 7) define critical thinking as the rational

examination of, *ideas, inferences, assumptions, principles, arguments, conclusions, issues, statements, beliefs and actions.* According to Bandman and Bandman (1995, p. 7) the 'examination' covers scientific reasoning, includes the nursing process, decision making and reasoning in controversial issues. The attributes of Bandman and Bandman's (1995) definition account for its appeal to selection by the nursing profession. Watson and Glaser (1957) define critical thinking in terms of knowledge skills and attitudes. The domains of knowledge, skills and attitudes also appear to have appealed to the nursing profession in the adoption of this definition.

Author	Definition
Bandman & Bandman 1995	11
Miller & Malcom 1980 (based on Watson & Glaser)	10
Watson & Glaser 1964	8
Paul 1993 & Paul & Scriven	8
Ennis 1985	5
Wilkinson (1991) based on Paul	3
Matthews and Gaul 1979	2
Brookfield 1987	1
Bowers & McCarthy 1993	1
Kurfiss 1998	1

Table 2.1 Frequency of definitions used in fifty US nursing programmes

A significant, and considered a landmark contribution to critical thinking in nursing is a study by Scheffer and Rubenfeld (2000) which used a Delphi technique to define critical thinking in nursing. The study involved fifty five nurses in education, practice, and research. Participants were asked, 'what skills and habits of mind are the core of critical thinking for nurses in any setting; practice, education and research?' The words *'habits of mind'* and *'skills'* were chosen to capture the affective and cognitive aspects of critical thinking. Scheffer and Rubenfeld (2000) developed their question in consultation with Dr Peter Facione (1990) a Philosopher who conducted the Delphi study for the American Philosophical Association (APA) on critical thinking and Dr Noreen Facione a Nurse Scholar in the field of critical thinking. Scheffer and Rubenfeld's (2000) study identified both the affective and cognitive components of

critical thinking through its defined *'habits of mind'* and *'skills'* of critical thinking in nursing and these are shown in Table 2.2 The habits of mind or dispositions and skills identified reflect some similarities to the dispositions and skills identified by other scholars and discussed earlier in this literature review.

Habits of Mind	**Cognitive Skills**
Perseverance,	Information-seeking (probing, receiving)
Open-mindedness,	Discriminating (classifying, choosing, relevance/irrelevance, Recognizing gaps/inconsistencies, prioritizing)
Flexibility	Analyzing (comparing, contrasting, contemplating)
Creativity	Transforming knowledge (recognizing theory from practice, testing theory in practice and synthesis)
Reflection	Predicting (anticipating, hypothesising, planning)
Intellectual integrity	Applying standards (evaluating, critiquing, idealizing)
Intuition	Logical reasoning (inducing, deducting, decision-making, argumentation, validation)
Contextual perspective	

Table 2.2 Habits of mind and cognitive skills for critical thinking in nursing

In more recent work, Turner (2005) conducted a concept analysis of critical thinking to identify how the term is used in nursing education and practice and she included the identification of definitions, attributes, surrogate terms, referents, antecedents, and consequences. Definitions of critical thinking were those of Watson and Glaser or Matthews and Gaul who published in the area of critical thinking in the 1960's and 1970's. The use of Watson and Glaser's definition was prevalent reflecting consistency with the work of Videbeck (1997a) mentioned above in which this definition was also prevalent. The most frequently cited definition of critical thinking was the American Philosophical Association (APA) Delphi consensus statement identified by Facione (1990).

Turner's (2005) concept analysis identified, attributes, surrogate terms, referents and consequences of critical thinking in nursing. Attributes of critical thinking that appeared most frequently were: analysis, reasoning, interpretation, knowledge, and open-mindedness. Analysis and reasoning appeared most frequently. Turner (2005) identified twenty seven surrogate terms in the literature and the most often used were: clinical decision-making, diagnostic reasoning, nursing process, clinical judgment, decision-making and problem-solving. Two types of referents, nursing education and nursing practice were evident. One antecedent, knowledge base, appeared, suggesting that knowledge is necessary as a foundation for the cognitive processes involved in critical thinking. Turner (2005) also identified five consequences of critical thinking as safe, competent and skilful practitioners; delivery of competent practice; successful clinical practice; managing shorter hospital stays; implement change and challenging philosophies.

An analysis of nursing literature provides a perspective of critical thinking in nursing. Videbeck (1997a) identified the definition of Watson and Glaser as the most prevalent in the 1990's. This is likely due to the availability of the Watson Glaser Critical Thinking Appraisal (WGCTA) at a time when the work of Facione and Facione was evolving at this time. Turner (2005) also identified the work of Watson and Glaser with the Delphi conceptualization of critical thinking identified by Facione (1990) as the main influence. Turner (2005) identified surrogate terms for critical thinking such as, clinical decision-making, diagnostic reasoning, clinical judgment, decision-making, problem-solving and the nursing process. These processes and the nursing process in particular, were seen as critical thinking in nursing. Scheffer and Rubenfeld (2000) identified *'habits of mind'* and *'skills'* used in critical thinking guided by the Delphi construct definition of critical thinking. Critical thinking is a set of cognitive skills and there is also evidence that critical thinking has an affective component referred to as '*habits of mind'* or dispositions. Scheffer and Rubenfeld (2000) add *'intuition'* and *'creativity'* while Norris (1985) refers to a '*critical spirit*' in relation to critical thinking.

Having identified and analysed the definitions of critical thinking used in nursing the Delphi consensus statement was identified as the most prevalent definition.Therefore, this definition provides a strong conceptualization of critical thinking for nursing and for the investigation of critical thinking in nursing. While nursing is concerned about critical

thinking it is important to examine some of the main influences on critical thinking in nursing. Two important approaches which have and continue to influence thinking and critical thinking in nursing are the Nursing Process and Benner's model of skill acquisition. These approaches are analysed and discussed in the next and subsequent sections.

2.3.2 The nursing process and critical thinking

An important approach with a significant influence on thinking in nursing is the nursing process which originated in the late 1950's and early 1960's (Alfaro-LeFevre, 2010; Gendrop & Eisenhauer, 1996; Henderson, 1982; Pesut & Herman, 1999; Wilkinson, 2007). The nursing process is described as a special way of thinking and acting which is systematic and provides a framework in which nurses use their knowledge and skills to care for patients or clients (Huckaby, 2009; Wilkinson, 2007). The nursing process emerged as a four step process of; *assessment, planning, implementation and evaluation* of nursing care (Henderson, 1987). Later it developed as a five step process with the inclusion of *nursing diagnosis* (Pesut & Herman, 1999). In current nursing practice in the US it is described as a six step process of: *assessment, diagnosis, outcome identification, planning, implementation and evaluation* (Wilkinson, 2007). The nursing process is an influential approach in both nursing education and practice for over sixty years, and Huckaby (2009, p. 72) states that, 'every student who enters a nursing programme in the US is taught the nursing process during the first semester'. Henderson, in 1982 stated that, the nursing process was initially viewed as a way of describing client-nurse communication and later used to mean problem-solving. According to Wilkinson (2007) problem solving uses a scientific method which is systematic and logical. The nursing process as a problem-solving scientific method has been criticised for being scientifically weighted to the extent it belittles the artistic, intuitive side of nursing (Henderson, 1982). The two extremes of scientific problem-solving on one hand, and intuitive artistic component on the other, suggest different sources of knowledge and patterns of thinking within the framework of the nursing process.

Patterns of thinking have been identified in tandem with the evolution of the nursing process in three generations described by Pesut and Herman (1999). The first generation from 1950-1970 involved a four step process of, assessment, planning,

intervention and evaluation and the focus was on the need to think before acting and was concerned with problem-solving. This model eventually became routine and thinking was seen to become ritual, traditional and focused on policies and procedures (Pesut & Herman, 1999; Tanner, 2000). The second generation nursing process was from 1970-1990 and was the result of a rethink in 1973 which led to the inclusion of nursing diagnosis. Thus, a five step nursing process was introduced; *assessment, diagnosis, planning, implementation and evaluation*. This led to a change in the orientation of thinking with the inclusion of diagnostic reasoning and a shift from problem-solution to hypothesis formulation and testing in nursing. According to Pesut and Herman (1999) towards the end of the 1980's and into the 1990's emphasis shifted to measurement of outcomes. The concurrent growth in research on thinking and reasoning gave rise to the third generation nursing process with emphasis on outcomes as well as complex client analysis and the need for critical thinking emerged. Thinking in the nursing process evolved from problem-solving to clinical reasoning and clinical judgment requiring critical thinking. It appears that with clinical judgment there was greater awareness of the requirement for higher level thinking and that critical thinking could facilitate thinking at a higher level.

In an earlier section, in this literature review, a perspective was provided on higher level thinking and critical thinking. Reed Geertsen (2003) identified problem-solving and critical thinking as higher level thinking and he also acknowledged that higher level thinking requires a systematic approach. It appears, that in the early days of discontentment with the problem-solving scientific approach of the nursing process there was a lack of awareness of such an approach as being higher level thinking. It is important to acknowledge that while scholars in other disciplines such as education, philosophy and social sciences were debating critical thinking in the literature the nursing profession was concerned about whether it was, art or science. The nature of thinking in nursing seemed to evolve with greater awareness of the thinking required in the second and third generational phases of the nursing process and the emergent recognition of the need for critical thinking, especially in relation to clinical judgment. It is also during the second and third generational phases that nursing was becoming interested in critical thinking and evidence of this can be seen in the work of Videbeck (1997a), mentioned earlier, with regard to nursing schools adoption of definitions of critical thinking. However, all does not appear to be fully resolved as there is a tendency among nursing faculty in the US to acknowledge problem-solving and the

nursing process as synonymous with critical thinking (Gordon, 2000). Turner (2005) also reported problem-solving and the nursing process as synonymous with critical thinking. This view does not appear to have changed and more recently Huckaby (2009) stated that:

> When nursing faculty are asked whether they teach critical thinking to their students, most will say they do; however, most think that, if they teach the nursing process and the problem-solving process, they are in fact, teaching CT. (Huckaby, 2009, p. 73)

The nursing process is a framework which for over sixty years has and continues to significantly influence how nurses are educated, practice and think and it has scope and potential to allow thinking at different levels. The nursing process is not critical thinking, but a framework within which higher level thinking such as problem-solving and critical thinking can be merged to seek the best outcomes for patient care. According to Wilkinson (2007) critical thinking and the nursing process are interdependent, but not identical and Wilkinson also states that the American Nurses Association in 2004 advised that the nursing process provides the framework for critical thinking in nursing. The nursing process is a *tool* and critical thinking is *how you use the tool* (Alfaro-LeFevre, 2010, p. 32). Another important influence on thinking and critical thinking in nursing is *intuition* and this is addressed next.

2.3.3 Critical thinking and intuition in nursing

In the previous section, the nursing process as an evolutionary framework for critical thinking in nursing was examined and it appeared to rely on a problem-solving scientific method, use of reason and judgment. The nursing process has been criticized for lack of recognition of the intuitive or artistic side of nursing (Henderson, 1982). Intuition as a source of knowledge used in nursing was brought to the fore in the mid 1980's. In 1984 Patricia Benner proposed a model of skill acquisition for nursing based on the Dreyfus model of skill acquisition. Benner's (1984) model proposes that skill acquisition develops through the stages from, novice, advanced beginner, competent, proficient to expert.

Each stage of skill acquisition from novice to expert requires different forms of thinking. The form of thinking in the novice stage is concrete with reliance on objective attributes to the expert stage in which an intuitive grasp of a situation occurs. Each stage relies upon different methods of thinking which together with experience play a significant role in advancement from novice to expert nurse. The patterns of thinking identified by Benner (1984) are used by nurses to feed into the nursing process framework which requires problem-solving, reason and judgment. As such, *tacit or intuitive knowledge* is combined with scientific knowledge and this is dependent on the level or experience of the practitioner. Benner's model of skill acquisition has provided a framework for nurse educators in the development of nursing curricula at both undergraduate and post graduate level. Recognition of the forms of thinking from novice to expert has also influenced the thinking of nurse educators in their pedagogical approaches in teaching and learning, as well as in assessment, with the main focus being to influence critical thinking of nurses. Benner's model of skill acquisition as well as the nursing process has significantly contributed to thinking, not only in clinical practice, but also by nurse educators in developing critical thinking among nursing students both at undergraduate and post-graduate level.

It is evident from the literature that the nursing profession has used various definitions of critical thinking and since the 1990's the Delphi conceptualisation identified by Facione (1990) appears as the most prevalent. Although the Delphi conceptualisation is prevalent in research there still remains a strong tendency in nursing to perceive critical thinking as synonymous with problem-solving, decision-making and the nursing process. Two significant influences on thinking in nursing are the nursing process which emerged in the mid 1950's and Benner's (1984) model of skill acquisition. Both approaches have provided frameworks which require different forms of thinking with the nursing process requiring problem-solving, reasoning and judgment. Benner's model identified thinking patterns which rely on concrete objective approaches at novice level to more intuitively guided reasoning and judgment at the expert level. The forms of thinking influenced by these models reflect forms of higher level thinking as identified by Reed Geertsen (2003) in his account of higher level thinking and addressed earlier in this chapter. The perspective on thinking and critical thinking discussed in this section has provided insight about critical thinking in nursing. The influences on critical thinking in nursing explored above are influential in the context of Irish nursing. It is only with the transition to higher level education in the Republic of

Ireland, in September 2002, that greater emphasises has been placed on the development of critical thinking as a graduate attribute. Critical thinking in the context of Irish nursing education is discussed in the next section.

2.4 Critical thinking in nurse education in the Irish setting

In this section, influences on thinking and critical thinking in the context of nursing education in Ireland are addressed. Three significant models of nurse education which have influenced thinking and critical thinking in Irish nursing education are examined. Critical thinking in the undergraduate nursing curriculum as well as research on critical thinking in Irish nursing is also examined.

2.4.1 Models of nurse education and thinking in Irish nursing

Thinking in Irish nurse education has been influenced by three approaches or models for over one hundred years. The approaches include *the apprenticeship model*, *the registration-diploma model* and *the new degree model.* The apprenticeship model of nurse training or the Florence Nightngale model prevailed from the 1890's to the 1990's (Fealy, 2006). This model was a form of probationership training and employment. According to Connolly and Ryan (2000) probationership nurse training provided middle-class women with a means of entry to paid professional employment. Emphasis in the apprenticeship model was to meet employment needs as opposed to a form of higher education. The focus of apprenticeship training emphasised disciplined work, custodian control and obedience to authority (Fealy, 2006). The nature of the apprenticeship model emphasised doing as opposed to thinking and this model prevailed for over one hundred years up to 1994 with the introduction of the registration-diploma model of nurse training. The registration-diploma model came about with discontentment from the 1980's onwards with the apprenticeship model. According to Fealy (2006):

> The system was questioned on the grounds that it was failing to meet the training of nurses for their new roles in healthcare. Epidemiological trends in altered health, advances in science and health policy... limited the perspective that hospital apprenticeship training offered.
>
> (Fealy, 2006, p. 158)

The registration-diploma model emerged as a partnership between the Health Service Providers and affiliated Higher Education Institutions. The first registration-diploma course commenced at the National University of Ireland Galway in September 1994 and became known as, the 'Galway Model' of nurse training. With the introduction of the registration-diploma model nurse educators were more confident that with a diploma level academic qualification graduates would be better prepared and would engage more in thinking. However, the registration-diploma model was not considered adequate and according to Fealy (2006, p. 159), 'the new registration-diploma Galway Model introduced in 1994, was adjudged to have failed to offer the student nurse the full benefits of a third-level education'. The desire for degree status was also reflected in the Commission on Nursing which cited international trends towards degree level education and called for full integration of pre-registration training into the third-level institutes of higher education (Government of Ireland, 1998). In September 2002, the first cohort of undergraduate nursing students entered the new degree programme and nurse training became fully integrated into higher education (Fealy, 2006, p. 159).

The three models of nurse education identified above have influenced thinking in Irish nursing. The apprenticeship model concerned with discipline and obedience placed greater emphasis on doing as opposed to thinking. The registration-diploma model while retaining the skilled component of the apprenticeship model emphasised a greater ability to think but was not seen as adequate. As the degree model emerged critical thinking was considered an important graduate outcome. In the course of the transition from the apprenticeship and registration-diploma model to full degree status nurse educators were enthusiastic to enhance critical thinking in the undergraduate nursing curriculum and this is discussed in the next section.

2.4.2 Critical thinking in the undergraduate nursing curriculum

The three models of nurse education explained above influenced thinking and critical thinking in Irish nursing education for over one hundred years with full integration to third level in September 2002 (Fealy, 2006). Full integration of nurse education into the higher education sector required a new curriculum which would achieve higher level learning commensurate with degree status. The new curriculum for the pre-registration nursing degree course was influenced by two significant reports: one was the Nursing Education and Training Evaluation in Ireland, also known as the NEATE or Simmons

report, which evaluated the registration-diploma programme (Simmons et al., 1998). The second was the Report of the Nursing Education Forum: A strategy for a Pre-Registration Nursing Education Degree Programme (Government of Ireland, 2000). The Requirements and Standards for Nurse Registration Education Programmes also influenced the development of the undergraduate nursing curriculum (An Bord Altranais, 2000).

The Nursing Education Forum (Government of Ireland, 2000, p. 59) identified the following seven suggested core principles to guide curriculum design; *flexibility, eclecticism, transferability and progression, utility, evidence base, and shared learning*. Flexibility meant that the curriculum design should be dynamic and flexible to permit responsiveness to local needs. Eclecticism meant that the curriculum design should be eclectic in so far as it draws on knowledge from diverse sources and uses a variety of teaching/learning strategies. Transferability and progression was concerned with ensuring pathways were in place to provide students with the option to transfer to other disciplines of nursing and to transfer to programmes outside of nursing. The application of a modular structure in curriculum design was considered essential for transferability and progression. Utility refers to the principle that knowledge obtained should be useful in informing the practice of the discipline being studied. Evidence base was concerned with the need to promote an open unbiased search for educationally and clinically sound content, involving all relevant bodies of expertise. The principle of shared learning was concerned with ensuring that nursing students should be actively encouraged to learn with and from other healthcare professionals. Along with the models for curriculum design and the suggested core principles, the Nursing Education Forum (Government of Ireland, 2000) also identified the following; *philosophy, learning outcomes, teaching and learning strategies, content, quality assurance as well as evaluation* as relevant in curriculum design.

While the components identified above were considered important and were clarified for curriculum planners in preparing the new undergraduate nursing degree course, critical thinking was not as clearly identified. Critical thinking was not explicit and was reflected in the context of the core principle of 'evidence base'. The Nursing Education Forum noted that:

> Submissions suggest that the degree programme will foster a cadre of critical thinkers in nursing who can access and interpret the findings of relevant evidence therefore the Forum recommends that the curriculum design for the pre-registration nursing degree programme should have a sound theoretical base.
>
> (Government of Ireland, 2000, p. 61)

Critical thinking was considered as for, a *'cadre'*, which appeared to suggest that critical thinking was the ability of some but not for all nursing students. Critical thinking was considered embedded in the ability to access and interpret evidence and in a sound theoretical base. This appears to suggest a lack of understanding and limited knowledge about critical thinking among nurse educators charged with the development of the undergraduate nursing curriculum.

The Nursing Education Forum (Government of Ireland, 2000) was keen for the new graduate nurse to practice from an evidence base. This was considered as a move away from practice based on tradition and the technocratic model which underpinned the apprenticeship system of training, to the post technocratic model, which was more in keeping with the attributes of higher level academic learning. Such a view is echoed by Rubenfeld and Scheffer (2006) who state that emphasis on evidence based practice is to facilitate a move away from practice based on tradition and lack of questioning, to practice based on the best available knowledge or evidence. A move to practice based on evidence as opposed to tradition was more in keeping with critical thinking. Evidence based practice according to Profetto-McGrath (2005, p. 365) is paramount to critical thinking and she identifies skills which include, 'questioning, critical appraisal, application and evaluation-skills that are influenced by and necessary for critical thinking'. While the Nursing Education Forum were clear on the need for curriculum planners to achieve evidence base along with the suggested core principles identified above, they were less clear about what constituted critical thinking or how it should be incorporated or developed in the undergraduate nursing curriculum. This challenge was left to the nurse educators charged with curriculum development in the thirteen higher education institutions in Ireland.

From the perspective of An Bord Altranais the acquisition of knowledge and skills for competent practice was the main focus in the new undergraduate nursing curriculum. According to An Bord Altranais (2000, p. 13), 'the purpose of the registration education

programme is to ensure that the student is equipped with the knowledge and skills necessary to practice as a competent and professional nurse'. Skills in the undergraduate nursing curriculum are acknowledge as skills for safe clinical practice and reflected in the following outcome statement, 'demonstrate a knowledge base and a level of competence in clinical practice skills essential for safe practice, which are grounded in recent evidence based nursing research, where available'. Critical thinking from the perspective of An Bord Altranais (2000, p. 13) is identified along with other skills in the following outcome statement; '*demonstrate development of skills of analysis, critical thinking, problem-solving and reflective practice'*. Critical thinking is identified as a skill while analysis is identified as a skill separate from critical thinking. This appears to suggest a fundamental dichotomy and lack of understanding with analysis and critical thinking seen as separate entities, yet analysis is a core skill for critical thinking. Analysis as was revealed earlier in the literature review is identified as a sub-skill of critical thinking (Facione & Facione, 2012; Facione, 1990). Critical thinking cannot happen without the skills of analysis.

The implication of these curriculum recommendations and requirements is that while they address knowledge in the curriculum, which is a significant component for critical thinking, they fail to acknowledge other important aspects of critical thinking such as dispositions and skills. The importance of knowledge was identified in a review of research studies by Norris (1985, p. 44) who stated that one of the highlights of research on critical thinking is that, *'to think critically, one must have knowledge'.* Knowledge was also identified as fundamental to critical thinking (Beyer, 1987). Knowledge, skills for safe and evidence based practice would also influence clinical competence and the achievement of competence was perceived to influence critical thinking. To facilitate the achievement of clinical competence both the Nursing Education Forum (Government of Ireland, 2000) and An Bord Altranais (2000) identified the need for reflective practice in the new undergraduate nursing curriculum. Reflective practice would function to link theory to practice and facilitate the achievement of clinical competence and thus the achievement of critical thinking. Reflective practice as a teaching and learning method was considered of high importance and given structured time in the fourth year of the undergraduate nursing degree course. Reflective practice was also incorporated into teaching and learning to prepare undergraduate nursing students for engagement in reflective practice through the use of reflective cycles. Evidence base, knowledge, competence and reflective

practice were core components in the development of the undergraduate curriculum for the new degree course. The onus was on each higher education institution to ensure that the statutory requirements of An Bord Altranais (2000) were met and that these components were included to enhance higher level learning. Critical thinking would develop in the process of curriculum experience and through engagement with knowledge, evidence base, competence and reflective practice. Critical thinking was considered embedded in these processes.

A review of curriculum documents (2007, 2009, 2012) with regard to critical thinking identified instances of the term critical thinking in the undergraduate nursing curriculum. Critical thinking was evident in relation to teaching and learning and this was consistent as the curriculum evolved over time (Table 2.3). Curriculum planners view teaching and learning as necessary for the development of critical thinking and it appears that the development of critical thinking lies with the individual nurse teacher and a perception that critical thinking is happening through teaching pedagogies. This strongly indicates the need for a study to investigate critical thinking in undergraduate nursing students.

Curriculum Document 2007. Instances of critical thinking (N= 6)	**Curriculum Document 2009. Instances of critical thinking (N=3)**	**Curriculum Document 2012. Instances of critical thinking (N =1)**
Nature of Instances Teaching and learning (N=1). Citation of An Bord Altranais learning outcome on critical thinking (N=1). Book References (N=2). Aim of a module (N=1). In relation to evaluation and pertaining to whether assessments provides learning experiences and critical thinking (N=1).	**Nature of Instances** In relation to teaching and learning strategies (N=2). Critical thinking as a skill to be achieved as an outcome of the course (N=1).	**Nature of Instances** Teaching and learning - Individual and group learning develops interactive skills, provides self-assessment, and assists in the development of critical thinking and team building skills (N=1).

Table 2.3 Instances of critical thinking in the undergraduate nursing curriculum

Another important component of the curriculum, while not specifically highlighted to curriculum planners in the Report of the Nursing Education Forum (Government of Ireland, 2000), is assessment. Assessment of the theoretical content across undergraduate nursing curricula, nationally, includes written examinations, reflective assignments, essays and larger written assignments such as a literature review and a research assignment, to enhance the use of research skills for evidenced based practice. Assessment of the clinical component is through the use of *a locally developed competency based measurement tool* which assesses five broad domains of competence as requirements of An Bord Altranais (2000, pp. 15-17) and include: *professional and ethical practice; holistic approaches to care and the integration of knowledge; interpersonal relationships; organisation and management of care; personal and professional development.*

Achievement in the theoretical component and in clinical competency is perceived as acknowledgement of critical thinking. Mastery of these components is considered to confirm higher level learning and thus critical thinking is assumed to be achieved. This approach appears to indicate a lack of clarity about critical thinking in the undergraduate nursing curriculum and reflects the belief of Rubenfeld and Scheffer (2006) who state that:

> We believe nurses, especially in nursing education, jumped on the bandwagon of evaluating critical thinking in the early 1990's, largely in response to accreditation standards, before they really understood what critical thinking was all about. They started evaluating something that they weren't overtly teaching. At the very least there was incongruence between what was being taught and what was being assessed.
>
> (Rubenfeld & Scheffer, 2006, p. 253)

This statement has important relevance for critical thinking in the context of Irish nursing education. Critical thinking is considered embedded in an evidence base and theoretical knowledge and if a sound theoretical base is provided for evidence based practice then critical thinking is deemed inherently achieved. From the perspective of An Bord Altranais (2000) critical thinking is a skill to be achieved, apparently, separate from the skill of analysis. For nurse educators, critical thinking is achieved through teaching and learning. It appears that in the context of Irish nursing education nurse

educators have as Rubenfeld and Scheffer (2006, p. 253), 'jumped on the bandwagon' and have been reactive to curriculum requirements of national bodies and strived to achieve critical thinking without fully understanding what critical thinking is and how it is best achieved. This raises concerns about the status of critical thinking and how it is developed in Irish nurse education and points to the need for research in relation to critical thinking.

Critical thinking remains somewhat obscured and in need of greater understanding in the undergraduate nursing curriculum. This obscurity or lack of transparency also appears to be reflected in the very recent and first review of the undergraduate degree programme; A Review of the Undergraduate Nursing and Midwifery Degree Programmes (Department of Health, 2012). The aim of the review was to examine the efficiency and effectiveness of the programmes in preparing nurses and midwives to practice in the health care systems now and in the future. In the review emphasis was on competence based outcomes as oppose to a content based curriculum and one of the five main competency goals is the achievement of, 'evidence-based scholarship, knowledge and cognition' (p.13). Competence, evidence base and knowledge remain the focus along with the inclusion of cognition. Critical thinking is acknowledged in the context of clinical practice and to be achieved towards the end of the course in the fourth or internship year. It is stated in the Review of the Undergraduate Nursing and Midwifery Degree Programmes (Department of Health, 2012, p. 39) that 'the internship was seen as essential for consolidation of learning and development of critical thinking'. To date there is little or no evidence about the status of critical thinking in the undergraduate nursing curriculum in the Irish context and this study offers a significant contribution. Reform in nurse education has acknowledged critical thinking and in tandem the emergence of interest in critical thinking research. Research on critical thinking to date in the context of Irish nursing is analysed in the next section.

2.4.3 Critical thinking research in the Irish nursing context

In this section, research studies which have investigated critical thinking in the discipline of nursing and psychology in the Irish setting are analysed and discussed. A longitudinal correlational study by Hegarty et al. (2008) in the South of Ireland compared the critical thinking abilities of first (N=72) and fourth year (N=37) bachelor in science undergraduate nursing students, as well as registered nurses (N=54) at the

end of a one year degree programme. The aim of the study was to illustrate the effects of advancing nurse education on critical thinking ability. The study involved a convenience sample at one university site and data were collected using the Watson Glaser Critical Thinking Appraisal (WGCTA). Findings revealed that critical thinking ability increased with the fourth year nursing students revealing a higher overall mean score of 51.92 compared to the overall mean of 50.43 the first year cohort. The authors concluded that nurse education to degree level had the potential to improve students' critical thinking abilities. Personal communication with the author Dr Hegarty (2014) confirmed the study was not published.

Critical thinking of students who had completed a Masters' degree in Nursing was investigated by Drennan (2009). The study was a cross-sectional cohort study and the sample was all students (N=222) who had completed a Masters in Nursing between 2003 and 2007 at six universities and colleges in the Republic of Ireland. For comparison a cohort of students commencing their Masters' degree in Nursing (N=110) was also included in the study. Results revealed that graduates from the course had statistically significantly higher critical thinking scores than students commencing their Masters' degree programme indicating the programme did have an impact on critical thinking. Drennan (2009) concluded that the Masters' in Nursing graduates had similar critical thinking scores measured on the Watson Glaser Critical Thinking appraisal-UK, to nurses at undergraduate and post graduate levels in the US.

Critical thinking in qualified paediatric intensive care nurses was investigated by McManus (2007) as a requirement for a Master Degree in Nursing. The study used an action research approach incorporating critical ethnography to ascertain the critical thinking skills of paediatric critical care nurses in clinical practice. Data was collected in the first cycle from ten paediatric ICU nurses using two focus groups. The second cycle involved the observation of the demonstration of critical thinking skills, in practice, in the ICU setting, in ten sessions, with five participants lasting four hours. The third cycle evaluated the previous two cycles and interviews were conducted with the five participants in cycle two. Findings revealed that most participants had a good understanding of the term critical thinking and they realised this in everyday clinical practice but found critical thinking hard to explain. Participants linked critical thinking to the nursing process with step-by-step nursing activities. They also linked critical

thinking to clinical decision making and safe practice. These findings are similar to those reported earlier in this literature review by (Tanner, 2000), in the US, where critical thinking was synonymous with the nursing process, problem-solving and decision-making.

Egan (2006) evaluated a learning skills intervention designed to improve first year psychology students' critical thinking and a deep approach to studying to improve their academic performance. The study was longitudinal in design at one Irish university over one academic year from September to April. The California Critical Thinking Skills test (CCTST) was used to evaluate the critical thinking skills component of the study. Seventy three students participated in a pre-test-post-test design. The CCTST was modified by the removal of eight items which did not have a significant effect on the reliability of the test. Findings revealed, that students' total critical thinking score and their scores on the four sub-scales of, inference, evaluation, inductive and deductive reasoning improved statistically significantly over the course of the intervention.

The study reported above by Hegarty et al. (2008) revealed that undergraduate nursing degree students in fourth year had slightly higher mean scores than first years in critical thinking. Drennan (2009) found that graduate Master in nursing students had statistically significantly higher critical thinking than beginning Master students. McManus (2007) found that paediatric ICU nurses equated critical thinking with the nursing process, decision-making and safe practice. Egan (2006) revealed that a learning skills intervention improved critical thinking skills of first year psychology students over their first academic year. Apart from Drennan's (2009) study these studies were unpublished, yet they acknowledge the beginning interest in critical thinking in the Irish nursing context and with stronger interest in an educational as opposed to a clinical context.

This section of the literature review addressed critical thinking in the context of nursing education in the Republic of Ireland. Three models of nurse education provided an insight into thinking and critical thinking in Irish nursing. The transition of nursing education to the higher education sector, in September 2002, brought curriculum reform and concern with the attributes of higher education which included critical thinking. The reform in nurse education also influenced interest in research on critical

thinking in Irish nursing. To date the study by Hegarty et al. (2008) is the only study which investigated critical thinking in undergraduate nursing students. The limited availability of research indicates the need for further investigation of critical thinking in the undergraduate nursing degree course. Outside of the Irish setting, critical thinking has been investigated from an international perspective and relevant studies and their findings are analysed and discussed in a subsequent section but first it is important to look at empirical measures available to measure critical thinking.

2.5 Empirical research on critical thinking

In this section, a range of empirical measures as well as empirical studies which investigated critical thinking are analysed and discussed. The studies analysed are underpinned by the Delphi construct of critical thinking (Facione, 1990). Critical thinking skills and dispositions are the focus of some studies while other studies investigated dispositions and skills independently or in association with other constructs such as learning styles, self-esteem and state anxiety in undergraduate nursing students. The critical thinking tests used were, the California Critical Thinking Disposition Inventory (CCTDI) and the California Critical Thinking Skills Test (CCTST). Studies which used the Watson Glaser Critical Thinking Appraisal (WGCTA) are also analysed in a later section but first a review of some of the empirical measures available to test critical thinking.

2.5.1 Empirical measures of critical thinking

A range of tests are described in the literature to test critical thinking (Appendix 4). Three very frequently used tests of critical thinking which appear in the literature are the California Critical Thinking Disposition Inventory (CCTDI), the California Critical Thinking Skills Test (CCTST) and the Health Sciences Reasoning Test (HSRT) (Facione & Facione, 1994a; Facione & Facione, 2010, 2012). Another frequently used test is the Watson Glaser Critical Thinking Appraisal (WGCTA) (Gadzella et al., 2005). Studies which used these tests are reported in the following sections of this literature review. Other tests of critical thinking are the Ennis Weir Critical Thinking Essay Test developed by Ennis and Weir in 1985 and the American College Testing - College Outcome Measures Programme (ACT-COMP) (Ennis, 1993; Rane-Szostak & Fisher-Robertson, 1996). The Cornell Critical Thinking Test (CCTT) developed by Ennis and Millman in 1985 and which according to Lauder and James (2001) covers a narrow

range of critical thinking ability. The Halpern Critical Thinking Assessment (HCTA) (Butler et al., 2012). Two tests developed for nursing are the Scale of Judgmental Ability in Nursing (SJAN) which measures judgment ability (Youssef & Goodrich, 1996) and the Critical Thinking Assessment (CTA) which measures cognitive skills (Jones & Morris, 2007). Each of the tests of critical thinking identified here measure different attributes of critical thinking as shown in Appendix 4. The Delphi conceptualisation of critical thinking, identified by Facione (1990), underpinned this study. The California Critical Thinking Disposition Inventory (CCTDI) and the Health Sciences Reasoning Test (HSRT) were appropriate to test the critical thinking dispositions and skills of the undergraduate nursing students in this study. The psychometric properties of these tests are described in detail in the methodology in the next chapter. Critical thinking dispositions and skills in nursing have been investigated using the CCTDI and the CCTST, which is equivalent to the HSRT, and these studies are analysed in the next and subsequent sections. In a later section, studies which used the Watson Glaser Critical Thinking Appraisal (WGCTA) are analysed.

2.5.2 Critical thinking dispositions and skills in nursing

Critical thinking dispositions and skills of baccalaureate nursing students were investigated by Colucciello (1997); Mc Carthy, Schuster, Zehr, and Mc Dougal (1999); Profetto-McGrath (2003); and Shin, Jung, Shin, and Kim (2006a) and findings are reported here. Colucciello (1997) undertook a cross-sectional study to investigate critical thinking dispositions and skills in a convenience sample (N=328) of baccalaureate nursing students in the USA. The purpose of the study was to analyse differences between students at five different levels from sophomore to senior level. Results for *overall critical thinking disposition* was positive for both sophomores and senior level two nursing students with scores above the cut-off score of 280.00. The senior students scored statistically significantly higher (311.83) than the sophomores (290.90), ($F = 8.86$, $p = \leq .0000$), standard deviation was not reported in the publication. In relation to the CCTDI sub-scales, truth-seeking was the weakest for all levels in the ambivalent category with scores below 40.00. The senior level two nursing students were stronger than the sophomores for all of the disposition sub-scales, truth-seeking, open-mindedness, analyticity, systematicity, critical thinking self-confidence, inquisitiveness and maturity of judgment (Table 2.4). The difference was statistically significant for truth-seeking ($p \leq .0001$), systematicity ($p \leq .0000$), self-confidence ($p \leq .003$) and inquisitiveness ($p \leq .0000$). All of the sub-scale scores were positive in

strength apart from the systematicity disposition for which the sophomores were weak and in the ambivalent category (Table 2.4). In relation to *overall critical thinking skill* ,in the category of moderate strength, the senior level two students had a higher mean score (17.26) compared to the sophomores (14.97) and this was statistically significant ($p \leq .05$). The senior level two students also had higher mean scores than the sophomores for the subscales of analysis (4.98, 4.30), inference (6.52, 5.45), evaluation (5.76, 5.22), deductive reasoning (8.43, 7.03) and inductive reasoning (6.89, 6.17), respectively. The difference was statistically significant for inference and deductive reasoning ($p \leq .05$). Senior level nursing students revealed a positive disposition and greater strength in critical thinking skills than the junior nursing students.

Mc Carthy et al. (1999) conducted a cross-sectional study to investigate critical thinking dispositions and skills in a convenience sample of baccalaureate nursing students in the USA. The aim was to find out if there were differences in critical thinking dispositions and skills between the sophomore (N=156) and the senior nursing students (N=85). Seniors revealed a statistically significantly higher mean score (325.94, SD 31.14) compared to the sophomores mean score (315.48, SD 31.07) in overall critical thinking disposition ($t = 239 = 2.5$, $p < .001$) and both groups were positive in disposition to think critically. Seniors also scored significantly higher than the sophomores on four of the seven subscales: truth-seeking ($t = 239 = 2.2$, $p < .05$), critical thinking self-confidence ($t = 239 = 2.9$, $p < .01$), analyticity ($t = 239 = 2.2$, $p < .05$), and inquisitiveness ($t = 239 = 2.2$, $p < .05$). There was no significant difference between the groups in the subscales of open-mindedness, systematicity or cognitive maturity. Seniors also scored statistically significantly higher (17.26, SD 3, 36) than the sophomores (15.36, SD 3.65) in overall critical thinking skill ($t = 237 = 4.1$, $p = < .001$). The main outcome of the study was that senior nursing students scored statistically significantly higher than juniors in overall disposition and skill in critical thinking. The scores for the sub-scales were not reported for either the dispositions or the skills. McCarthy (1999) stated that the cohort groups in the study were similar in age and gender, lending credence to the results of the research.

Profetto-McGrath (2003) conducted a non-experimental cross-sectional study to investigate the critical thinking dispositions and skills in a convenience sample of

students (N=228) enrolled in a four year baccalaureate programme, in Canada. In relation to overall critical thinking disposition, students in the four years of the program revealed scores above 300 and were positive in strength. Third years scored higher (313.50, SD 27.2) than first years (304.20, SD 32.10) but the difference was not statistically significant ($F = 0.822$, $df\ 1 = 3$, $df\ 2 = 224$, $p = 0.483$). While the specific scores for the sub-scales for each year were not reported results for the sub-scales for the entire sample were reported. Findings in relation to the sub-scales of the CCTDI, for the entire sample, revealed truth-seeking was the lowest with a score of 37.60 (SD 6.90) in the ambivalent category. Students scored highest on inquisitiveness (48.90, SD7.20) and open-mindedness (46.50, SD 5.90). Scores for analyticity (45.80, SD 5.50), systematicity (42.40, SD 7.20), self-confidence (44.70, SD 7.60) and maturity of judgment (46.10, SD 7.40) were all in the positive category. Systematicity scores were statistically significantly higher for third and fourth year students than for first and second year students ($F = 3.582$, $df\ 1 = 3$, $df\ 2 = 224$, $p = 0.015$). Mean scores for overall critical thinking skill increased from year one (17.10, SD 4.50) to four (17.90, SD 3.70) with the exception of year three with the lowest mean score (16.70, 4.30). However, there was no statistically significant difference among the groups ($F = 1.243$, $df\ 1 = 3$, $df\ 2 = 224$, $p = 0.295$). Profetto McGrath (2003) suggested that the lack of a statistically significant difference among students, in the four years of the programme may have been associated, in part, with their cognitive development as well as the convenience and cross-sectional nature of the sample.

Shin et al. (2006a) compared the critical thinking dispositions and skills of students in a three year associate degree (ADN), four year baccalaureate degree (BSN), and a five year RN-BSN program in Korea. Findings revealed the mean CCTDI score for all students was 263.20 (SD18.24) which fell short of the established mean of 280.00 and was weak in the ambivalent category. The mean scores for four scales on the CCTDI, open-mindedness (36.9, SD 3.35), systematicity (35.70, SD 4.19)), maturity of judgement (34.43, SD 5.20), and truth-seeking (30.12,SD 4.06) fell short of the standard cut score of 40.00. All of these scores were in the ambivalent category revealing weaknesses in critical thinking disposition. The nursing students mean CCTST score was 11.36 (SD 4.09) and fell short of the established mean of 15.89 indicating weakness. The main outcome in the study by Shin et al., (2006a) for the sample of ADN, BSN and RN- BSN was mean scores below the established mean scores in relation to critical thinking dispositions and skills for all groups.

The studies reported above which investigated both critical thinking dispositions and skills in undergraduate nursing students revealed that senior nursing students in the USA had strong critical thinking ability in terms of both dispositions and skills (Colucciello, 1997; Mc Carthy et al., 1999). Third year nursing students in one Canadian programme were not significantly better than first years (Profetto-McGrath, 2003) and Shin et al., (2006a) reported low mean scores in relation to critical thinking dispositions and skills for three different groups of nursing students. It appears from the analysis of the findings of the studies that Korean nursing students compared to North American and Canadian nursing students have a tendency towards lower critical thinking ability and the researchers attributed this to cultural differences and the nature of curricula. The empirical findings from these studies provide a reference point for the interpretation of the findings from this study and are discussed later in the discussion chapters. Studies which investigated critical thinking dispositions independently are analysed and discussed next.

2.5.3 Critical thinking dispositions in nursing

Critical thinking dispositions were investigated by Ip et al. (2000), Kawashima and Petrini (2004), Shin, Lee, Ha, and Kim (2006b), Suliman (2006), Suliman and Halabi (2007), and Tiwari, Avery, and Lai (2003). Ip et al. (2000) conducted a cross-sectional descriptive study to investigate the critical thinking dispositions of baccalaureate nursing students in a Hong Kong university. The sample was a volunteer sample of first, second and third year undergraduate nursing students (N=122). There were no statistically significant differences between year one and year two students in all mean disposition scores. Students in year three scored statistically significantly lower (243.00, SD 32.00) than first (269.00, SD18.40) and second years (270.00, SD 20.20) on the total disposition score (F= 12.70, p <0.01) and the scores were in the ambivalent category and as such they were weak in overall critical thinking disposition (Table 2.4). Ip et al., (2000) also found that third year nursing students were ambivalent and scored statistically significantly lower than the first years on five of the disposition subscales of open-mindedness (F = 5.68, $p < 0.01$), analyticity (F = 11.43, $p < 0.01$), systematicity (F = 5.16, $p < 0.01$), self-confidence (F = 13.07, $p < 0.01$), and inquisitiveness (F= 13.09, $p < 0.01$) (Table 2.4). Slightly lower ambivalent scores were reported for the third year students compared to the first year students for truth-seeking and maturity of judgment, but the findings were not statistically significant. Results revealed there were significant differences among the three groups on the total

disposition score as well as the majority of subscale scores. Ip et al. (2000) suggested that the significantly lower disposition scores of the third year nursing students may have been related to the course and it seemed to make critical thinking worse. Ip et al., (2000) identified the following limitations of their study, such as, the small sample size, the social environment, Chinese culture, and the influence of Confucian philosophy (effort, endurance, and compliance) as and influence on the low scores.

Kawashima and Petrini (2004) conducted a cross-sectional study to measure the critical thinking abilities of Japanese nursing students and registered nurses using the CCTDI. The total sample was a convenience sample consisting of three small groups of Japanese baccalaureate nursing students and Japanese registered nurses. Group one (N= 82) comprised of freshmen and junior students in the first and third year of a four year baccalaureate nursing programme. Group two (N=16) comprised students who had transferred from a three year diploma programme and two year college programmes and enrolled in third year. Group three (N=67) were Japanese registered nurses. Findings revealed group two (transfers from a diploma programme) had an overall positive disposition towards critical thinking with a mean score of 284.00 while the other two groups, the first and third year baccalaureate students and registered nurses in employment had scores below 280.00 indicating ambivalence and weakness towards critical thinking. Further analysis revealed that all three groups scored below the cut-off score of 40.00 and as such they were ambivalent or weak on four of the subscales, truth-seeking, analyticity, systematicity and self-confidence. All three groups scored in the positive range (> 40.00) for open-mindedness, inquisitiveness, and maturity of judgment.

Kawashima and Petrini (2004) state that, the positive scores on inquisitiveness, open-mindedness and maturity of judgment demonstrated by all the groups of participants, like other participants in the west, perhaps indicates that the Japanese nursing students may be encouraged to be actively open-minded and to consider other's opinions that differ from their own in making judgements. They also suggested their findings could be related to the nursing practice environment at the time of the study and given that the instruments were developed in the USA cultural biases could have affected the results. The main outcome was that diploma transfer students scored

positive in overall disposition compared to baccalaureate and registered nurses who scored lower and were weaker.

Shin et al. (2006b) investigated critical thinking dispositions using the CCTDI in a convenience sample of students enrolled in a baccalaureate nursing programme in Korea (N=32). The aim was to understand and compare dispositions towards critical thinking in nursing students. Findings revealed positive dispositions with a mean score of 289.78 (SD 14.42) in the first year, 298.34 (SD 16.42) in the third year and the improvement was statistically significant (F= 7.54, p= 0.0001) (Table 2.4). There were statistically significant improvements from first to third year nursing students for the subscales of open-mindedness in the positive category (F= 3.46, p = 0.0194). There were statistically significant improvements for self-confidence (F= 4.72, p = 0.0041) and maturity of judgment (F= 4.67, p = 0.0044) and the scores remained in the ambivalent category. There was no statistically significant difference in the subscales of truth-seeking (F= 1.92, p= 0.1324) inquisitiveness (F= 0.87, p = 0.4607) and analyticity (F= 1.54, p = 0.2085) in the positive category nor for systematicity (F = 2.53, p = 0.0620) in the ambivalent category. The third year nursing students scored very slightly lower than the first years for inquisitiveness. Systematicity, in the ambivalent category, revealed higher scores for the third year nursing students. However the differences as mentioned above were not statistically significant (Table 2.4).

Suliman (2006) conducted a correlational study with a convenience sample (N=130) of Bachelor in Science in Nursing degree students in Saudi Arabia to explore the critical thinking dispositions and learning styles in conventional (stream one; high school graduates N=80) and non-conventional (stream two; who had completed biology, physics, chemistry and mathematics N=50) students. Findings revealed that the overall sample mean score of 276.64 was marginally low and ambivalent or weak. The total disposition mean scores, per stream, revealed that stream two exceeded the cut-off point of 280.00 with a mean score of 281.90 compared to stream one with a mean of 272.85. Mean scores for each critical thinking disposition were also calculated. The overall sample scored lower than the cut-off point of 40.00 and as such was ambivalent or weak in most of the critical thinking dispositions. Truth-seeking was rated the lowest with a mean score of 31.74. Standard deviation scores were not reported in the publication

		Overall CCTDI Score	Truth-seeking	Open-minded	Analyticity	Systematicity	Critical thinking Self-confidence	Inquisitiveness	Maturity of Judgment
Colucciello (1997)	Sophomore	290,90	35.72	43.69	42.32	39.03	40.73	44.37	45.03
	Senior	311.83	38.69	45.69	43.22	42.89	44.52	49.24	46.59
Ip et al., (2000) Hong Kong	Year 1 (N=51)	269.00 (18.40)	31.20 (4.20)	38.10 (3.70)	41.30 (3.70)	37.60 (4.90)	39.80 (5.60)	44.00 (4.70)	36.90 (4.50)
	Year 3 (N=21)	243.00 (32.00)	32.10 (5.50)	35.60 (4.40)	36.20 (7.20)	33.80 (4.90)	32.30 (8.90)	36.10 (9.20)	36.60 (5.10)
Shin et al., (2006b) Korea	Year 1 (N=32)	289.78 (14.42)	46.19 (7.21)	43.13 (4.05)	49.13 (2.95)	38.03 (5.18)	34.22 (4.89)	45.84 (3.84)	33.25 (3.98)
	Year 3 (N=32)	298.34 (16.42)	47.97 (5.30)	45.13 (4.19)	49.22 (3.26)	39.82 (5.83)	36.19 (4.88)	45.13 (4.89)	34.91 (3.61)
Suliman & Halabi (2007) Jordan	Year 1 (N=105)	283.57 (26.80)	40.06 (7.99)	43.09 (5.48)	44.44 (6.28)	42.32 (6.14)	35.70 (5.88)	42.18 (6.50)	35.79 6.30)
	Year 4 (N= 60)	287.32 (23.32)	40.53 (7.26)	42.15 (5.03)	45.95 (5.77)	42.78 (6.60)	37.58 (5.08)	42.62 (6.63)	35.70 (5.15)

Table 2.4 Critical thinking disposition scores of junior and senior baccalaureate nursing students

Three dispositions were predominant in the overall sample: analyticity, self-confidence, and inquisitiveness. The results of Suliman's (2006) study revealed marginal overall critical thinking and weakness among students as the overall sample mean score was 276.24. According to Suliman (2006) the significant difference in critical thinking between streams one and two may have been attributed to stream two students entering the nursing programme at an older age and bringing with them their previous academic experience as independent learners. Stream one students were high school graduates who were younger and lacked experience and competency in independent learning.

Suliman and Halabi (2007) explored the critical thinking dispositions as well as the relationship of critical thinking to self-esteem and state anxiety in first and fourth year baccalaureate nursing students. Findings revealed that that for the nursing students overall critical thinking ability was marginally higher (284.93, SD 25.58) than the cut-off total score of 280 and as such was positive. Fourth year nursing students scored higher (287.32, SD 23.32) than junior students (283.57, SD 26.80) but this was not statistically significant ($F = 1.337$ ($df = 7$) $p = .236$) (Table 2.4). The predominant critical thinking dispositions with a mean score greater than 40.00 indicating a positive disposition for the overall sample and for each individual sample were, truth-seeking, open-mindedness, analyticity, systematicity, and inquisitiveness. Graduating fourth year nursing students revealed a slight gain compared to the first year students for truth-seeking, analyticity, systematicity and inquisitiveness and all scores were positive in strength (Table 2.4). For open-mindedness, which was positive in strength, graduating fourth years revealed a slightly lower score compared to beginning students. None of the differences were statically significant indicating that in effect these dispositions had not changed over the course.

Mean scores for critical thinking self-confidence and maturity of judgment fell below the cut-off point of 40.00 and were in the ambivalent category indicating weakness for beginning and graduating students. For critical thinking self-confidence, the graduating students scored higher than beginning students and this was statistically significant ($t= -2.053$ (df 136.904), $p = .042$) (Table 2.4). For maturity of judgment, the graduating fourth years scored very slightly lower than the beginning students but this was not significant. Suliman and Halabi (2007) concluded that although not significantly

different, beginning and graduating students had marginal overall critical thinking disposition. Predominant and positive in strength were the dispositions, analyticity, open-mindedness, systematicity, inquisitiveness, and truth-seeking. The two cohorts of nursing students demonstrated weakness in relation to maturity of judgment and critical thinking self-confidence and beginning students were statistically significantly less confident.

Tiwari et al. (2003) compared critical thinking dispositions of Hong Kong and Australian nursing students in a cross-sectional, descriptive comparative study. A convenience sample of nursing students (N=384) from two universities, one in Hong Kong and the other in Australia participated in the study. The sample consisted of students from all years of the pre-registration and post-registration nursing programmes. Findings revealed that Chinese students failed to show a positive disposition towards critical thinking with a total mean score of 268.36 (SD 21.58) which was below the cut-off score of 280.00. The Australian nurses showed a positive disposition towards critical thinking with a total mean score of 287.73 (SD 30.98). The Hong Kong Chinese students with scores above 40.00 were positively disposed for the dispositions, inquisitiveness, analyticity, and critical thinking confidence. They were ambivalent with scores below 40.00 for, truth-seeking, open-mindedness, systematicity, and maturity of judgment. The Australian nursing students were positively disposed towards, inquisitiveness, analyticity, critical thinking confidence, open-mindedness and maturity. They were ambivalent for truth-seeking and systematicity. Both groups had ambivalent scores on the truth-seeking sub-scale, suggesting that they were less inclined to be honest and objective in pursuing inquiry or to reconsider decisions in light of new evidence. They were also ambivalent for systematicity. Tiwari et al. (2003) concluded that their findings indicated similarities and differences between Hong Kong Chinese and Australian nursing students' critical thinking dispositions. They suggested culture as the influence in differences between groups in relation to open-mindedness and maturity. They also stated the results could be attributed to institutional, educational, professional and cultural factors, with implications for education and practice alike. Tiwari et al. (2003) identify limitations of their study such as, generalization of the findings being limited by the cross-sectional study design, convenience sampling and low response rate (50% for the Australian nursing students).

The studies reported above, in relation to critical thinking dispositions, revealed there were significant differences among three groups of Chinese nursing students on the total disposition score as well as the majority of subscale scores (Ip et al., 2000). Kawashima and Petrini (2004) reported that for Japanese nursing students diploma transfer students scored positive in overall disposition compared to baccalaureate and registered nurses who scored lower and were weaker. Tiwari et al. (2003) concluded that their findings indicated similarities and differences between Hong Kong Chinese and Australian students' critical thinking dispositions. The results of Suliman's (2006) study, in the Middle East, revealed overall weakness in critical thinking disposition. Suliman and Halabi (2007) concluded that although not significantly different, beginning and graduating nursing students in the Middle East had marginal overall critical thinking disposition. The results of these studies which investigated critical thinking dispositions only tend towards weaker disposition in Eastern culture. Studies which investigated critical thinking skills only are also reported in the literature and these are analysed next.

2.5.4 Critical thinking skills in nursing

Studies which investigated critical thinking skills in nursing students are also reported in the literature. Spleic et al. (2001) investigated the critical thinking skills of different groups of nursing students in the US A undertaking a baccalaureate nursing degree. Results revealed that sophomores by the end of four years scored significantly higher (58.29, SD 3.16) than at entry (49.86, SD3.95) ($p \leq .01$). May, Edell, Butell, Doughty, and Langford (1999) found senior baccalaureate nursing students in the USA in the last semester of their course one month prior to graduation reported moderate strength with an average score of 16.75 (SD 15.89).

Beckie, Lowry, and Barnett (2001) investigated critical thinking skills of baccalaureate nursing students at one university site in the USA before and after a curriculum revision. The purpose of the study was to ascertain the difference in critical thinking skills of baccalaureate nursing students who completed a former or baseline nursing curriculum, and those who completed a revised curriculum to promote critical thinking. The second aim was to ascertain the change over time in critical thinking skills. Data collection was at three points in time with first data collection at entry, the second point was one year later, and the third data collection point was at exit from the course. Data

were collected using a 34 item CCTST from cohort one (N=55), the base line cohort, while cohorts two (N=55) and three (N=73) experienced the revised curriculum.

Findings revealed that irrespective of whether a cohort had experienced the curriculum before or after revision there were statistically significant differences in overall critical thinking skill. Cohort one who had experienced a baseline curriculum showed a slight improvement in overall critical thinking score from entry to exit (Table 2.5). Cohort two the first cohort to experience the revised curriculum showed an improvement in scores from junior to senior level. Cohort three, the second cohort to experience the revised curriculum, failed to demonstrate improved overall critical thinking skill scores from junior to senior level and the differences from entry to exit were statistically significant ($F = 7.72$, 0.006; $F = 11.22$, 0.000, $p < 0.168$). Beckie et al. (2001) attributed the poor performance in group three to significant life transitions unique to the group. One, the students were aware of no direct benefits to their grades from completing the test, two, the students found the test particularly cognitively challenging, and three, some tended to have little motivation to complete the test.

Cohort one, the base line cohort, showed a statistically significant decline from test one to test three in analysis and inference (Table 2.5). Deductive reasoning also declined but this was not statistically significant. Evaluation and inductive reasoning improved but not statistically significantly. Cohort two who experienced the revised curriculum improved in all critical thinking skills compared to cohort one (baseline curriculum) and the improvements were statistically significant for inductive reasoning ($F=16.37$, $p < .001$), deductive reasoning ($F= 12.48$, $p < .001$), inference ($F=12.98$, $p <.001$) and evaluation ($F= 18.70$, $p < .001$). Cohort three did not score significantly higher compared with cohort one on any of the sub-skills and the researchers attributed this to life transitions for the cohort, motivation and the cognitive challenge of the test. The studies reported above point towards slight gains in critical thinking skill over the course of a nursing degree programme and Beckie et al. (2001) also found significant improvements in critical thinking skills in the case of a revised curriculum which emphasised critical thinking. These findings appear to indicate that emphasising critical thinking skills has the potential to enhance their development. Critical thinking in nursing has also been investigated using the Watson Glaser Critical Thinking Appraisal (WGCTA) and is discussed in the next section.

	Entry			Exit		
Cohort	**1**	**2**	**3**	**1**	**2**	**3**
Total Score & SD	16.1 (4.7)	17.8 (3.8)	16.7 (4.1)	16.3 (3.7)	18.5 (5.9)	13.6 (5.4)
Analysis	4.9 (1.4)	4.7 (1.2)	4.6 (1.3)	4.7 (1.1)	4.8 (1.7)	3.6 (1.7)
Inference	6.4 (1.8)	6.5 (1.9)	6.3 (1.7)	5.3 (1.8)	6.7 (2.2)	4.6 (2.2)
Evaluation	4.9 (3.0)	6.7 (2.3)	5.8 (2.3)	6.3 (2.2)	7.1 (2.7)	5.3 (2.8)
Inductive Reasoning	6.0 (2.9)	7.5 (2.1)	7.0 (2.1)	6.6 (1.9)	7.6 (2.8)	5.3 (2.8)
Deductive Reasoning	8.2 (2.9)	8.5 (2.5)	7.9 (2.5)	7.8 (2.1)	9.1 (3.0)	7.0 (2.9)

Table 2.5 Critical thinking skill scores of baccalaureate nursing students following curriculum revision

2.5.5 Critical thinking as knowledge, skills and attitudes in nursing

Critical thinking has been investigated as knowledge, skills and attitudes using the Watson Glaser Critical Thinking Appraisal-Form S (WGCTA-FS). The WGCTA- Form S has five subscales: *inference, recognition of assumptions, deduction, interpretation, and evaluation of arguments* (Crites, 1965; Gadzella et al., 2005). Inference captures the extent to which one can discriminate truth from falsity. Recognition of assumptions captures if subjects recognizes whether assumptions are clearly stated. Deduction captures if the subject can decide whether certain conclusions necessarily follow the information provided. Interpretation in which the subject considers the evidence provided and determines whether generalizations on the data are warranted. Evaluation of arguments captures whether subjects distinguish between strong and relevant arguments from those that are weak and irrelevant. The total critical thinking appraisal score is a summation of the five sub-scale scores and provides a more accurate estimate of individuals overall proficiency with respect to attitudes, knowledge, and skills (Gadzella et al., 2005). Critical thinking has been investigated using the Watson Glaser Critical Thinking Appraisal with nursing students undertaking a baccalaureate (Bauwens & Gerhard, 1987; Miller, 1992; Vaughan-Wrobel et al., 1997), a diploma in nursing (Beherns, 1996), and a bachelor in nursing science (Howell Adams, Stover, & Whitlow, 1999; Shin, Ha, Kyungrim, & Davis, 2006). The main

findings of these studies are presented here to provide an insight into the assessment of critical thinking using the Watson Glaser Critical Thinking Appraisal.

The longitudinal studies with baccalaureate nursing students (Bauwens & Gerhard, 1987; Vaughan-Wrobel et al., 1997) and bachelor in nursing science students (Howell Adams et al., 1999) did not show gains in critical thinking ability. The researchers explained the following as reasons for their findings. Bauwens and Gerhard (1987) suggested that lack of gain in critical thinking ability may have been related to the WGCTA emphasis on logic rather than process and suggested that perhaps logical critical thinking is essential to the problem-solving process as utilised in nursing, while in its reciprocal situation the problem-solving process exerts less influence on existing logical critical thinking patterns. Vaughan-Wrobel et al. (1997) noted the following factors to explain why the students in their study did not show significant gains in critical thinking ability over the course of two and a half years of nursing education. One, the WGCTA may not be the best measure of critical thinking ability for nursing students. Two, the expectation of a gain in critical thinking scores as a result of completing upper division course work may be erroneous. Three, the curriculum may not have been designed to enhance critical thinking. Four, the traditional teaching strategies used in nursing programmes at the time may not have encouraged critical thinking in the students. In conclusion to their study Howell Adams et al. (1999) stated that in their study the WGCTA was not the instrument of choice for a longitudinal measurement of critical thinking abilities of BSN students. Beherns (1996) investigated critical thinking using the WGCTA in three freshman classes of diploma in nursing students between 1989 and 1991 and he reported that critical thinking did not increase as a result of the nursing school experience.

In a longitudinal study by Miller (1992) in a baccalaureate registered nurse programme there was a gain in critical thinking ability for the overall cohort but not for diploma and associate degree students when investigated independently. Miller (1992) suggested that the lack of gain in associate degree students may have been due to the fact that associate degree students had been exposed to at least two years of higher education prior to entering the baccalaureate registered nurse programme and therefore they did not have significant gains. In contrast, diploma graduates had little exposure to higher education and therefore registered greater gains. In a study by Shin et al. (2006)

bachelor in science nursing students scored gains in critical thinking ability over associate and RN-BSN students at four university sites in Korea, but lower critical thinking ability compared to studies with western students using the WGCTA. Shin et al. (2006) suggested the lower critical thinking scores could be explained in that the educational objectives of the nursing programme in Korea did not fully focus on improving the students' critical thinking ability. There was no standard for the level of critical thinking to be achieved. Educational objectives for improving the students thinking ability were not clearly reflected in the overall nursing education system, including course objectives, curricula and teaching methods. There were no educational guidelines on the level of critical thinking and how student's critical thinking abilities could be measured.

The studies reviewed above reveal mixed results from the Watson Glaser Critical Thinking Appraisal and the author's comments identify the challenges of measuring critical thinking using the test. In this study, critical thinking was defined using the Delphi conceptualisation and the derived constructs of dispositions and skills identified by Facione (1990). The appropriate measures were the California Critical Thinking Disposition Inventory (CCTDI) and the Health Sciences Reasoning Test (HSRT) (Facione & Facione, 2010, 2012). Empirical studies of critical thinking from a quantitative perspective have been analysed to this point and they provide knowledge of critical thinking among undergraduate nursing students. Studies of a qualitative nature, although less prevalent, have investigated perceptions of nursing students about critical thinking and these are analysed in the next section.

2.5.6 Nursing students perceptions of critical thinking

In addition to the quantitative studies reported above for critical thinking dispositions and skills there are qualitative studies which have explored the perceptions of nursing students in relation to critical thinking and these studies, although rather limited, are reported here. These studies are relevant as they provide further insights about critical thinking in nursing students and are of relevance in this study as it also explored the perceptions of undergraduate nursing students. The development of critical thinking in the first six months in nursing practice was explored in a phenomenological study by Boychuck Duchscher (2003), among five newly graduated baccalaureate registered nurses in Canada. Data collection was two in-depth interviews with the initial semi-

structured interview within two months of participants beginning practice as registered nurses and the final interview was six months later. All participants engaged in monthly reflective journaling throughout the study period. Findings revealed that critical thinking was described as being, the *'big picture'*, and most participants were unable to see beyond their task for at least the first five months of practice. Critical thinking was perceived as being *elitist* and reserved for *'expert'* practitioners. In the final interview, approximately six months after acquiring their initial definition of critical thinking, many descriptions of critical thinking had narrowed and become consistent with the nursing process and participants perceived that if they were applying the nursing process they were thinking critically within their practice. Participants saw critical thinking as triggered by events such as, limited resources from which they could seek a prescribed response and an unknown or questionable entity that appeared in their practice. Critical thinking was considered an essential part of problem-solving, but problem-solving did not necessarily assume a critical thinking process. Decision making was the outcome of problem-solving and could be the end product of critical thinking, but critical thinking did not always assume an outcome. The findings of the study by Boychuck Duchscher (2003) indicated a socialization process in professionalizing graduate nurses that discouraged critical thought and fostered a scientific, reduction based application of the nursing process. Participants also reported objectivity in judgement and the *'feeling'* part of thinking as indicative of critical thinking.

Critical thinking was perceived as, purposeful or goal directed, as well as confluent or a process of bringing together the parts of a whole to achieve a broader view. Participants described critical thinking as being *'triggered'* or initiated when a question surfaced for which there was no prescribed answer. The concept of a *'critical spirit'* being open-minded and use of dialogue with peers were perceived as aspects of critical thinking. Coping with uncertainty or ambiguity in one's own thoughts was also believed to initiate the critical thinking process. For the participants, face saving, resistance to change, and conformity were behaviours which impeded critical thinking. Standards of breath, depth, and purpose in thinking, and the principle of clarity in reasoning were identified by participants as important to critical thinking. Use of reflection in practice and an attitude of inquiry were also reported by participants in the study.

The findings of the study by Boychuck Duchscher (2003) revealed that newly graduated nursing students perceived critical thinking in the context of problem-solving and decision-making. Application of the nursing process was also perceived as critical thinking. This finding reflects other studies reported earlier in this literature review in which the nursing process was synonymous with critical thinking (Gordon, 2000; Huckaby, 2009; Turner, 2005; Videbeck, 1997a). Being reflective, an attitude of being open-minded and the use of inquiry were also perceived as critical thinking. These findings also reflect a similarity to the findings reported in relation to the perceptions of nurse educators which are reported in the next section. This is not overly surprising as newly graduated nursing students perceptions of critical thinking are likely to be influenced by the way in which critical thinking is impacted by the totality of curriculum experiences, both academic and in clinical practice.

2.5.7 Nurse educators' perceptions of critical thinking in undergraduate nursing students

Studies of a qualitative nature are reported in relation to nurse educators' perceptions of critical thinking. These studies, although rather limited in number, are of interest as they provide insights from a qualitative perspective. The findings reported here are relevant as this study also explored the perceptions of both lecturers and nursing students on critical thinking. An exploratory study was conducted by Twibell et al. (2005), in the USA, to explore the perceptions of nursing faculty members as they taught critical thinking skills to baccalaureate student nurses in clinical settings. According to Twibell et al. (2005) the findings suggest that clinical faculty can describe indicators of critical thinking in baccalaureate nursing students and that the nature of critical thinking, as perceived by the respondents, shared some similarities with earlier definitions. Twibell et al. (2005) noted that respondents in the study did not differentiate clearly between problem-solving, decision-making, clinical judgement, and critical thinking and most used the terms interchangeably. All respondents in the study valued questioning in the promotion of critical thinking. Questioning by faculty in clinical conferences as well as faculty members writing comments on student papers and journals were also valued. The study concluded that faculty reported that the primary cognitions in critical thinking include synthesis, reflection, information gathering, prediction, planning, assigning meaning, problem-solving, and applying new knowledge. Primary strategies to promote critical thinking in clinical settings were

asking questions, conducting clinical conferences, and evaluating written assignments, including journals.

A study by Walthew (2004) explored the conceptions of critical thinking held by nurse educators in a large urban nursing school in New Zealand which taught a Bachelor of Health Science (Nursing) degree programme. The main focus of the study was the nurse teachers' perceptions of critical thinking in students in the practice setting. The results of the study revealed *a traditional view* and *a feminist view* of critical thinking. In relation to the traditional view of critical thinking, all participants viewed rational logical thinking as a central feature of critical thinking for decision making in nursing. Aspects of logical thinking described by the nurse educators were, information gathering, recognizing patterns, linking theory to practice, analyzing the situation, presenting arguments, and problem-solving. When discussing problem-solving many of the nurse educators considered the nursing process to be closely related to critical thinking and a number of participants disagreed with this position. They considered the nursing process to actually inhibit critical thinking by stifling creativity, which they considered to be an essential component of critical thinking. In addition to skills and knowledge, the nurse educators considered attitude and disposition essential if critical thinking was to occur. One participant stated, *'well, I think just to bring an attitude of being open to what is happening here'.* A second participant stated, *'I think curiosity is an absolute fundamental to critical thinking'.* Another participant suggested that to think critically in nursing requires a particular way of thinking unique to the discipline of nursing. According to Walthew (2004) these understandings of critical thinking expressed by the nurse educators were grounded in rational, logical thinking and were clearly reflective of the traditional view of critical thinking.

Raymond and Profetto-McGrath (2005) conducted a descriptive exploratory study as part of a mixed methods study with six nurse educators in Canada. Data were collected using a semi-structured interview. The nurse educators described critical thinking as a purposeful and in-depth problem-solving process, evidence based practice, methodological information sorting, a process of deconstruction and synthesis of ideas and information, reflection on knowledge, information and one's own thinking process. They described various qualities of the critical thinking process such as, open-mindedness, analyticity, systematicity, creativity, curiosity, honesty and reflection. They

described strategies to facilitate critical thinking such as questioning, analysis of information, in-depth discussions, engaging with students and creating and applying frameworks to organize ideas.

In the qualitative studies reported above, critical thinking was perceived as synonymous with problem-solving, decision-making and clinical judgment. In the study by Walthew (2004) some respondents reported critical thinking as related to the nursing process and a problem-solving approach while there was dissent on this for some faculty members. Attitude or dispositions were identified such as, open-mindedness and curiosity (Walthew, 2004), open-mindedness, analyticity, systematicity, creativity, curiosity and honesty (Raymond & Profetto-McGrath, 2005). Critical thinking was perceived to be happening through seeking information, assigning meaning, application of knowledge, use of reflection and evidence based practice. These qualitative findings provide knowledge of what nurse educators in these studies perceived in relation to critical thinking.

Empirical research on critical thinking was analysed and discussed in this final section of the literature review. In relation to dispositions towards critical thinking, nursing students in western culture in Canada (Profetto-McGrath, 2003) and in the USA (Colucciello, 1997; Mc Carthy et al., 1999) tended towards higher disposition scores compared to nursing students in Eastern cultures (Ip et al., 2000; Shin et al., 2006b) and in the Middle East (Suliman & Halabi, 2007; Suliman, 2006). Studies which investigated critical thinking skills showed gains in overall critical thinking skill from junior to senior levels (May et al., 1999; Spleic et al., 2001). There appears to be very few studies reported in the literature which investigated gains in critical thinking skill sub-scales from junior to senior level. A study by Beckie et al. (2001), in the USA, reported differences from entry to exit for three different cohorts of baccalaureate nursing students who experienced a revised curriculum to promote critical thinking.

Studies which used the Watson Glaser Critical Thinking Appraisal (WGCTA) also reported variable findings. The longitudinal studies with baccalaureate nursing students (Bauwens & Gerhard, 1987; Vaughan-Wrobel et al., 1997) bachelor in nursing science students (Howell Adams et al., 1999) and with diploma in nursing students (Beherns, 1996) did not show gains in overall critical thinking ability. Other studies which used the

WGCTA showed gains in critical thinking ability (Miller, 1992; Shin et al., 2006). Qualitative studies reported in the literature revealed that newly graduated nursing students' perceived problem-solving, decision-making, the nursing process and reflection as synonymous with critical thinking. In relation to nurse educators, questioning was valued (Twibell et al., 2005). There were mixed views about the nursing process with some agreeing it was critical thinking while others disagreed (Walthew, 2004). In general, empirical studies which used the CCTDI the CCTST and the WGCTA revealed variable results. The studies used different designs such as correlational, descriptive, exploratory as well as pre-test post-test design. Sampling methods were convenience and sample size was very variable with small samples in some studies. While these studies are variable in nature they provide a body of empirical knowledge on critical thinking in undergraduate nursing students from an international perspective and this knowledge also contributed to a component of the theoretical framework for this study and discussed later in Chapter 4. The findings from these studies also permitted a comparison with the findings from this study and are discussed later in the discussion chapters.

2.6 Summary of the literature review

This chapter presented a review of the literature on critical thinking and it also provided perspectives on critical thinking as well as critical thinking in nursing, to include, the perceptions of both nursing students and nurse educators. In the first section, components of critical thinking identified were, domain-specific knowledge, cognitive operations which include major strategies of problem-solving, decision-making and conceptualizing. Critical thinking skills were identified as well as micro-thinking skills and reasoning. These components underpin critical thinking in addition to other aspects of such as challenging assumptions and reasoning in the form of inductive and deductive processes. Dispositions, as well as skills were seen as important for critical thinking. Definitions of critical thinking were analysed and it was evident that while there appears to be lack of consensus on a single definition of critical thinking there is consensus about, *knowledge, skills, and dispositions* as components of critical thinking. The Delphi consensus statement on critical thinking, identified by Facione (1990), was seen as very significant in the conceptualization of critical thinking and the derivation of critical thinking dispositions and skills (Facione & Facione, 2010, 2012).

In the second section of the literature review, a perspective on critical thinking in nursing, definitions of critical thinking used in nursing and nursing's conceptualisation of critical thinking were explored. The nursing process provided an insight into thinking and critical thinking in nursing. The influence of intuitive thinking on critical thinking was also addressed. In the third section, a perspective on critical thinking in Irish nursing, three models of nurse education were identified, the apprenticeship model, the registration-diploma model and the new degree model, all which influenced thinking and critical thinking over the past one hundred years. With the new degree model and the move to higher education in September 2002 greater emphasis was placed on critical thinking as part of higher level learning. The emphasis on critical thinking led to an interest in research on critical thinking in nursing, albeit limited to less than a than a handful of studies to date, with one study which used the Watson Glaser Critical Thinking Appraisal to investigate critical thinking at undergraduate level (Hegarty et al., 2008).

In the fourth and final section of the literature review empirical studies on critical thinking were analysed. The studies were predominantly North American and for the most part investigated critical thinking dispositions and skills in baccalaureate level nursing students. Findings from these studies varied, with some showing gains, while others showed lack of gain in critical thinking as a result of the academic experience. The Delphi conceptualization of critical thinking (Facione, 1990) was predominant in these studies, while the Watson and Glaser conceptualisation of critical thinking as knowledge, skills and attitudes was also popular in undergraduate studies on critical thinking. Studies were descriptive, correlational and of a pre-test-post-test design. Convenience sampling with cohorts of students at single university sites was also prevalent in the studies. Empirical studies of a qualitative nature were less prevalent in the literature and investigated the perceptions of educators and nursing students in relation to critical thinking. The perspectives of critical thinking explored, in this literature review not only provided an insight into critical thinking, but also provided a theoretical foundation which informed this investigation of critical thinking in undergraduate nursing students in the context of Irish nurse education. The review of the literature gave rise to implications in relation to this study and these are discussed in the next section.

2.7 Implications arising from the literature review

In this concluding section implications arising from the literature review which determined the nature of this study on critical thinking are explained. In the review of the literature the components of critical thinking, definitions, the nature of empirical studies, and gaps in the research on critical thinking were identified and informed this study. Three significant components of critical thinking were identified by academics in the field of critical thinking. These components stood out as, *domain-specific knowledge, cognitive operations which include critical thinking skills and dispositions* referred to by Facione and Facione (2010) as *'habits of mind'*. Components such as, *checking one's assumptions* and *use of reason* were also identified as important for critical thinking. The implication of these three significant components of critical thinking identified above is that, they provided domains for the investigation of critical thinking in this study. Domain-specific knowledge is the knowledge gained by the nursing students as they progress through the four years of the nursing degree programme and is continuously assessed throughout the programme with grades awarded as evidence of achievement. This is not the case in relation to the dispositions and skills components of critical thinking. The assumption is, that nursing students possess the dispositions or attitudes as well as the skills to engage in critical thinking and these are likely to be influenced as a result of the curriculum experience. Empirical knowledge of the influence of the curriculum on the dispositions and skills of critical thinking, in the Irish nursing education context, is not available. Knowledge of dispositions and skills is necessary to gain an understanding of critical thinking in undergraduate nursing students and these two latter components provided the focus in this study.

The conceptualisation of critical thinking in studies reported in this literature review also informed this study. Empirical studies on critical thinking were informed by two conceptualizations of critical thinking. One conceptualization is that of Watson and Glaser (1957) in which critical thinking is conceptualized as, knowledge, skills and attitudes. The second and predominant conceptualization is the Delphi consensus statement in which critical thinking is conceptualized as dispositions and skills (Facione, 1990). The Delphi consensus statement of critical thinking provided the conceptualization of critical thinking in this study. The rationale for the Delphi conceptualisation was grounded in the scope of the conceptualisation of critical thinking. The Delphi conceptualisation goes beyond the knowledge, skills, and attitudes of the Watson Glaser Critical Thinking Appraisal (WGCTA) in its conceptualisation of critical

thinking. It also incorporates a broader scope of attributes which captured critical thinking in the nursing students and therefore was appropriate for this study. Also, the dispositions and skills derived from the Delphi consensus statement identified by Facione (1990) provided the constructs specific to the dispositions and skills. Relevant critical thinking tests such as the California Critical Thinking Disposition Inventory (CCTDI) and the Health Sciences Reasoning Test (HSRT) provided the means to measure critical thinking as dispositions and skills. These were the main reasons for the use of the Delphi conceptualisation as the core theoretical conceptualisation. A more detailed explanation is provided later in Chapter 4 which outlines the theoretical framework for this study.

Studies reported in the literature review were predominantly mono-method and quantitative in nature with limited studies of a qualitative nature. While empirical studies were mono-method and the designs used were appropriate to the investigations conducted they provided a perspective which was either quantitative or qualitative. The research designs in the quantitative studies were descriptive, correlational, pre-test post-test with cohorts of baccalaureate nursing students and used convenience sampling. The qualitative studies were descriptive exploratory and phenomenological in nature. A mixed methods study was reported by Raymond and Profetto-McGrath (2005) while Twibell et al. (2005) used a multiple case study approach. However, the identification of the main case, units of analysis, and the boundaries were not specified by the latter.

Having reviewed the literature and the nature of empirical studies *a case study approach* was considered as an appropriate approach in this investigation of critical thinking. A case study approach permitted a focus on *critical thinking as the main case* and it also permitted the use of both quantitative and qualitative methods. The rationale for the combination of quantitative and qualitative data was to complement each other and add further insights about critical thinking as the main case. As this study investigated critical thinking in two cohorts of undergraduate nursing students, one in first year and one in third year at one point in time, it was also cross-sectional in design. The lack of studies on critical thinking in Irish nursing, both in education and in clinical practice contexts also influenced the need for an investigation. While there are ample studies on critical thinking of North American origin this is not the case in the Republic of Ireland with studies limited to a handful and with only one published study by Drennan (2009).

Critical thinking as dispositions and skills has not been investigated to date among registered nurses or nursing students in the Republic of Ireland at undergraduate or post-graduate level. Knowledge of the influence of curriculum experiences in the new degree course critical thinking skills and dispositions is needed. This study, as a starting point, aimed to address this gap as the first study to investigate critical thinking using the Delphi conceptualization of critical thinking. This study adds to the body of knowledge on critical thinking from and Irish perspective and allows a comparison of findings with existing international studies on critical thinking.

2.8 Conclusion

This chapter presented a review of the literature and in doing so provided a perspective on critical thinking, more specifically it provided a perspective on critical thinking in nursing as well as in the context of Irish nursing education. Components of critical thinking as dispositions and skills were identified and these provided a focus for this investigation of critical thinking. Definitions of critical thinking were analysed and the Delphi conceptualisation and derived constructs of dispositions and skills directed the core theoretical underpinnings for this investigation of critical thinking. The empirical studies analysed informed the use of a case study approach in this investigation of critical thinking. From the review of the literature the complexity and challenge of assessing critical thinking is evident. Researchers are also challenged to use an approach which is most effective to address their research aims. In the next chapter, the methodology to investigate critical thinking in this study is presented.

Chapter 3 Methodology

3.1 Introduction

This chapter explains the methodology used to investigate critical thinking in this study. The first section explains the purpose of the study, the aims and research questions. The second section explains the philosophical underpinnings to include pragmatism as well as the ontological perspectives of logical positivism and constructivism which underpinned the quantitative and qualitative components of the study. The third section explains a case study approach which incorporated mixed methods as well as a cross-sectional design. The fourth section describes the tests used to measure critical thinking and their psychometric properties. In the fifth section sampling methods and recruitment of participants is explained. The sixth section explains the methods used to collect the quantitative and qualitative data. Rigour or trustworthiness of the qualitative component of the study is explained in section seven. Section eight explains the strategy and methods to analyse the quantitative and qualitative data. In the final section, the ethical principles which guided this study are addressed.

3.2 Researcher stance in this investigation of critical thinking

In this investigation of critical thinking it is important to clarify my beliefs, values and interests as they influence the nature of this study. I believe that critical thinking is important not just for the profession of nursing but for each individual nurse as they make clinical judgments which impact the wellbeing of patients or clients with whom they work. I believe that critical thinking enhances high standards of care and has the potential to take those high standards higher by dispelling even the slightest hint of complacency in relation to what one believes or does. I believe that critical thinking from an ontological perspective can be measured as an entity separate from the minds of people. I also believe that critical thinking exists in the minds of people and can be captured from their descriptions of critical thinking. I believe that what can be measured using tests of critical thinking and gained form the descriptions of nursing students and their lecturers will provide knowledge of undergraduate nursing students' critical thinking as well as their knowledge of critical thinking in the nursing curriculum. These ontological perspectives are closely tied to the epistemological approaches to investigate the mixed quantitative and qualitative research questions in this study and this is further explained later in this chapter. My interest in critical thinking while

shaped by my beliefs and values was also influenced by the Delphi consensus statement which formed the theoretical framework for this study and is described later in Chapter 4. My beliefs and values about critical thinking informed the purpose of this study and the three main purposes are stated next followed by the research questions.

3.3 Purpose of the study

The purpose of a study is important and according to Creswell (2014) the purpose statement is central to any study and it sets out the intent or objective of the study. This study had three main purposes or aims as follows:

1) The first aim was to investigate critical thinking in undergraduate nursing students and in doing so measure their critical thinking dispositions and skills.

2) The second aim was to explore the perceptions of nursing students and their lecturers about critical thinking in the undergraduate nursing curriculum.

3) To third aim was to find out if there was a difference in the critical thinking of first year nursing students compared to more senior third year nursing students in context of an undergraduate nursing curriculum.

Four main reasons underpinned these aims. The first was the expectation of An Bord Altranais (2000) that nursing students will be critical thinkers as an outcome of the undergraduate nursing degree course. The second reason was that lecturers have their views about critical thinking in the undergraduate nursing curriculum and it was important to explore these. A third reason was to provide knowledge and insights about critical thinking in Irish nursing education. A fourth reason was to provide recommendations in relation to critical thinking in the undergraduate nursing curriculum. To address the aims of this study it was necessary to identify specific research questions and these are stated in the next section.

3.4 Research questions

To achieve the aims of this case study a set of nine research questions were investigated. Six of the questions were quantitative and three were qualitative in nature. Questions one to four were quantitative and addressed critical thinking dispositions and skills. Questions five and six addressed the difference in the dispositions and skills of the first and third year nursing students. Two of the qualitative questions, questions seven and eight, explored students' views about critical thinking in the nursing curriculum. Question nine explored the views of nurse lecturers about critical thinking in the nursing curriculum. The following are the research questions investigated in this case study:

- **1)** What are the critical thinking dispositions of first year undergraduate general nursing students as measured by the CCTDI?
- **2)** What are the critical thinking dispositions of the third year undergraduate general nursing students as measured by the CCTDI?
- **3)** What critical thinking skills do undergraduate general nursing students have in the first year of the nursing degree course as measured by the HSRT?
- **4)** What critical thinking skills do undergraduate general nursing students have in year three of the nursing degree course as measured by the HSRT?
- **5)** What is the difference in the critical thinking dispositions of the first and third year undergraduate general nursing students?
- **6)** What is the difference in the critical thinking skills of the first and third year undergraduate general nursing students?
- **7)** What are first year undergraduate general nursing students' perceptions of critical thinking in the nursing curriculum?
- **8)** What are third year undergraduate general nursing students' perceptions of critical thinking in the nursing curriculum?
- **9)** What are the perceptions of nurse lecturers about critical thinking in the undergraduate nursing curriculum?

The nature of the research questions required both a quantitative and a qualitative approach. The purpose of the quantitative approach was *explanatory* to confirm critical thinking in the undergraduate nursing students. The purpose of the qualitative approach was *exploratory* and allowed for the exploration of critical thinking in the

undergraduate nursing curriculum from the perspective of students as well as their lecturers. *To achieve the aims and research questions of this study a case study approach which incorporated a mixed methods strategy as well as a cross-sectional design was necessary.* The case study approach, mixed methods strategy and cross-sectional design is explained in detail in later sections in this chapter. As the case study approach incorporated mixed methods it is necessary to explain the philosophical perspective of pragmatism which underpinned mixed methods. This is then followed by an explanation of the ontological perspectives of logical positivism and constructivism which underpinned the quantitative and qualitative components of this case study. Both the philosophical and ontological perspectives also underpinned the case study approach.

3.5 Philosophical Perspective

Before explaining the case study approach it is important to explain the philosophical perspectives of pragmatism and the ontological perspectives of logical positivism and constructivism which underpinned the use of mixed methods in this study. Making sense of reality or the world around us requires an understanding of the nature of knowledge and as Crotty (1998, p. 8) states, this entails *'how we know what we know'* and constitutes an epistemology. According to Crotty (1998, p. 10), 'ontological and epistemological issues emerge together' and these issues as they relate to this study are explained here. Epistemological issues in relation to the tenets or beliefs and axioms of pragmatism as they influenced this study are explained first. The ontological issues are explained in a later section.

3.5.1 Pragmatism and mixed methods

The combination of both quantitative and qualitative research questions to investigate critical thinking in this study acknowledges the compatibility of quantitative and qualitative research methods, and according to Howe (1988, p. 12), subscribes to the *'compatability thesis'* and the acceptance of pragmatism. Pragmatism as a paradigm provides the researcher with *tenets or beliefs* as well as *axioms* which underpin pragmatism as an approach to research. According to Tashakkori and Teddlie (1998) the tenets of pragmatism are, *paradigm relativism, compatability of methods, the importance of the research question* and *truth.* Each of these tenets is explained here as they underpinned this study. *Paradigm relativism* is the use of whatever

philosophical and/or methodological approach works for the particular research problem under study. A major tenet of Howe's (1988, p. 12) concept of pragmatism accepts that quantitative and qualitative methods *'are compatible'*. This tenet underpinned this investigation of critical thinking by using quantitative and qualitative methods in a way that was compatible to provide an expanded dimension beyond what would be available using a mono-method approach. According to Teddlie and Tashakkori (2003, p. 21) pragmatists consider the importance of the research question over the method or world view that is supposed to underline the method and they use the phrase, *'the dictatorship of the research question'*. The relevance of this latter tenet, while acknowledging the importance of the underlying method or paradigm, emphasised the research questions, both quantitative and qualitative, as of central importance in this investigation of critical thinking.

In relation to *truth*, Teddlie and Tashakkori (2003, p. 21) state that, 'pragmatism avoids the metaphysical concepts of *'truth'* and *'reality'*. According to Howe (1988, p. 15) pragmatists 'reject the problem regarding theories of truth altogether' and accept that *'some reality'* or *'some given'* by its very nature can never be known' and they 'deny that a dilemma exists about the nature of truth'. There are multiple explanations for the results of any study, according to Tashakkori and Teddlie (1998, p. 29), and for the pragmatist, 'the choice is between, the 'better' explanation (postpositivist) and the one closer to the researcher's values (pragmatism), which will often be the same given that the researcher designed the study and gave the constructs their operational definitions. Pragmatists deny that *'truth'* can be determined once and for all and consider truth to be 'what works' (Tashakkori & Teddlie, 1998, p. 28).

Along with the tenets or beliefs about pragmatism identified above, Tashakkori and Teddlie (1998, p. 23) refer to axioms which underpin pragmatism and have to do with *ontology, epistemology, methodology, logic, axiology and causal linkages.* The use of mixed methods in this study was underpinned by pragmatism and consequently by these axioms. With regard to *ontology*, Cherryholmes (1992, p. 14) states that, 'pragmatists agree that there is an external world independent of our minds'. From this ontological perspective critical thinking may be viewed as a construct independent of our minds and as such amenable to measurement. With regard to *epistemology* both objective and subjective points of view are influential in the relation between knower

and the known. From an epistemological perspective, what we know of critical thinking and how we know what we know consists of what can be measured objectively independent of our minds as well as explored subjectively as constructions in the minds of participants. The integration of the objective and subjective knowledge derived from quantitative and qualitative methods in this case study provided insights about critical thinking as a broader dimension than either an objective or subjective approach on its own. According to Teddlie and Tashakkori (2003, p. 21) pragmatism involves, 'rejecting the forced choice between positivism (including post-positivism) and constructivism with regard to methods, logic, and epistemology' and the pragmatist orientation is toward using both qualitative and quantitative methods. In this case study the use of two measures of critical thinking and semi structured interviews were appropriate and justified to investigate the mixed research questions. In relation to *logic,* 'pragmatists accept that they will have a choice of inductive and deductive logic in the course of conducting research on a question that needs to be answered' (Tashakkori & Teddlie, 1998, p. 25). The use of deductive logic was consistent with the explanatory nature of the quantitative research questions and the use of inductive logic was consistent with the exploratory nature of the qualitative research questions to investigate critical thinking.

In relation to *axiology,* values play a large role in conducting and interpreting results and researchers are guided by their own personal value system. The issue of being, value free from a positivist perspective, and value laden from and interpretative perspective, is offset by pragmatism which prioritises the research questions over paradigm concerns and acknowledges that, *'truth'* is, *'what works'.* With regard to causal linkages among variables there may be causal relationships, 'but we will never be able to pin them down' (Tashakkori & Teddlie, 1998, p. 28). Cherryholmes (1992, p. 15) states that, '...we should give up the idea that we will ever be able to pin down 'underlying causal entities'. While it is acknowledged that there may be variables with a causal effect on critical thinking this study did not aim to *'pin these down'.* Pragmatism was used instead to inform the investigation of critical thinking and in doing so consider the consequences of the investigation as opposed to an investigation of causality.

The tenets and axioms of pragmatism explained above underpinned the use of mixed methods in this case study. According to Tashakkori and Teddlie (1998, p. 13), 'pragmatism allows for the use of mixed methods in social and behavioural research' and they define mixed methods studies as, 'those that combine the qualitative and quantitative approaches into the research methodology of a single study or multi-phased study' (p.17). Pragmatism as a paradigm permitted me to approach this investigation of critical thinking from different ontological perspectives in the context of the compatibility thesis of pragmatism. The use of mixed methods also provided a strategy for the investigation of the range of mixed research questions. The ontological perspectives which underpinned the quantitative and qualitative research questions are explained in the next section.

3.5.2 Ontological perspective and pragmatism

The tenets and axioms of pragmatism explained in the previous section provided the philosophical underpinnings of mixed methods and influenced this case study. From an *epistemological perspective* it was identified that both subjective and objective points of view are relevant and pragmatists reject the forced choice between logical positivism and constructivism and accept they will have a choice of deductive and inductive logic at their disposal (Tashakkori & Teddlie, 1998) and (Teddlie & Tashakkori, 2003, p. 21). In relation to *ontology* and acceptance of reality from the pragmatist point of view, reality (ontology) consists of two parts: one, there is a reality external to our minds and two, pragmatists deny that *'truth'* can be determined once and for all and for pragmatists, *'truth is what works'* (Howe, 1988). The ontological perspective or reality from the pragmatist point of view allows for research problems to be investigated from different perspectives and in this case study the quantitative and qualitative questions were underpinned by logical positivism and constructivism. Both of these approaches provided different ontological perspectives about critical thinking. Each of the two paradigms has opposing beliefs about ontology, epistemology and methodology and the establishment of *'truth'* is also different. The ontology, epistemology and methodology related to each of these approaches of positivism and constructivism influenced the nature of this investigation of critical thinking.

The quantitative questions were underpinned by logical positivism while the qualitative questions were underpinned by constructivism. These two paradigms convey beliefs

about ontology, epistemology and methodology and the explanations given here are based on the accounts of Guba and Lincoln (1989, pp. 85-90). In relation to *ontology* logical positivism asserts an objective reality exists independent of the inquirer, *a realist ontology*. From an *epistemological perspective* the investigator and phenomenon investigated are independent, the investigation is value free and the investigator maintains an objective position in the investigation. From the point of view of *methodology* according to Guba and Lincoln (1989, p. 89) it is interventionist, with interest in causal mechanisms and 'the key process is *explaining,* making clear the cause or the reason for something'. Control and statistical methods are relevant. The implication of logical positivism, in this case study, is that ontologically critical thinking is considered a reality independent of and external to the minds of the nursing students. Epistemologically it is objective and value free, methodologically it can be understood by intervention through the use of measurement and explained using statistical methods.

The qualitative questions which explored critical thinking were approached using constructivism as an ontological perspective. Beliefs about constructivism from an ontological, epistemological and methodological nature are different to logical positivism. In relation to *ontology* there are multiple, socially constructed realities ungoverned by natural laws, causal or otherwise, *a relativst ontology*. Phenomena are defined depending on the kind and amount of prior knowledge and the level of sophistication that the constructor brings to the task. In relation to *epistemology* Guba and Lincoln (1989, p. 88) state that, 'it is impossible to separate the inquirer from the inquired into'. The inquiry is value laden with human values of the inquirer and the respondent as well as context are relevant. In relation to *methodology* the inquiry must be carried out in a way that will expose the constructions of the variety of concerned parties. According to Guba and Lincoln (1989, p. 89) the ultimate of the inquiry is 'better understanding'. From the constructivist ontological perspective the reality of critical thinking is what is constructed in the minds of the nursing students and their lecturers. Epistemologically, values play a part in the investigation and the methodological concern is with capturing the constructions in the minds of the informants to gain an understanding of critical thinking from their perspective, or what Creswell (2013, p. 96) identifies as, an *emic,* as opposed to the views of the researcher or, *etic* perspective.

The ontological perspectives of positivism and constructivism convey different realities of critical thinking investigated in this case study. Accepting the philosophy of pragmatism or as Tashakkori and Teddlie (1998, p. 5) state, 'paradigm relativism' of mixed methods, permitted the two paradigms of positivism and constructivism to be used in a compatible way to investigate critical thinking. The philosophical underpinnings of pragmatism as well as the ontological and epistemological perspectives of logical positivism and constructivism were inherent in the mixed methods used in this case study. In the next section, the case study approach which incorporated a mixed methods strategy to address the mixed research questions is explained.

3.6 Case study approach

This section explains the rationale for a case study approach in this investigation of critical thinking. The components of a case study which include units of analysis, the main case as well as context and boundaries of the case study are also described.

3.6.1 Rationale for a case study approach

In this section, case study as well as the definition and rationale for a case study in this investigation of critical thinking is explained. According to Loxley (2010) when the *case* and the *inquiry* are put together it constitutes a *'case study'.* First it is important to define a case study and then explain the rationale for a case study approach to investigate critical thinking. Yin (2014, p. 16) identifies a case study in terms of its scope as, 'an empirical inquiry that investigates a contemporary phenomenon *(the 'case')* in depth and within its real world context, especially when the boundaries between phenomenon and context are not clear'. This definition by Yin (2014, p. 17) also incorporates features identified by Abbercrombie, Hills, and Turner (2006) such as, 'many more variables of interest than data points', 'multiple sources of evidence with data needing to converge in a triangulating fashion' and, 'benefits from prior development of theoretical propositions to guide data collection and analysis'. Yin's (2014) definition provided a rationale for the use of a case study approach in this investigation of critical thinking. In terms of scope, this study was an empirical investigation of critical thinking as a contemporary phenomenon in the context of an undergraduate nursing curriculum. In terms of its features it investigated quantitative variables of interest such as dispositions and skills of critical thinking with qualitative

data to compliment the quantitative data. The use of data triangulation assisted the integration of the data to expand the study and provide further insights about critical thinking. A conceptualisation of the phenomenon of interest is necessary to clarify the case. According to Loxley (2010) it is important to have at the very least a conceptual framework which will help with demarcation. The Delphi conceptualisation of critical thinking (Facione, 1990) provided a theoretical construct of critical thinking and this assisted to identify critical thinking as the main case. It also provided the theoretical framework for this study and this is discussed in detail in Chapter 4.

A case study approach was also appropriate to the nature of the quantitative and qualitative research questions about critical thinking. According to Yin (2003, p. 15), 'case studies can be based on a mix of quantitative and qualitative evidence'. Woodside (2010, p. 11) also states that the value of a case study may be enhanced considerably by both quantitative and qualitative methods in the same study. The research questions in this study were stated as, *'what'* questions, and according to Yin (2014, p. 10) *'what'* questions may be addressed using research designs which include an *exploratory case study design*. While the use of an exploratory case study approach is justified in this study the type of case study is also important and this is explained next.

Four types of case study are identified by Yin (2014, p. 50); *a single-case (holistic) design, a single-case (embedded) design, multiple-case (holistic) design, and multiple-case (embedded) design.* This exploratory case study used a single case embedded design as shown is shown in Figure 3.1. According to Yin (2009) in a case study boundaries between case and context may not be very sharp. *This case study was embedded in design in that the nursing students and lecturers as units of analysis were embedded in the main case. The broken lines used in Figure 3.1 indicate that context, case and embedded units are very much related and interdependent.* This provided a focus for data collection and each embedded unit also provided different sources of information about critical thinking. The research questions provided the link between critical thinking as the main case and two cohorts of nursing students and the lecturers as embedded units of analysis. The embedded units of analysis are described next.

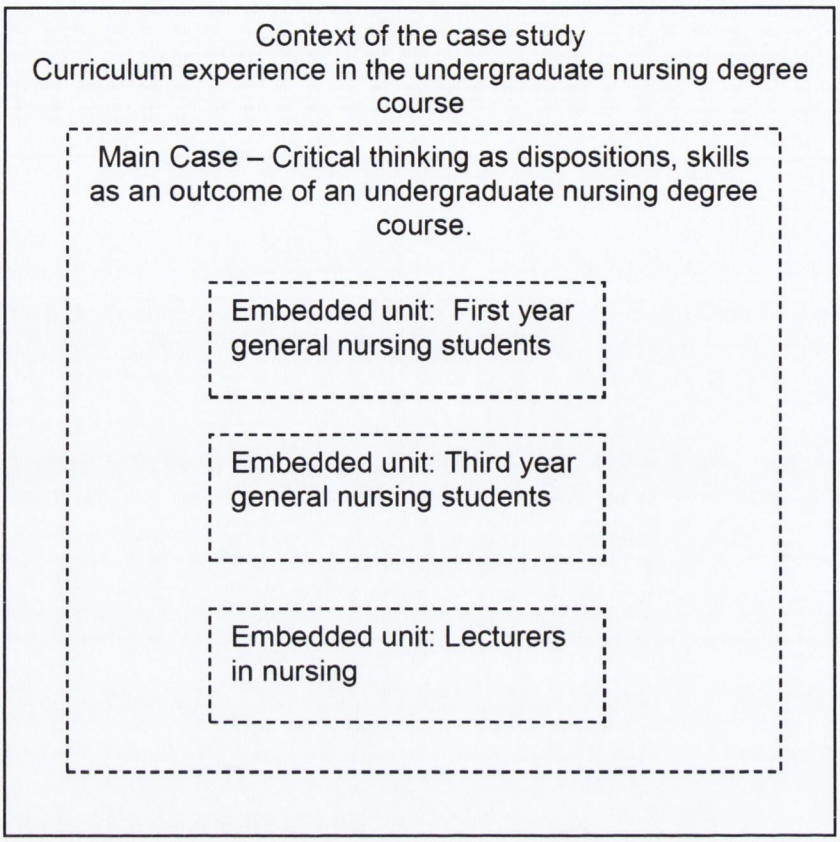


Figure 3.1 A single embedded case study with critical thinking as the main case

3.6.2 Embedded units of analysis

According to Yin (2009, p. 30), 'selection of the appropriate units of analysis will occur when you accurately specify your primary research questions'. A total of nine research questions were the focus of this investigation of critical thinking and these were stated earlier in Section 3.4 in this chapter. The research questions were stated as *'what'* questions and as explained above were appropriate for exploration using a single embedded case study approach. The research questions assisted to delineate the dimensions of critical thinking as the main case and also linked the three embedded units of analysis to critical thinking as the main case.

The three embedded units of analysis were a cohort of first year nursing students, a cohort of third year nursing students and lecturers who taught on the undergraduate nursing degree course. Each embedded unit included participants from two university sites and provided a different perspective about critical thinking. Embedded *'units'* as opposed to embedded *'cases'* was appropriate and this was to avoid any consideration that there could be different contextual issues if embedded cases as

opposed to embedded units were used. The three embedded units were embedded in a single case and aimed to provide for a more *holistic investigation* of critical thinking as a single case within a single context. The mixed research questions guided the data collection from the embedded units of analysis and required a mixed methods approach. According to Yin (2009, p. 63) '...embedded case study designs, in fact points to the fact that certain kinds of case studies already represent a form of mixed methods research'. To implement mixed methods in this case study the mixed methods strategy used was *concurrent triangulation* in which both the quantitative and qualitative data were collected concurrently. The mixed methods approach was also underpinned by the principles of mixed methods design. The mixed methods strategy and the principles of mixed methods are explained later in this chapter. The research questions and the embedded units of analysis focused critical thinking as the main case which is described next.

3.6.3 Critical thinking as the main case

It is necessary to identify the main case in a case study and according to Yin (2014, p. 31), a 'case' may be an 'individual' or 'some event or entity other than an individual'. A case is not limited to an individual or event. According to Stake (1995, p. 8) and in a later publication (Stake, 2000, p. 23), he uses a term identified by Smith (1974) and states that it can be, *'whatever bounded system is of interest'.* Critical thinking as dispositions and skills in undergraduate nursing students was the main case in this investigation. It was important to clarify the case so that data collection would focus on the case as opposed to a focus on the context extraneous to the case, but nonetheless with an influence on the case, in other words acknowledging the interdependence of case and context. While defining critical thinking as the main case it also constituted the main variable of interest in this study.

3.6.4 Critical thinking as a dependent variable in the study

Critical thinking was defined as dispositions and skills derived from the Delphi conceptualization of critical thinking (Facione, 1990). Dispositions and skills were the main constructs or variables measured in relation to critical thinking in this study. According to Sarantakos (2005) it is important to identify the variables in any investigation and variables may be; *independent, dependent or extraneous.* Critical thinking as dispositions and skills was the *dependent or outcome variable* (Figure 3.2).

Critical thinking dispositions and skills as a requirement of the undergraduate nursing degree course were perceived to be influenced by *extraneous or intervening variables* such as, exposure to the nursing curriculum, clinical experience and the duration of time on the course. *Control variables* intrinsic to the student such as, age, gender, maturity, life experiences, cognitive development, personality, and motivation as well as completion of a thinking skills course were considered to impact critical thinking. The *extraneous and control variables* were also perceived to impact critical thinking as the main case. The focus in this study was on critical thinking as the main case and the dependent or outcome variable as influenced by the background of the undergraduate nursing curriculum as the context of the case.

3.6.5 Context of the case study

Context is an important component in a case study approach and according to Creswell (2013, p. 294), 'the researcher sets the case within its setting'. The undergraduate nursing curriculum at two similar university sites was the context of the case, the case being critical thinking. The rationale for two sites was to enable sufficient data to be collected to ensure a high response rate for the quantitative component of the study. Both Schools of Nursing and Midwifery had critical thinking as a requirement of the undergraduate nursing curriculum. Within the context both lecturers and nursing students engaged with the curriculum to achieve critical thinking. Both, the case, the context as well as the nursing students and lecturers as embedded units of analysis were interdependent. According to Loxley (2010) the case is inescapably bound to context in which participants find themselves and he goes on to state that any attempt to separate the '*object of the study*' from '*those within it*' presupposes no interconnection between the two. While the case and context can be seen to be linked it is also important to determine the boundaries of the case study.

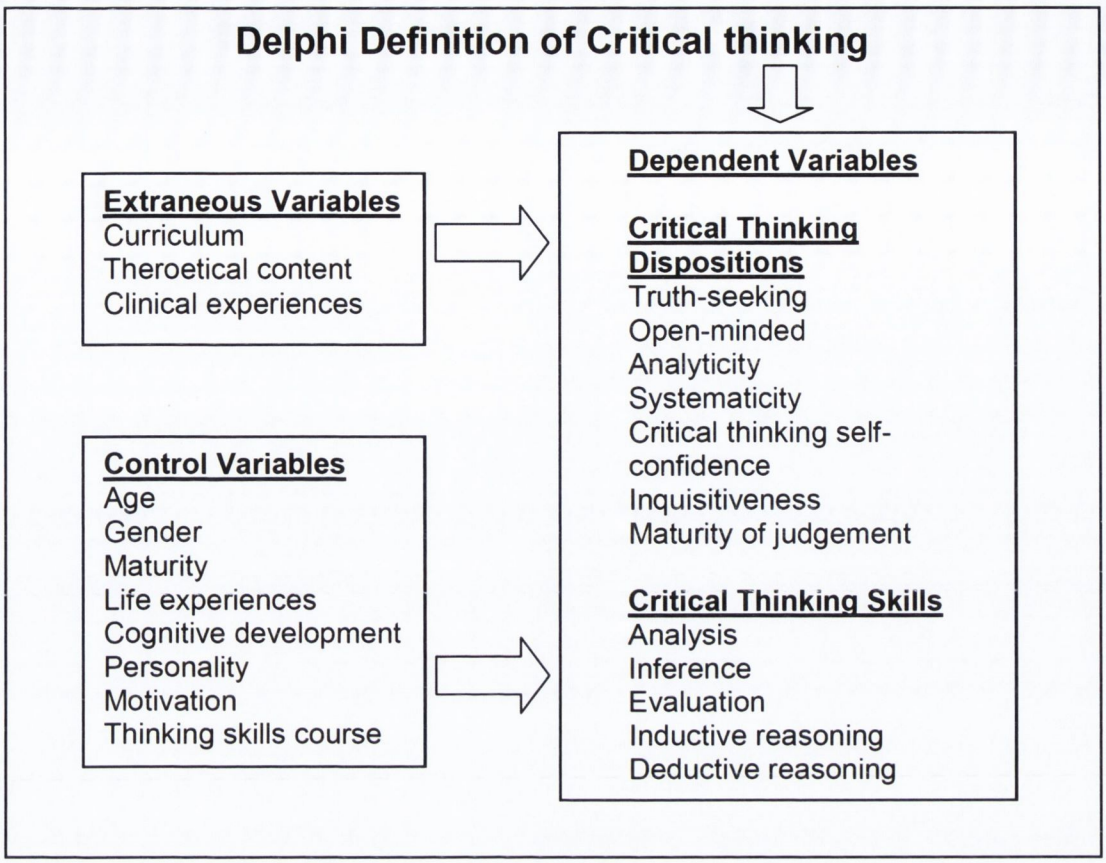


Figure 3.2 Critical thinking dispositions and skills as outcome variables of the study

3.6.6 Boundaries of the case study

Another component of a case study are the boundaries to define the beginning and end of the case (Creswell, 2013; Loxley, 2010; Yin, 2014). The boundaries or parameters identify the scope of a case study. Loxley (2010) identifies three forms of boundary as, physical (geographical positioning of schools, classrooms), social to do with social relations and temporal (past or present oriented) and he also points out that it is essential at the planning stage of a study to define the boundaries. A boundary of this case study was the focus of the study at undergraduate level. The study was also bounded physically and geographically by two university sites. The mixed research questions also provided a boundary in that they focused data collection from the embedded units of analysis. According to Yin (2014, p. 31) the more specific the research questions the more a case study will stay within feasible limits. The Delphi conceptualisation of the ideal critical thinker identified by Facione (1990) provided the theoretical definition of critical thinking. The case study was also bounded by three embedded units of analysis which consisted of first and third year cohorts of

undergraduate nursing students and their lecturers. Another boundary was the course at undergraduate nursing degree level. The case study was also bounded by temporal issues such as the duration of time for data collection over a period of twenty six months from October 2009 to December 2011. A final temporal issue was the time to complete this PhD study on a part-time basis. As this case study had a quantitative and qualitative component mixed methods was inherent in the case study approach and the rationale for mixed methods is explained next.

3.6.7 Rationale for mixed methods in a case study approach

A single embedded case study approach was appropriate to the investigation of critical thinking in this study and the components were described above. It was also identified that mixed methods is appropriate in a case study approach and Yin (2014, p. 66) states that, 'embedded case study designs points to the fact that certain kinds of case studies already represent a form of mixed methods research'. This view by Yin acknowledges the rationale for mixed methods in this case study. The nature of the mixed research questions also determined mixed methods. According to Creswell and Plano Clark (2007, p. 9), 'mixed methods research provides strengths that offset the weaknesses of both quantitative and qualitative research'. A mixed methods approach also allowed for the triangulation of data during the integration phase of this case study and this had the potential of generating what Yin (2014) describes as *'rival explanations'* for interpretation of the findings. Another reason for using mixed methods was that the majority of existing published studies on critical thinking are predominantly quantitative in nature. The incorporation of mixed methods into the embedded case study approach required that the principles and strategies of mixed methods be adhered to and these are explained in the following sections.

3.6.8 Principles of mixed method design

According to Morse (2003, p. 193) four principles underpin a mixed methods design and they are: *recognise the theoretical drive of the project, recognise the role of the imported component in the project, adhere to the methodological assumptions of the base method, and work with as few data sets as possible.* These four principles were applied in this case study. In relation to the first principle; *recognition of the theoretical drive,* the base method was deductive with a dominant quantitative component to confirm the dispositions and skills of critical thinking in undergraduate nursing students.

The qualitative component was less-dominant and served to supplement the quantitative component and had an inductive theoretical drive. The second principle relates to recognition of the *role of the imported component* in a project. The base method was quantitative dominant and the qualitative component was imported to supplement the quantitative component. According to Morse (2003, p. 192) the interdependence of the different data collection methods in a study means supplementary data provide, 'only a glimpse of another perspective' and are confirmed and verified in the base project and not independently form the main study then triangulation is an appropriate term. This statement by Morse (2003) applied to this case study in that the quantitative component as the base method allowed the qualitative component provide a glimpse or perspective of critical thinking from the perspective of the students and lecturers to supplement the quantitative data. The use of data triangulation during the integration phase allowed the qualitative data to compliment the quantitative data.

The third principle requires *adherence to the methodological assumptions* of the base method and in this case study the methodological assumptions of the dominant quantitative component as the base method were adhered to. The methodological assumptions of the less-dominant qualitative component were also adhered to as the imported component in the study. In relation to the application of the fourth principle, work with as few data sets as possible Morse (2003, p. 195) suggests that supplemental data be incorporated into the core project. I used data triangulation in which quantitative and qualitative data sets addressed the research questions to achieve complimentarity. A total of seven sets of data addressed the research questions. Four data sets were used to address the quantitative or base component and three data sets were used to address the qualitative component of the study. While these principles were applied in this case study approach the criteria for a mixed methods strategy were also applied and these are described in the next section.

3.6.9 Criteria for a mixed methods strategy

In this section the criteria recommended by Creswell (2003) for a mixed methods strategy and their application in this case study is explained. According to Creswell (2003) there are *four criteria* to consider when choosing a mixed methods strategy: *implementation sequence for data collection, priority, stage of integration of data and*

findings, and a theoretical perspective. The first criterion of *implementation sequence* is influenced by the '...intent of the researcher' (Creswell, 2003, p. 212). Implementation may be concurrent or sequential. Concurrent means both qualitative and quantitative data are collected at the same time and the implementation is simultaneous. Implementation may be sequential in which data are collected in phases and either quantitative or qualitative data can be collected first. The implementation sequence used in this case study was concurrent. In relation to the second criterion of *priority,* the priority for the collection of quantitative data in this study was influenced by the aims of the study. The confirmatory nature of the dominant quantitative research questions and less-dominant qualitative research questions prioritised the dominant quantitative component over the less-dominant component. If quantitative takes priority over qualitative then a *'dominant less-dominant'* approach would apply (Creswell, Plano Clark, Gutmann, & Hanson, 2003, 219). Priority for data collection may also be influenced by the following identified by Creswell et al. (2003, p. 219), 'practical constraints, the need to understand one form of data before proceeding to the next, audience preference, and comfort level of the researcher with one approach over the other'. The structure of the nursing programme, as a practical constraint, was influential in prioritising data collection but to a lesser extent. It was more feasible to collect the quantitative data when the students attended the academic component of the course. Qualitative data was collected when this could be arranged with each participant outside of teaching, assessment and clinical practice time.

The third criterion of *integration* applied at the data interpretation phase of the study with the merging of the quantitative and qualitative data sets. Quantitative data were interpreted for evidence to confirm critical thinking in the undergraduate nursing students. Qualitative findings were interpreted for evidence of emergent themes related to students and lecturers views of critical thinking in the undergraduate nursing curriculum. Data triangulation was used to determine convergence in relation to critical thinking as evidenced in the overall skills, dispositions and perceptions of the participants. Divergence was also acknowledged as the potential outcome of data triangulation. The processes of data triangulation and integration are explained later in this chapter. The fourth criterion related to *theoretical perspective*. Two theoretical perspectives were relevant in this study, logical positivism, which underpinned the quantitative component and constructivism which underpinned the qualitative component of the study. The philosophy of pragmatism with its tenets and axioms

described earlier in this chapter provided for the inclusion of logical positivism and constructivism and *'truth'* value was accepted as *'what works'*. From the pragmatist perspective this meant acknowledging an external reality and the belief that *'truth'* may never be fully known and uncertainty as to, 'whether one explanation of reality is better than another' (Tashakkori & Teddlie, 1998, p. 28).

3.6.10 Concurrent triangulation mixed methods strategy

The implementation sequence in this case study was a concurrent triangulation strategy. A concurrent triangulation strategy is when a researcher uses two different methods in an attempt to confirm, cross-validate, or corroborate findings within a single study (Green, Caracelli, & Graham, 1989; Steckler, McLeroy, Goodman, Bird, & McCormack, 1992). Concurrent triangulation according to Creswell (2003, p. 217) 'generally uses separate quantitative and qualitative methods as a means to off-set the weaknesses inherent within one method with the strengths of the other method'. The quantitative component provided data to confirm critical thinking dispositions and skills while the qualitative data provided additional insights. The corroboration of both sets of data expanded this case study beyond what could be achieved using a mono-method approach.

A concurrent triangulation strategy also has implications for the timing of data collection. According to Creswell (2003) the ideal is that both methods be given equal priority in the study but in practical application priority may be given to either the quantitative or the qualitative method. In this case study priority was given to the quantitative component over the qualitative component. The reason for this was that, the quantitative component of the study was used to confirm critical thinking dispositions and skills in undergraduate nursing students, and also to confirm critical thinking dispositions and skills as an outcome of the undergraduate nursing curriculum. The qualitative component sought to achieve complimentarity by exploring the views of nursing students and their lecturers about critical thinking and this was to add a further dimension to the understanding of critical thinking. Another important aspect of a concurrent triangulation strategy is the integration of the findings, at the interpretation phase of the study, to bring convergence to strengthen knowledge claims or to explain lack of convergence or divergence (Creswell, 2003). At the integration phase of this

study data triangulation permitted inferences from the integration of the data and as such expand the knowledge claims of critical thinking in this case study.

3.6.11 Mixed methods notation

In using mixed methods it is important to use appropriate notation and Morse (2003, p. 197) identified such notation. The dominant quantitative component is identified as 'QUAN' and the less dominant qualitative component is identified as 'qual' with a plus sign '+' denoting concurrent data collection (Morse, 1991). Both types of data are brought together at the integration phase of the study using data triangulation (Figure 3.3).

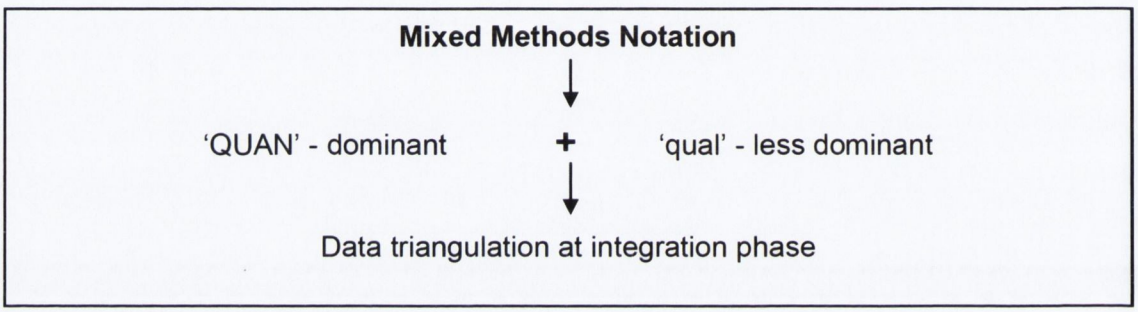


Figure 3.3 Mixed methods notation

A case study approach provided an appropriate design for the investigation of critical thinking in this study and it also had scope to address the quantitative and qualitative research questions in context of the components of a case study, guided by the principles and strategies for mixed methods. Three embedded units of analysis brought focus to critical thinking as the main case and were central in relation to data collection. As the quantitative component of the study was dominant and underpinned by positivism, objective measurement of critical thinking using established measures was essential and the critical thinking tests used are described next.

3.7 Measurement of critical thinking in this study

One of the aims of this case study was to confirm critical thinking as dispositions and skills in undergraduate nursing students and to achieve this aim *two tests* were used to measure critical thinking. Both tests are derived from the Delphi conceptualisation of critical thinking (Facione, 1990). The tests are the California Critical Thinking Disposition Inventory (CCTDI) and the Health Sciences Reasoning Test (HSRT)

(Facione & Facione, 2012, 2014). It was also important to ensure that the data collected was both *reliable* and *valid*. According to Sarantakos (2005, p. 88) *reliability* is equivalent to '*consistency*' and is the capacity of measurement to produce consistent results, thus, a method is reliable if it produces the same results whenever it is repeated and is not sensitive to the researcher, the research conditions or the respondents. It was also important to ensure *validity* of the data collected and this feature of measurement according to Sarantakos (2005, p. 82), 'tells the researcher whether an instrument measures what it is supposed to measure, and whether this measurement is accurate and precise'. The descriptions and psychometric properties of the critical thinking tests used are explained in the following sections and the properties described are derived from the test manuals (Facione & Facione, 2012, 2014). To protect the integrity of the critical thinking tests and due to copyright sample items used to test critical thinking dispositions and skills are included, with permission of the test developers, in Appendices 5 and 6. The psychometric properties of the California Critical Thinking Disposition Inventory (CCTDI) are described first, followed by a description of the Health Sciences Reasoning Test (HSRT).

3.7.1 The California Critical Thinking Disposition Inventory

The California Critical Thinking Disposition Inventory (CCTDI), developed in 1992 by Doctors Peter and Noreen Facione, is the premier critical thinking disposition instrument in the world today and is grounded in the Delphi Expert Consensus Definition of critical thinking (Facione & Facione, 2014; Facione et al., 1994; Facione, 1990). The CCTDI consists of the following seven sub-scales, *truth-seeking, open-mindedness, analyticity, systematicity, critical thinking self-confidence, inquisitiveness, and cognitive maturity*. Each sub-scale is a measurement of a critical thinking, *'habit of mind'* and is specifically designed to measure the dispositional dimension of critical thinking. The CCTDI assesses the affective, attitudinal dimension of critical thinking, one's opinions, beliefs, and attitudes in relation to critical thinking. The CCTDI is phrased in standard English and no college level content knowledge is presumed; it consists of 75 Likert style items which measure the seven sub-scales identified above and it takes twenty minutes to complete (Facione & Facione, 2014). Sample items for the measurement of thinking attributes and used in the CCTDI are shown in Appendix 5.

3.7.2 Reliability of the California Critical Thinking Disposition Inventory

Internal consistency reliability for the seven individual scales in the initial CCTDI pilot sample ranged from .71 to .80. Alpha reliability for the overall instrument measuring the overall disposition towards critical thinking was .91. These strong values have been observed consistently in samples collected over the past fifteen years (ranging from .60 to .78 on the scales and .90 overall) thus empirically supporting the internal reliability of the instrument and each scale (Facione & Facione, 2010, 2014).

3.7.3 Content validity of the California Critical Thinking Disposition Inventory

Content validity according to Sarantakos (2005, p. 84) is when a measure covers all dimensions of the research topic. Facione, Facione, and Winterhalter (2014, p. 54) report the validity of the CCTDI using content validity based on two criteria. One criterion for content validity refers to the ability of an assessment to capture a measure of the intended domain. The CCTDI is grounded in the Delphi definition of the ideal critical thinker and was developed to capture the attributes embodied in the description of the dispositional aspects of critical thinking identified by Facione (1990) in the American Philosophical Association (APA) Delphi study. The second criterion of content validity is assuring that 'sensible' methods of instrument construction are employed (Nunnally, 1978). The CCTDI prompts express familiar opinions, beliefs, values, expectations and perceptions, and use no technical vocabulary of critical thinking jargon. The CCTDI prompts were screened by college level critical thinking educators and researchers skilled in survey research and instrument development to identify those items least subject to ambiguity and misinterpretation (Facione & Facione, 2014, p. 54). Based on the above criteria content validity of the CCTDI was determined.

3.7.4 Construct validity of the California Critical Thinking Disposition Inventory

Construct validity of the CCTDI is also reported for the CCTDI (Facione & Facione, 2010). Construct validity according to Sarantakos (2005, p. 85) is when a measure measures the constructs it is supposed to measure. There are several studies which have investigated the relationship between the CCTDI and other cognitive and psychological constructs. Initial psychological research suggests that significant relationships exist between the disposition toward critical thinking and the constructs

'openness to experience' and *'ego resiliency'*. Four of the seven CCTDI scales (truth-seeking, open-mindedness, critical thinking self-confidence and inquisitiveness) were found to be significantly correlated with openness to experience while all seven CCTDI sub-scales were significantly correlated with ego resiliency (Facione & Facione, 2014). Positive correlations of the CCTDI are reported within Latino high school students (N=365) and measures of biculturalism, modernity, mathematical, verbal and written achievement and math (Sanchez, 1996). Based on the above criteria construct validity of the CCTDI has been established.

3.7.5 Criterion validity of the California Critical Thinking Disposition Inventory

Criterion validity is the most important consideration in the validity of a test (Facione & Facione, 2014, p. 54). According to Nunnally and Bernstein (1994) criterion validity refers to the ability of a test to predict some criterion behaviour external to the instrument itself. In the case of the CCTDI one might want to know that it could predict some meaningful measure demonstrating the achievement of designated learning outcomes, or the successful preparation and licensure of key professionals in society (Facione & Facione, 2014, 54). Scores on the CCTDI have provided predictive validity in peer-reviewed independent published research. The established criterion validity identified by Facione and Facione (2014, p. 54) further confirms the use of the CCTDI as a robust tool for use in this study. The interpretation of findings gained from the CCTDI is dependent on the use of established categories and score ranges explained next.

3.8 Categories and range of scores for the California Critical Thinking Disposition Inventory

Responses to the 75 item CCTDI are scored using a forced-choice Likert scale that requires the respondent to either, *'agree'* or *'disagree'* with each item and there is no middle choice (Facione & Facione, 2014). Items are scored on a scale of one to six where a high score of six indicates *'strongly agree'* and a score of one indicates *'strongly disagree'* with a test item (Facione & Facione 1992). The CCTDI offers eight scores, seven sub-scale scores and an overall or total disposition score. The recommended *positive* cut-off score for each sub-scale is 40 and the suggested target score is 50. Persons who score above 50 on a scale, a *high positive* score, are *strong* in that dispositional aspect. A scale score from 30 to 40 indicates *ambivalence* toward

that disposition and could be considered weak at best, since scoring below 40 requires responding negatively to at least some scale items. Persons who score below 30 on a given scale are negatively disposed in that critical thinking dispositional aspect. Scoring below 30 indicates that, on average, the person responds in opposition to the critical thinking disposition measured by a given scale (Facione & Facione, 2014). Scale scores ranging from 10 to 29 indicate a *low or negative* disposition, scores ranging from 30 to 40 indicate *ambivalence* revealing inconsistent endorsement of the attribute measured, scores from 40 to 50 indicate an increasingly *positive* disposition and scores of 50 to 60 indicate a *highly positive* attitude or disposition toward the attribute measured Facione and Facione (2014, p. 29). Table 3.1 shows the categories and range of scores for each of disposition sub-scales.

Negative	Ambivalent	Positive	Strong Positive
10 - 29	30 - 40	40 - 50	50 - 60

Table 3.1 Categories and range of scores for the sub-scales of the CCTDI

According to Facione and Facione (2014) just as a score of less than 40 on a disposition sub-scale shows weakness, an overall or total CCTDI score of less than 280 could be used as a cut-off indicator of overall deficiency in the disposition toward critical thinking. When all seven scores are 40 and higher a test taker will have demonstrated significant and generalized strength in critical thinking disposition (Facione & Facione, 2014). Facione and Facione (2014, p. 28) state that the overall or total disposition score is a composite score of the seven sub-scale scores and while it is a valuable measure much more can be gained from the interpretation of the individual sub-scale scores. Both overall and sub-scale disposition scores are reported in the results chapters, Chapters 5 and 7, Results are discussed in the discussion chapters, Chapters 10, 11 and 12. While the CCTDI provides a measure of critical thinking disposition tests are also available to measure critical thinking skills. Tests to measure critical thinking skills which are also grounded in the Delphi conceptualisation of critical thinking include the California Critical Thinking Skills Test and the Health Sciences Reasoning Test (HSRT). The similarities of these tests and the rationale for the choice of the HSRT to measure critical thinking skills in this study and its psychometric properties are explained next.

3.9 The Health Sciences Reasoning Test

The first test derived from the Delphi consensus statement to measure critical thinking skills was the California Critical Thinking Skills Test (CCTST. According to Facione et al. (2014, pp. 9-10) this test has evolved over forty years and continues to evolve with professional specific versions available for Business, Military Science, Legal Studies and the Health Sciences . The California Critical Thinking Skills Test (CCTST) provides an overall score of one's critical thinking skills and for five sub-scales of, *analysis, inference, evaluation, deductive reasoning and inductive reasoning* (Facione & Facione, 2008, p. 12). The Health Sciences Reasoning Test (HSRT) is a comparable test to the California Critical Thinking Skills Test as it also provides and overall measure of one's critical thinking skill and similar sub-scales to the CCTST. The HSRT is especially designed to appeal more directly to those in the health sciences or who aspire to be health sciences professionals (Facione & Facione, 2012) and (Facione et al., 2014). The HSRT uses items that have the context of the professional workplace targeted by the instrument and the development involved consultation with professionals in health care. For the above reasons and based on its comparability with the CCTST it was used to measure the critical thinking skills of the undergraduate nursing students in this study. The Health Sciences Reasoning Test grounded in the Delphi conceptualisation of critical thinking is a *33-item, multiple choice test* which takes fifty minutes to complete (Facione & Facione, 2012; Facione et al., 2014; Facione, 1990). The HSRT measures overall or total critical thinking skills and five sub-scales, similar to the CCTST as described above, which include; *analysis, inference, evaluation, inductive reasoning* and *deductive reasoning.* It is important to point out that while this study used the HSRT existing studies, discussed in the literature review in Chapter 2 and further discussed in the discussion chapters, used the CCTST. Both tests are derived from the Delphi consensus statement and measure the same disposition subscales. Categories and category score ranges are similar which provided consistency for the comparison of results between this study and existing international studies. The description and the psychometric properties reported here are based on the Health Sciences Reasoning Test (HSRT) test manual and described by Facione and Facione (2012) and (Facione et al., 2014). Sample items for the testing of critical thinking skills are shown in Appendix 6.

3.9.1 Reliability of the Health Sciences Reasoning Test

According to Facione (2012) the CCTST and HSRT constitute rich and robust tools for evaluating critical thinking skills in a variety of test-taker populations. On-going validation studies for reliability using the Kuder Richardson-20 has produced internal reliability consistency estimates ranging from .68 to .80. For an instrument with multidimensional scales, a KR-20 above .70 indicates a high level of internal consistency and Facione and Facione (2012, p. 40) report internal reliability consistency scores for the CCTST in the range of .78 to .82. These coefficients demonstrate more than sufficient evidence to inspire confidence in the internal consistency of these instruments to measure the overall construct of critical thinking. Facione and Facione (2012) also state that while the subscales have fewer items than the test as a whole their internal consistency reliability remains strong with KR-20's consistently ranging from .52 to .77. The internal consistency reliability reported by Facione and Facione (2012) provided sufficiently strong evidence for the use of the HSRT in this study.

3.9.2 Content validity of the Health Science Reasoning Test

Content validity refers to the ability of a test to capture a measure of the intended domain (Facione & Facione, 2012). The need to identify the domain and agree on it is of primary importance (Cronbach, 1990). Also important is assuring 'sensible' methods of test construction are employed (Nunnally, 1978). In the case of the first criterion the specific domain is critical thinking defined by the Delphi group of experts and incorporating embedded cognitive activities of analysis, inference, evaluation and reasoning processes (Facione, 1990). The HSRT is a holistic measure of the construct of critical thinking with embedded scales that can be used to examine the embedded concepts as well.

Content validity of the HSRT is also supported by educators in the field of human reasoning, researchers and doctoral dissertation scholars studying human reasoning skills, as well as those human resource professionals who use the HSRT to select employees with strong decision skills (Facione & Facione, 2012). Validity of the HSRT requires the instrument be free from unintended distracters and administrators of the test are cautioned to use the appropriate test for educational level and reading. The HSRT was the appropriate test for the undergraduate nursing students in this study as

it was designed for administration to health science students at undergraduate and post-graduate level. Another aspect of the HSRT is that it does NOT test any content area of knowledge. All necessary information to answer an item is contained in the item and this makes the HSRT suitable to measure improvement in critical thinking that occurs in any educational programme or staff development exercise (Facione & Facione, 2012).

3.9.3 Construct validity of the Health Sciences Reasoning Test

Construct validity is when measures on a scale correlate with other measures which purport to measure the same construct. According to Facione and Facione (2012) forms of the CCTST have demonstrated strong correlations with other measures that purport to include a measure of critical thinking or higher-order reasoning as a component of their scales or ratings. High correlations with standardized tests of college level preparedness in higher-order reasoning have been demonstrated. A number of these relationships were reported in a large multi-site study involving fifty programmes of health science education assessing student's critical thinking (Venderly, 2007). Further evidence of construct validity for the HSRT is provided by the demonstration of improvement in students' HSRT test scores after a course in critical thinking or an educational programme training the critical thinking portion of clinical reasoning (Facione & Facione, 2012). Validation studies demonstrate no threats to validity due to prior experience with the test instrument (test effects). In talk aloud studies, when the same version of the test is used as a post-test two weeks after pre-test, test takers are observed to recall some of the item stems but must reason through the answer choices again to determine their response to each item (Facione & Facione, 2012). The above evidence provided by (Facione & Facione, 2012) supports the HSRT and is more than sufficient to validate the use of the HSRT in this study of critical thinking in undergraduate nursing students.

3.9.4 Criterion validity of the Health Sciences Reasoning Test

Criterion validity is the most important consideration in the validity of a test. According to Nunnally and Bernstein (1994) criterion validity refers to the ability of the test to predict some criterion behaviour external to the test itself. In the case of the HSRT one might want to know that it could predict some meaningful measure demonstrating the achievement of designated learning outcomes, or the successful preparation and

licensure of key professionals in society. The HSRT and CCTST measure identical Delphi constructs with the HSRT targeting health sciences. Scores on the CCTST have provided predictive validity in peer-reviewed independent published research (Facione & Facione, 2012). The established criterion validity identified by Facione and Facione (2012) further confirms the use of the CCTST and the HSRT as robust tools for use in this investigation of critical thinking skills in undergraduate nursing students. Interpretation of the results of the Health Sciences Reasoning Test is dependent on the application of the categories and score ranges and these are explained next.

3.10 Categories and scores for the Health Sciences Reasoning Test

The Health Sciences Reasoning Test is a 33 item test and to interpret the results it is necessary to know the *categories* and *range of scores* identified by Facione and Facione (2012) and Facione et al. (2014). For the total HSRT score, a cut off score of 14 or less indicates that critical thinking is, *'not manifested'*, a score of 15 - 20 is considered *'moderate'*, a score of 21 - 25 is considered *'strong'* and a score of 26 and higher is considered *'superior'* in overall critical thinking skill (Facione & Facione, 2012; Facione et al., 2014) The categories and score ranges are shown below in Table 3.2.

Recommended Categorical Interpretations	**Not Manifested**	**Moderate**	**Strong**	**Superior**
HSRT Total Score (33-point version)	0 - 14	15 - 20	21 - 25	26 or Higher

Table 3.2 Categories and range of scores for overall critical thinking skill measured by the HSRT

It is important to note that the HSRT is a 33 item test and some items measure more than one sub-scale, which are independent sub-scales and this can give rise to a number of items greater than 33. The specific items on each subscale is not available and the test developers state that for security reasons and to protect the integrity of the test, test item construction, instrument structure and scale structure are not released to testers (Facione et al., 2014). Personal communication to obtain the maximum possible scores for each sub-scale was also unsuccessful for the above reason and it was recommended to use the category score ranges supplied with the test for the interpretation of results (Smitt, 2015). *To interpret the sub-scale results it is important to make an interpretation based on the score range for each category described here*

and in Table 3.3 below. For the sub-scales of *analysis, inference and evaluation* a cut off score of 2 or less indicates that these critical thinking skills are *'not manifested'*, a score of 3 - 4 is considered *'moderate'* strength and a score of 5 and above is considered *'high or strong'* for the particular skill. For the skills of inductive and deductive reasoning a score of 4 or less is considered *'not manifested'*, a score of 5 -7 is considered *'moderate'* and a score of 8 or more is considered *'high or strong'* (Facione & Facione, 2012; Facione et al., 2014), (Table 3.3).

Recommended Categorical Interpretation HSRT Scale Scores	HSRT Scale Scores Categorical Scores (33 - Point Versions)		
	Not Manifested	**Moderate**	**Strong**
Analysis	0 - 2	3 - 4	5 or more
Inference	0 - 2	3 - 4	5 or more
Evaluation	0 - 2	3 - 4	5 or more
Induction	0 - 4	5 - 7	8 or more
Deduction	0 - 4	5 - 7	8 or more

3.3 Categories and range of scores for the critical thinking skill sub-scales measured by the HSRT

The psychometric properties of the California Critical Thinking Disposition Inventory (CCTDI) and the Health Sciences Reasoning Test (HSRT) described above confirm the suitability of these tests for use in this study. The HSRT was used as it specifically targets health science students. Both the CCTDI and the HSRT were tested in a pilot test and this is reported later in this chapter.

3.11 Research design and sampling methods in a case study approach

In this section a cross-sectional design, the study population, sampling methods and rationale for inclusion of the embedded units of analysis as sources of data are explained. Yin (2014, p. 103) acknowledges the use of quantitative and qualitative methods in case study research and he recommends that regular sampling procedures are followed. As both quantitative and qualitative data was collected the sampling methods were those used in quantitative and qualitative research. First it is important to discuss a cross-sectional design and it's justification in the context of a case study approach in this investigation of critical thinking. The study population which constituted

the embedded units of analysis and from whom data was collected and the methods for quantitative and qualitative data are subsequently discussed.

3.11.1 Cross-sectional design

A single embedded case study approach was used in this investigation of critical thinking and was describe earlier in this chapter. It was an embedded case study as the boundaries between critical thinking as the case and the embedded units of analysis, first and third year nursing students and lecturers, were interdependent and embedded in the context of the nursing curriculum. The mixed research questions were addressed using a mixed methods concurrent triangulation strategy. This study was also cross-sectional in that data about critical thinking skills and dispositions was collected from two different cohorts of first and third year nursing students, as embedded units of analysis, to provide knowledge of critical thinking at one point in time. A cross-sectional design comprises the collection of data on a series of variables at a single point in time (Bryman, 2012; Toon, 2000). Cross-sectional research is also appropriate for a case study and can incorporate quantitative and qualitative data. According to Bryman (2012, p. 68) case studies are frequently sites for the employment of both quantitative and qualitative research and he also states that cross-sectional research while used in quantitative research is 'a very popular mode of qualitative research' (p 62). Thus, a cross-sectional design was appropriate in the context of the case study approach in this study. While a cross-sectional design was used to address the mixed research question within a case study approach it is important to acknowledge that inferences from the findings are different compared had a longitudinal study been undertaken. The differences between a cross-sectional and a longitudinal study design as well as implications for the inferences from findings are discussed next including the justification for a cross-sectional study.

A longitudinal study differs from a cross-sectional study in relation to the time of data collection. According to Bryman (2012, p. 63) in a longitudinal study a sample is surveyed and is surveyed again on at least one occasion and this allows some insight into the time order of variables and therefore may be more able to allow causal inferences be made. A longitudinal approach in this study would have provided for the collection of data from the same cohort or cohorts about the same variables of dispositions and skills, and captured their perceptions, on at least two occasions. This

would have permitted findings about the development of critical thinking over time in the nursing students experiencing the undergraduate nursing curriculum, thus adding greater strength to inferences about the development of critical thinking. The determination of causal influence is another difference and according to Bryman (2012, p. 63) a longitudinal study is somewhat better able to deal with the problem of 'ambiguity about the direction of causal influence' that plagues cross-sectional designs and he also states that a cross-sectional approach impacts the findings in that causal direction of findings is not feasible, thus impacting internal validity (p.59). The nature of this investigation was to capture knowledge of the dispositions, skills and perceptions about critical thinking and as such it did not focus on the impact of variables on each other or the causal nature of critical thinking dispositions and skills. Another difference to consider is that longitudinal studies are costly and require considerable time (Bryman, 2012; Neuman, 2011). Implications of time and cost impacted this study and justified the nature of a cross-sectional design to data collection.

The justification for a cross-sectional approach in this study was determined by the following reasons. An initial attempt to conduct this study as a longitudinal study was unsuccessful at the first wave of data collection due to failure to recruit participants at entry to the course and this was also impacted by the voluntary nature of participation. This necessitated the need to recommence the study at a later stage with the next cohort at entry and the realisation of a similar situation justified a cross-sectional approach to data collection. A cross-sectional approach was more feasible and achieved the aims of this study to ascertain knowledge of the dispositions and skills of first and third year nursing students, as well as their perceptions, although acknowledging knowledge at one point in time and from two different cohorts of nursing student. The duration of time to collect the data, the need to obtain a high response rate for the quantitative component of the study and the voluntary nature of participation also determined a cross-sectional approach. The nature and differences of a longitudinal compared to a cross-sectional design identified above impact inferences about the findings of a study. A longitudinal study, as was identified above, provides for inferences of a developmental nature compared to a cross-sectional study at one point in time. The cross-sectional nature of data collection from first and third year nursing students, as embedded units of analysis, implied that findings revealed differences in dispositions and skills as well as perceptions of critical thinking. Inferences cannot be made about the developmental trajectory of the differences identified and for this

reason the discussion of findings, in Chapter 12, portray differences in critical thinking as opposed to knowledge of a developmental nature of critical thinking. A longitudinal study over time would address the development trajectory of critical thinking over time and provide stronger inferences about critical thinking in the context of the undergraduate nursing curriculum. In the next section the study population is explained.

3.11.2 The study population

A study population is defined by Kumar (2011, p. 400) as, 'the people who you want to find out about'. The total study population consisted of first and third year undergraduate general nursing students in the Republic of Ireland undertaking the undergraduate nursing degree course at the time of data collection in the academic year 2009. The total of first year general nursing students who entered the degree course in 2009 was 860 and the total of third years who entered in 2007 was 1057 (Nursing Careers Centre, 2010, p. 50). There was a reduction in the number of places on the course in 2009 due to a Government decision. The focus of this study was first and third year undergraduate general nursing students at two similar university sites. Three embedded units of analysis were the target for data collection. A target population is defined by Sarantakos (2005, 434) as the part of the general population for which research data are required. The embedded units of analysis were first year nursing students, third year nursing students and lecturers in nursing who taught on the undergraduate nursing degree course. The rationale for the inclusion of the embedded units of analysis is explained in the next section.

3.11.3 Rationale for inclusion of embedded units of analysis

A cohort of first year undergraduate nursing students constituted an embedded unit of analysis to provide an insight into critical thinking at an early stage in the first year of course. The third year cohort of nursing students formed the second embedded unit of analysis as they had completed first and second year and were approaching the end of their third year when data was collected. It was expected that the duration of time from first through to third year would result in differences in critical thinking as a result of curriculum experiences. This was the basis of an, a-posteriori hypothesis, the results of which are presented in Chapter Nine and discussed in Chapter Twelve.

Second and fourth year nursing students were not recruited for this study for the following reasons. Second year nursing students were not recruited as data at this point would be collected close to first year and it was expected that by third year nursing students would have more exposure to the nursing curriculum. Data were not collected in the fourth year of the course as the students enter their *internship year* which consists mainly of clinical practice placements across a range of sites. The feasibility of the data collection in the fourth year was anticipated to be problematic as these students would not be available as a cohort for the administration of the research instruments. Also the very poor response rate from an initial attempt at online assessment despite continued recruitment efforts was a factor which mitigated against a large enough sample. Another factor which was influential in the collection of data was the principle identified by Morse (2003) which is the importance of working with as few data sets as possible. For this reason, as well as time to administer the two research instruments and the need to work with as few data sets as possible at the integration phase of the study second year and fourth year students were not recruited. Students from other disciplines such as psychiatric nursing and intellectual disability nursing were not recruited. These were smaller cohorts in the undergraduate nursing degree course and have different curriculum experiences both theoretical and clinical. For these reasons these disciplines were not recruited for the study. Having determined the embedded units of analysis as the target for data collection both quantitative and qualitative sampling methods were used and the methods are explained in the following sections

3.11.4 Quantitative sampling method

The sampling method used was non-probability and a purposive sampling type for both the quantitative and qualitative components of this study. According to Kemper, Stringfield, and Teddlie (2003, p. 280), 'purposive sampling techniques are commonly associated with qualitative methods, and can be used within studies with either a qualitative or quantitative orientation and are quite common in mixed methods studies'. In purposive sampling, according to Sarantakos (2005, p. 164), 'researchers purposively choose subjects who, in their opinion, are relevant to the project'. The three embedded units of analysis constituted the sample and were purposively selected to address the research questions related to critical thinking as the main case. According to Silverman (2013, p. 148), 'purposive sampling allows us to choose a case because it illustrates some feature or process in which we are interested'. Based on

this judgment, and my own knowledge of the target population, I purposively collected data from two cohorts of undergraduate general nursing students as embedded units of analysis as they possessed the relevant knowledge to answer the research questions about critical thinking as the main case of interest.

3.11.5 Qualitative sampling method

Purposive sampling was also used to collect qualitative data from the nursing students and the lecturers. In the case of the nursing students as informants were recruited from the participants who volunteered for the quantitative component of the study. According to Kemper et al. (2003, p. 284) participants for the qualitative component of a study drawn for those who complete the quantitative component of a study is a strong approach and commonly used in mixed methods. In this study, participants who completed the questionnaires were invited to volunteer for an interview by completing an interview recruitment form (Appendix 14).

3.11.6 Sample size

The first and third year cohorts of undergraduate nursing students were the two main embedded units of analysis in this case study. The total number of students in each embedded unit was based on the numbers at entry to the course and constituted the target population for recruitment (Table 3.4). The qualitative component of the study was less-dominant and complimentary to the quantitative component. Data were collected from ten first year and ten third year undergraduate nursing students. The third embedded unit of analysis consisted of eight lecturers in nursing who were also interviewed to explore their views of critical thinking in the undergraduate nursing curriculum.

University Site	Embedded Unit of Analysis: First year cohort	Embedded Unit of Analysis: Third year cohort	Total
Site One	210	210	420
Site Two	168	168	336
Total Per Cohort	378	378	756

Table 3.4 Total number of nursing students in the first and third year of the undergraduate nursing degree course

3.11.7 Pooling of the sample

Undergraduate nursing students at two similar university sites were pooled to provide one cohort each of first and third year nursing students. The rationale for the pooling of the sample was to provide a sufficient number of participants to ensure a high response rate for the quantitative component of the study. It was anticipated that the recruitment of participants would be challenging due the voluntary nature of participation. The consideration that nursing students work commitments, clinical placements, and tight teaching schedule would impact recruitment was a real concern. Nursing students were unlikely to consider participation in research of high priority. Also, the need for fifty minutes to complete the HSRT on a second occasion after the CCTDI impacted on the required commitment of participants. These reasons justified the need for pooling of the sample. Pooling of the sample was also appropriate and facilitated the qualitative component of this study. In relation to pooling of the sample in qualitative research Morse (1991) states:

> This raises the issue of dependence on context and whether data should be pooled and she goes on to state that, if the second site is selected to increase the potential pool of participants and the researcher cannot identify any reason that the sites may be different, then the data could be pooled. (Morse, 1991, p. 140)

Similarities between the sites and the intakes of nursing students were two important factors which supported the rationale and justification for pooling of the sample. First, is to address the similarities between the two sites. Each of the sites provided a four year undergraduate honours degree course in nursing and it was important to ensure that exposure to the nursing curriculum was similar. This was achieved in that, the first year cohorts at each site had completed a theoretical component of one term from September to December 2009 as well as a clinical practice component of six weeks duration at the time of data collection. The two third year cohorts were similar in that they had completed similar theoretical and clinical components by the third year of the course. The curriculum at both university sites was organised into modules of content and critical thinking was an expected outcome at both sites. It is acknowledged that there were differences between the sites in the organisation of the theoretical content of various modules in the teaching schedules. The theoretical and clinical practice components were similar and consistent with the requirements of An Bord Altranais (2000) (Appendix 1).

The second important factor which facilitated pooling of the sample was the similarity of entry level points[3] required for the undergraduate nursing degree course at each of the two university sites. At a national level, the final entry points for general nursing, in 2009, ranged from 380 to 450. The final entry points for the *first year cohort of general nursing students* who entered in the autumn 2009 and participated in this study ranged from 385 to 395 points. The final entry points for the integrated children's and general nursing students ranged from 465 to 475 (Nursing Careers Centre, 2010, p. 46). For *the third year cohort of general nursing students* the final entry points for general nursing, nationally in 2007, ranged from 345 to 420 and for the cohort who participated in this study the final entry points range was 360 to 370. The final entry points nationally for the integrated children's and general nursing students ranged from 450 to 495. The final entry minimum points for the integrated children's and general nursing, in the third year sub-group, in this study ranged from 450 to 485 (Nursing Careers Centre, 2010, p. 46).

In the case of the first year nursing students who entered in 2009 there was ten points (N=10) in the difference between the two university sites. There was also ten points (N=10) in the difference between the two university sites for the third year nursing students who entered in 2007. Students from each university site were very similar and this facilitated pooling of the sample. For the small sub-group of general nursing students, undertaking the integrated children's nursing component, there was ten points (N=10) in the difference between the sites for the first years who entered in 2007. There was thirty five points (N=35) in the difference between the two sites for the third year students who entered in 2009. While it could be expected that the integrated nursing students, based on their higher points at entry, would have a potential for stronger critical thinking ability it was important to examine this using an independent samples t-test. The independent samples t-tests, the results of which are reported later

[3] The points system operates by giving a points score for each grade allocated in the Leaving Certificate depending on the percentage mark attained by the candidate. The number of points is calculated for each subject and the applicant's six best subjects are added together to get the points total. Applicants are then ranked according to their points scores in any single sitting of the Leaving Certificate and the available courses are filled from this ranked list. The points level required for any specific course is determined by the number of applications for the course, the points received by the applicants, and the number of places available on the course (Government of Ireland, 1999) .

in Chapters 5 through to 9, did not reveal any differences in the category scores between the general and integrated general nursing students. This further supported pooling of the sample.

The similarities between the two university sites, An Bord Altranais (2000) Requirements and Standards for Nurse Registration Education Programmes, and similarities between the undergraduate nursing students at each site, in the first and third year cohorts, provided justification for pooling of the sample. The above characteristics of the sites and the study participants underpinned the pooling of the sample thus ensuring that the findings could be relied upon to reflect the dispositions and skills of both cohorts without the threat of distortion of the findings. Ensuring similarities were assessed in pooling of the sample also aimed to avoid differences in characteristics which would act as a threat to internal validity. Having considered the sampling methods the next stage was recruitment of the participants and this is explained next.

3.12 Recruitment for the study

In this section access for data collection as well as the recruitment process for the nursing students and the lecturers is explained.

3.12.1 Access for data collection

Recruitment for this study commenced following ethical approval and permission for access. Ethical approval was granted in January 2009 by the School of Education Research Ethics Committee where I was a registered postgraduate student. Ethical approval was also granted by the Faculty of Health Sciences Research Ethics Committee at one university site in January 2009, and with subsequent approval in November 2009 to accommodate a cross-sectional approach to data collection. Ethical approval was granted at the second university site in September 2009 (Appendices 9, 10 & 11). Following ethical approval access was granted by the Heads of the Schools of Nursing and Midwifery and the Directors of Teaching and Learning, undergraduate nursing, at both university sites. The Director of Teaching and Learning undergraduate and the course coordinators and module leaders at each site facilitated schedule times for both information sessions and data collection. The recruitment processes is explained next.

3.12.2 Recruitment for quantitative data collection

Recruitment commenced with a twenty minute information session at the end of a scheduled teaching time. Using this approach I was able to capture all present in the teaching session and provide them with verbal and written information about the study (Appendices 12 & 13). During the information sessions I explained the significance of the study and what was involved in relation to data collection. *A period of seven days was allowed for the students to decide to participate in the study before data collection commenced and this was in keeping with ethical requirements.* I also provided my contact details on the information sheet and the students were invited to contact me to answer any additional questions they had. An e-mail was sent as a reminder by the course administrative personnel to the cohort of students the day before the scheduled time for data collection. It also reminded them of the duration of time required to complete the specific critical thinking test administered.

3.12.3 Recruitment of nursing students for an interview

I recruited the undergraduate general nursing students for the qualitative component of this study at the two university sites at same time as recruitment for the quantitative component of the study. Participants who completed the critical thinking tests were provided with an interview recruitment form (Appendix 14). Participants completed the recruitment form with their contact details to include their phone number, e-mail address, year on the course, and indicated their willingness to participate in an interview. The interview recruitment form was returned with the tests and score sheets. This approach recruited both first and third year nursing students who were willing to participate in an interview.

3.12.4 Recruitment of nurse lecturers for an interview

Nurse lecturers were recruited for the qualitative component of the study at the two university sites. I recruited eight lecturers who taught on the undergraduate nursing degree course. At one site the Director of undergraduate teaching and learning acted as a *'gate keeper'* and informed the academic staff at a staff meeting about this research project. This approach generated a list of teaching staff willing to participate in an interview and from the list four lecturers were recruited. An awareness of the study at the second research site resulted in volunteers among teaching staff to participate in an interview. They self-selected based on their eagerness and willingness to discuss

critical thinking. All the Lecturers who volunteered taught on the undergraduate nursing degree course, and they had the relevant knowledge of critical thinking in the undergraduate nursing curriculum. Each lecturer was sent a letter of invite, an information sheet about the study which included my contact details, and an interview recruitment form (Appendices 16, 17 & 18). Participants were made aware that they would be required to complete a consent form at the time of their interview (Appendix 19). Following the recruitment phase data collection got underway and the procedures are explained in the next section.

3.13 Quantitative data collection methods

In this section the procedures for the collection of the quantitative and qualitative data are explained. First it is necessary to explain the pilot test of the critical thinking tests.

3.13.1 Pilot test of the critical thinking tests

Two tests were used to measure critical thinking in this study: the California Critical Thinking Disposition Inventory (CCTDI) and the Health Sciences Reasoning Test (HSRT) (Facione & Facione, 2012, 2014). Sample items of each test are shown in Appendices 5 and 6. Both tests have been used in research on critical thinking internationally since the CCTDI was first developed in the early 1990's (Facione et al., 1994). Prior to their use in this study it was necessary to do a pilot test to identify any issues that might affect the main study. A pilot test according to Teddlie and Tashakkori (2009) is a 'test drive' of procedures and can set the stage for the actual study and Sarantakos (2005, p. 256) states that the pilot test 'is a small-scale replica and a rehearsal for the main study' and can serve to 'test the suitability of the research methods and instruments'. Testing the suitability of the critical thinking tests was essential to avoid threats to validity in this study.

The pilot tests were conducted after ethical approval and access was permitted. The pilot test was undertaken with undergraduate nursing students similar to respondents recruited for the main study. The CCTDI was completed by thirteen undergraduate nursing students both male and female in February 2009. The test was completed in the required time of twenty minutes and participants were able to complete all items successfully. The Health Sciences Reasoning Test was pilot tested by twelve third year nursing students in May 2009. Participants were able to complete all thirty three items

in the required time of fifty minutes. Participants were asked to complete a short inventory on their experience and if they encountered any difficulties in completing the tests. No difficulties were reported and all students indicated that the HSRT was a challenge. Following the pilot test I was confident that both tests could be administered in the main study. Respondents who completed the pilot test were not involved in the main study as the main study commenced in November 2009 with two different cohorts of first and third year nursing students.

3.13.2 Quantitative data collection strategy

This single embedded case study used mixed methods and a concurrent triangulation strategy described earlier in this chapter and it was explained that a concurrent triangulation strategy has implications for the timing of data collection. According to Creswell (2003), the ideal is that both methods be given equal priority in the study, but in practical application priority may be given to either the quantitative or the qualitative method. A dominant less-dominant approach was used in which priority was given to quantitative data collection. According to Creswell et al. (2003, p. 219) the priority of data collection can be influenced by 'practical constraints for data collection'. Practical constraints were relevant in this study as the collection of data was determined by the structure of the course with the theory and practice placement components interspersed throughout the academic year. Data collection was during the theoretical components when the students were available as a cohort. It was also dependent upon the availability of a scheduled time in a very tight teaching schedule. Examinations were scheduled at strategic weeks towards the end of the academic year and data collection did not occur at these times. Given the above practical issues priority was given to the collection of quantitative data followed by qualitative data collection.

An initial attempt at online data collection and continued efforts at recruitment resulted in a very poor response rate with the loss of the cohort who had entered in September 2008 and this consequently delayed the progression of this study. I recommenced recruitment and data collection with the next first year cohort in September 2009 using a 'pencil and paper' approach. Recruitment was after ethical approval was granted and this was described earlier in the section on access for data collection. Each cohort was given at least seven days following an information session to decide to volunteer to

participate in data collection, and this was in line with ethical requirements of the study. The CCTDI was administered on all occasions prior to the administration of the HSRT as recommended by Facione and Facione (2010). The CCTDI was administered to the first years at both sites *in November 2009.* It was also planned to administer the HSRT at both sites in November, but a national work stoppage resulted in cancellation of data collection. The next available opportunity was the *first week of February 2010* following Christmas vacation and a practice placement of four weeks duration. The cohort of third years who had entered the course in September 2007 and at the time of data collection in 2010 had completed an equivalent number of theoretical weeks and clinical practice placements. The CCTDI and the HSRT were administered between the first week of March and the middle of April 2010 as close as possible to the end of the academic year. Two occasions were scheduled for each test to allow for data collection and follow up data collection.

3.13.3 Quantitative data collection methods

The critical thinking tests were distributed by *'gate keepers'* who were members of the course administrative team at my own research site. At the second site the Director of teaching and learning undergraduate and the module leaders acted as gate keepers. This way I was removed from the data collection process in keeping with the ethical principles of the study. It was important to ensure that the tests were administered according to the instructions provided to ensure the integrity of the tests and the data collection process. I arranged to meet with the gate keepers before each scheduled data collection time and I explained the procedure for the administration of each test. I also provided clear written instructions for the correct administration of the tests and I satisfied myself that they were clear on the administration procedure for each test. I informed the gate keepers that participants were not to receive any prompts during the test and that all information required was in the test items. I remained outside the test venues to support the gate keepers and to check that all test materials were returned. I also checked each room after testing was completed to ensure that none of the test material remained in the room. At the commencement of data collection all participants were again informed that participation was entirely their own voluntary decision so that they did not feel they had to participate in the study.

3.13.4 Administration of the California Critical Thinking Disposition Inventory

The California Critical Thinking Disposition (CCTDI) is a 75 item Likert style test which was completed by the participants in twenty minutes. The test and the score sheets were administered to the participants and they were informed to read the instructions and the sample item which indicated how to complete the test. Participants rated each of the test items along a six point continuum from, *'agree strongly'* to *'disagree strongly'*. Participants were advised not to write their names on the score sheets or the tests and they used their student identification numbers instead to ensure anonymity. Participants also completed a consent form and this was returned with the test materials (Appendix 15). Participants returned their completed tests by inserting them into a box placed in the room. The CCTDI was administered in all testing occasions before the HSRT and was completed by all participants in twenty minutes.

3.13.5 Administration of the Health Sciences Reasoning Test

The Health Sciences Reasoning Test (HSRT) is a thirty three item multiple choice test which measures five critical thinking skills, *analysis, inference, evaluation, inductive and deductive reasoning.* The test takes fifty minutes to complete and it was administered after the CCTDI. Participants were provided with the test and a separate score sheet. A sample item identified how the test and score sheet should be completed. Participants were instructed not to write their names on the test or the score sheet and to use their student identification numbers only. No prompts or assistance was given during the completion of the test and participants were informed that all the necessary information was in the test items. The tests distributed and returned were counted and participants were instructed to return all materials used during testing even if they decided to leave during the test. Participants returned their completed tests by inserting them into a box placed in the room. A consent form was also included with the HSRT, so that if a participant had not completed the CCTDI but decide to complete the HSRT they provided written consent (Appendix 15). Qualitative data collection with the nursing students commenced following completion of quantitative data collection. The procedures for qualitative data collection are explained in the next section.

3.14 Qualitative data collection methods

In this section the strategy for the collection of the qualitative data is explained. The development of the topic guide and the interview process is also explained.

3.14.1 Qualitative data collection strategy

A concurrent triangulation strategy was used in this case study and was described earlier in this chapter. In relation to a concurrent triangulation strategy Creswell (2003, p. 217) states that, the ideal is that both methods be given equal priority in the study but in practical application priority may be given to either the quantitative or the qualitative method. A factor which impacted data collection was my opportunity due to work commitments as this was a part-time study. The structure of the undergraduate nursing degree course and the willingness of the participants was also an important factor. Given these factors qualitative data collection took place after quantitative data collection was completed.

While students had volunteered for an interview at the time of quantitative data collection some students later declined due to personal commitments. The recruitment process explained earlier in the section on recruitment provided ten first and ten third year nursing students who willingly completed an interview. During the phase of quantitative data collection the students had completed an interview recruitment form with their contact details and indicated their willingness to participate in an interview (Appendix14). I sent an e-mail to each participant who had volunteered to remind them that I was about to follow up with an interview and that I would make further contact with them once they had reconfirmed their willingness to participate in an interview. Once the students had reconfirmed their willingness to participate in an interview I contacted them using the phone number they provided to arrange an interview.

Interviews were completed at a time that was convenient for the participants and this required that on some occasions I had to travel to meet participants at their university site. Most of the participants were willing to travel to my work location and they explained that this was the most acceptable and convenient for them. Participants were informed during the recruitment process that the interview would be approximately forty five minutes duration. Interviews with the nursing students ranged from forty minutes to a maximum of sixty minutes and most of the interviews were completed in fifty

minutes. Interviews with the nurse lecturers took place at each university site in their office or in a pre-booked meeting room and again this was most convenient for them. In the case of the nurse lecturers the interviews ranged from forty minutes with most completed in less than sixty minutes, with the exception of one interview which lasted seventy minutes. In the case of the nurse lecturers two were willing and eager to provide greater knowledge of the topic and as they had volunteered I was reluctant to terminate the interview and facilitated them to complete their account of critical thinking.

Interviews with the undergraduate nursing students took place over a period of eight months with *the first interview in the first week of November 2010 and the final interview in June 2011.* Extreme weather conditions for up to four weeks along with the Christmas vacation in December 2010 required that interviews be reschedule and this prolonged the duration of the data collection schedule but did not affect the quality of the data collected. Recruitment for the interviews with the lecturers commenced in May 2011 and completed in December 2011. Eight lecturers were interviewed with five from one university site and three from the second university site. To facilitate qualitative data collection it was necessary to develop a topic guide and this is explained next.

3.14.2 Development of the topic guide

Qualitative data collection was guided by a *topic guide* designed with a focus on aspects of critical thinking. According to Arthur and Nazroo (2003) the purpose of a topic guide is to enhance consistency of data collection, ensure relevant issues are covered systematically and uniformly yet allowing flexibility to pursue the detail that is salient to each individual participant. The topic guide was developed with the qualitative research questions in mind as research objectives to be achieved. Three embedded units of analysis; first and third year undergraduate nursing students and their lecturers were also the focus for data collection. The development of the topic guide was also influenced by reading literature on critical thinking and according to Arthur and Nazroo (2003, p. 116), 'the process usually begins by reviewing the research specification and relevant literature'. Broad topic areas were identified for exploration around critical thinking as the main case in this study. The topic guide for the undergraduate nursing students focused on a range of topics perceived as relevant to critical thinking

(Appendix 20). The focus of the topic guide for the nurse lecturers was to address topics about critical thinking in the undergraduate nursing curriculum (Appendix 21).

Arthur and Nazroo (2003) suggest the use of *simple topics for exploration* and the use of neutral language and they also state that it is important to make sure that both the researcher and the participant are using language and specific terms in the same way, and that there is no misunderstanding. These principles were adopted in the development of the topic guides and terms familiar to the informants were used. A concern in the development of the topic guides was the scope of topics and the need to balance breadth and depth of the topics covered. I was aware that the depth of the exploration on any of the topics would range from not having a view at all, to more in-depth views about aspects critical thinking. The structure of the topic guide was another important consideration and Arthur and Nazroo (2003) suggest the topic guide should be easy to use and that the use of a brief statement of the objective of the research study, an introduction and summary topics are useful. The topic guides used with the nursing students and the lecturers focused on critical thinking in the undergraduate nursing curriculum. I felt that it was essential at the outset to explore what critical thinking meant to participants and then progress systematically with each topic. The topic guide was used to address the range of topics in a consistent and uniform way with all informants. Topics explored were summarised at the end of each interview.

Having developed the topic guides I was aware of the need to do a pilot test. According to Silverman (2010, p. 197) it is good research practice to, 'pilot your interview schedule'. The first interview with each different set of informants provided an opportunity to test the topic guide in terms of the range of topics as well as the use of language and terminology. It also permitted me to experience the interview process and test my interview skills as I was new to qualitative research interviewing. I was also able to practice the use of prompts and probes to elicit understanding and exploration of critical thinking. It also provided me with a focus on aspects of the interview which needed development, aspects which were not yielding relevant information and areas of duplication or overlap. The topic guides provided as Arthur and Nazroo (2003, p. 115) state, 'an aide-memoire' and 'not an exact prescription of coverage'. The topic

guides facilitated a semi-structured interview in the collection of qualitative and the interview process is explained next.

3.14.3 The semi-structured interview

Interviews may be structured, semi-structured, non-directive, focused and informal conversational (Gray, 2009) . The use of a one-to-one interview with the undergraduate nursing students and the nurse lecturers was semi-structured and guided by a topic guide. The rationale for a one-to-one interview in this study was influenced by the advantages identified by Denscombe (2012) as being, more straight forward in the location of specific ideas as one individual is guided through the interview agenda, and one person is the source of the ideas. The semi-structured nature of the interview also permitted probing of views and opinions, a skill identified as important by Gray (2009). The use of the topic guides provided for the semi-structured nature of the interview in the qualitative component of this study. To conduct effective one-to-one interviews it was important to consider the interview setting.

3.14.4 The interview setting

The setting for the interviews was considered important to provide an environment that was relaxed, confidential and permitted free and open discussion about critical thinking. All of the interviews took place in a quiet location, either in a meeting room or an office space as described earlier. The room was made comfortable with comfortable seating and ventilation. Phones were diverted or switched off, and a notice to indicate, a 'meeting in progress-please do not disturb' with a completion time was placed on the door, and this prevented interruption during the interview. Water was available to drink should it be needed in the course of an interview.

3.14.5 Collection of interview data

All interviews were recorded using a digital recorder which was placed on a table in discrete position to record the conversation. The power charge of the data recorder was checked before each interview and batteries were checked and replaced to ensure that the data recorder was fully charged throughout the interview. The chairs were arranged so that the informant and I were seated face to face at the same level and each interview progressed as for a normal conversation and was recorded without any disruption. The interview schedule was placed on a table so I could view it discretely

and this avoided the distraction of holding it in my hand. It also helped to create an informal relaxed approach to the interview. There were no physical barriers between myself and the informant and the chairs were of an equal height to promote equality of position and remove this as a barrier during the conversation. Both the informant and I were casually dressed and this also contributed to a natural a setting and conversation.

3.14.6 The interview process

At the start of the interview participants were greeted and light conversation was used to allow them settle down and get comfortable. They were informed of the process of the interview and that their views, beliefs and knowledge of critical thinking were highly valued. They were assured that there was no correct answer to any of the topics or the questions asked and it was entirely their thoughts that were important. Each participant was given *a consent form* and this was carefully read through before they signed it (Appendix 15). I was conscious of the need to obtain their perspective or what Creswell (2013, p. 96) identifies as and *'emic'* perspective without any interference or distortion. Participants were asked to think about the questions posed, ask for clarification if needed, and not to feel rushed or that they should give an answer that was pleasing to me. They were asked to give their views openly and honestly and they were assured that they were not being judged or assessed.

They were informed that the interview was being recorded, when the recorder was in record mode, and when the recording was stopped at the end of the interview. They were informed that approximately forty five minutes was allowed for the conversation but that it could finish sooner if they felt they had completed the interview. They were assured that no other person would hear the recording. The recording would be transcribed and their name would not be used and any identifying information would not be evident in the transcribed interview nor could they be identified from their transcribed interview. They were informed they would be sent a copy of the transcription to verify the content of the interview at a later stage. The introduction took approximately five minutes and it assisted the informant to settle down and focus on the topic of critical thinking. It also facilitated the development of a rapport and initiated the conversation about critical thinking. I progressed with the interview, guided by the topic guide with the key topic areas in mind and *open questions* to initiate the conversation and elicit informant's views from their perspective, for example, *'can you*

tell me…' and 'tell me what your views are. I allowed the informant time to think about the topic and did not rush the interview. As the interview progressed I used what (Berg, 2009, p. 113) refers to as *'transition'* from one topic to the next. This was achieved by using transition statements such as, *Okay, now that we have discussed…'the next topic we will discuss is'. Probing questions* were also used (Berg, 2009, p. 115) and examples of the probes used were, *'would you like to tell me more about that' and 'that's a very interesting point would you like to say more about that'.*

At the end of the interview I outlined the topics that had been discussed. I provided an opportunity for each participant to add any further information and to include what they felt was important to them and which I had not considered. I was reassured that I had not left out any aspects as informants concluded with comments such as, *'I think you covered everything', I don't think I can add any more'.* Given these replies I was confident that they had presented their views about critical thinking. At the end of the interview each informant was thanked for their time and contribution. Nursing students were reimbursed for public travel expenses and refreshments such as tea or coffee was also provided. Following each interview field notes were recorded which documented how I felt the interview progressed and contextual issues in relation to the interview. Sample of the field notes is included in Appendix 22.

3.15 Rigour in the qualitative research component of the study

Rigour in any research is required to prevent error of either a constant or intermittent nature (Morse & Field, 2002, p. 118). To establish rigour or trustworthiness of the qualitative component of this case study four processes identified by Lincoln and Guba (1985) were addressed; *'credibility', dependability', confirmability'* and *'transferability'.* The qualitative component was less-dominant and the aim was to describe nursing students' and lecturers' perceptions of critical thinking as well as their perceptions of critical thinking in the nursing curriculum. The audit process is evident in the qualitative data analysis section and supported by audit trail documents included in the appendices. First it is important to explain the above processes which were used to establish rigour and this was important even though the qualitative component was less-dominant.

3.15.1 Credibility as a criterion for trustworthiness

In relation to credibility to establish trustworthiness the criteria described by Lincoln and Guba (1985, p. 313) are *prolonged engagement in the field, peer debriefing, negative case analysis, referential adequacy and member checking.* Two of the criteria were relevant and applied in this study; prolonged engagement and member checking. The duration of time in the field was contingent upon the collection of data. The duration of qualitative data collection extended from November 2010 to December 2011. This duration of time assisted me to gain confidence in the process of qualitative data collection and enhanced a more natural situation during the interviews and it also facilitate the development of trust. I also ensured informants that the ethical principles of the study would be upheld in terms of anonymity, confidentiality, autonomy, and justice. This served to reassure informants and to build their trust and to get the true meaning of the critical thinking without distortion or the need to feel they had to please the researcher or perform to any preconceived standard. These approaches contributed to the credibility of the data collected. Member checking was also used to establish credibility (Lincoln & Guba, 1985). To ensure member checking full transcripts were returned to the nursing students as well as the lecturers for verification of the data as a true reflection of their accounts of critical thinking. Participants responded and confirmed that the verbatim transcriptions were true reflections of their accounts of critical thinking. The application of the processes described above, such as, prolonged engagement, building trust, and member checking facilitated the establishment of credibility as a criterion for trustworthiness. Dependability as a criterion for trustworthiness was also important and this is explained next.

3.15.2 Dependability as a criterion for trustworthiness

Dependability in this study was established on the grounds of established credibility. According to Lincoln and Guba (1985) dependability is contingent upon credibility and they state that if it is possible using the technique(s)for credibility to show that a study has that quality, it ought not to be necessary to demonstrate dependability separately. However, Lincoln and Guba (1985, 318) also state that this argument while having merit is weak and they suggest an inquiry audit to examine the *process* of the inquiry and to examine the *product*- the data, findings, interpretations, and recommendations and this latter process establishes the *confirmability* of the inquiry. According to Lincoln and Guba (1985, 318), 'a single audit, properly managed, can be used to determine dependability and confirmability simultaneously'. Given these assertions by

Lincoln and Guba, the next section explains the audit process to establish confirmability and in doing so, also achieve dependability to establish trustworthiness of the qualitative findings in this study.

3.15.3 Confirmability as a criterion for trustworthiness

To achieve confirmability, auditability or neutrality for trustworthiness or rigour an audit trail and audit process are necessary (Lincoln & Guba, 1985). According to Lincoln and Guba (1985, 318), 'the major technique for establishing confirmability is, '...the confirmability audit, the audit trail and audit process'. Halpern (1983) identified six audit trail categories and a five stage audit process to establish confirmability. The six audit trail categories were used to develop the audit trail in this study (Appendix 23). The audit trail consisted of raw data in the transcripts, field notes provided contextual information, codes and categories provided evidence of data analysis and reduction, while emergent themes provide evidence of data reconstruction and synthesis. The topic guides also provided evidence of the focus of this study relative to the inquiry and the findings reported. The findings reported in the discussion chapters further confirmed the audit trail in the qualitative component of this study. Later in the section on qualitative data analysis the methods used to analyse the qualitative data are explained and the necessary documentation for the audit trail is identified. An audit process is necessary with the audit trail for confirmability and the audit process is described next.

3.15.4 Audit Process

While the audit material provides evidence of the audit trail to achieve confirmability the process of the audit also added to the confirmability of the study findings. According to Lincoln and Guba (1985, p. 320) the audit process may be divided into five stages based on Halpern's (1983) algorithm for confirmability or auditability: *pre-entry, determination of auditability, formal agreement, determination of trustworthiness (dependability and confirmability, and a secondary check on credibility), and closure.* Not every category or criteria, nor every stage of the process was relevant in this case study and Lincoln and Guba (1985, p. 320) state that, 'the steps may be interchanged and others omitted entirely'. The audit process may be from the beginning of the inquiry, during the inquiry or retrospectively (Lincoln & Guba, 1985, p. 320). As I was the only researcher I was familiar with the steps of the qualitative component of the

study as it developed and I was auditing the study as it progressed and I documented the audit process retrospectively. Auditing as the study progressed and retrospectively provided greater confidence in the confirmation of the qualitative findings.

This five step audit process was applied to determine confirmability in this case study. In relation to *stage one; pre entry,* the inquiry audit outlined above documented the process of data analysis and confirmed a logical link traceable from the findings to the source of the findings. In relation to *stage two; determination of auditability*, my familiarity with the qualitative component of this study, the paradigmatic approach of constructivism, the findings and the conclusions contributed to the inquiry process. The documentation of the audit trail facilitated linkage of the findings back to the data source. According to Lincoln and Guba (1985) the auditor must determine *completeness* in that the audit trail is completed and audit materials are available and accounted for; that the trail is *comprehensive* in that it can be understood and followed; the trail is *useful* in that the evidence of the trail is organised and finally that the trail is *linked* to the methods used. These four criteria of completeness, comprehensiveness, usefulness and linkage were relevant to the audit trail used to confirm the findings in this study. The *third stage is formal agreement* and this was not necessary as I conducted the study and there were no other researchers involved.

The fourth and fifth stages; determination of trustworthiness and closure, respectively, also applied and are explained next. The fourth stage of the confirmability audit is *determination of trustworthiness*. According to Lincoln and Guba (1985) an assessment of confirmability and dependability is important. To achieve this, an auditor must first ascertain whether the findings are grounded in the data. This involves checking the audit trail through the established linkages in which a sample of the findings is traced back via the audit trail to the raw data on which they are based. It was possible to achieve this in this study and the reported findings can be traced back to the raw data using a coding process. This traceability is explained later in the section on qualitative data analysis. The auditor also judges whether inferences based on data are logical and in this study this involved carefully examining the category labels and construction of themes in the process of data reduction. This confirmed that the data fitted the emergent categories. Category utility was also examined to determine that the categories which emerged had utility in making judgments and inferences from the

findings in the categories and themes constructed. Inquirer bias was addressed by ensuring that the findings represented critical thinking as the informant's *'emic'* constructions as opposed to any imposed *'etic'* constructions on my part as the inquirer. Awareness of this along with checking and elimination of my own preconceptions aimed to prevent inquirer bias on my part.

The *fifth and final stage of the process is closure* when the previous four steps are completed. As I was the only researcher and while the audit was happening as the qualitative component of the study developed, as well as retrospectively, it was appropriate to bring closure to the audit process. Based on the above criteria for the audit trail and the audit process I was able to bring closure to the audit process and conclude with a level of confidence that the findings were authentic as described by the informants. I was also able to confirm, on the basis of the audit process, that the findings and interpretations represent the truth of the findings and not my constructions or *'etic'* perspective and that the findings speak for themselves.

3.15.5 Transferability for trustworthiness

Trustworthiness or rigour is further established based on transferability. Transferability or applicability relates to how one determines the extent to which the findings of a particular inquiry have applicability in other contexts or with other subjects (Holloway & Wheeler, 2004; Lincoln & Guba, 1985). All researchers must strive to achieve transferability. According to Lincoln and Guba (1985, p. 316) it is the naturalist's responsibility, 'to provide the data base that makes transferability judgements possible on the part of potential appliers'. The qualitative component of this study explored the perceptions of undergraduate nursing students and their lecturers about critical thinking and in doing so sought to gain a *'thick description'* facilitated by purposive sampling. Purposive sampling was used in this case study and it is acknowledged that *'thick description'* has greater likelihood with theoretical sampling in grounded theory. The use of purposive sampling and the reported findings in this study provide *'rich descriptions'* of the students and lecturers views about critical thinking in the undergraduate nursing curriculum.

According to Lincoln and Guba (1985) transferability is also dependent upon externals in the application of the findings and this is contingent upon the inquirer providing 'thick

descriptions' to enable someone interested in making the transfer to make a conclusion about whether the findings are transferable or not. Transferability depends on the application of the findings from this study in other contexts by other researchers and this is dependent upon further qualitative research in this area to confirm the transferability of the qualitative findings from this study. Also, the methods used are transparent and permit external researchers to determine the transferability of the findings to other contexts. The four criteria of; *credibility, dependability, confirmability and transferability* identified by Lincoln and Guba (1985) and the criteria and processes for confirmability identified by (Halpern, 1983) served to establish rigour or trustworthiness of the qualitative component of this study. Two other processes necessary for trustworthiness are, the researcher as insider/outsider and reflexivity. These processes were also inherent in the establishment of trustworthiness.

3.15.6 Researcher as Insider/Outsider

Another important aspect in relation to the determination of trustworthiness is the researcher as an insider/outsider. It is important to acknowledge the implication in relation to the qualitative data and the knowledge claims about critical thinking in the undergraduate nursing degree course. According to Loxley and Seery (2008, p. 3) insider research is undertaken by members of the same group, who supposedly share one or a number of characteristics (cultural, biological, linguistic. political, occupational). In contrast, outsider research is undertaken by someone who is not a member of that group and *de facto* is in 'possession' of a different set of characteristics. The effect of being and insider/outsider according to Griffith (1998, p. 362) gives the researcher tacit knowledge which informs research producing a different knowledge than that available to the outsider, who does not have an intimate knowledge of the group being researched.

The researcher as insider/outsider was relevant in the qualitative component of this study which sought the views of the nursing students and their lecturers in relation to critical thinking in the undergraduate nursing curriculum. As the sole researcher I was an *'insider'* in that, I, as Loxley and Seery (2008) state, was 'a member of the same group.' As an insider, I fitted the characteristics of the nurse lecturers as I possessed a similar background and I had similar knowledge of the nursing curriculum. I was also an insider in relation to the nursing students as I had insight into their background and

curriculum experiences. As an insider, I possessed a *'tacit knowledge'* which according to Griffith (1998), is different and considered privileged knowledge than if I was an outsider. In acknowledgement of my position as an insider, in this research study, I was cautious in ensuring that my privileged knowledge did not consciously distort the views of the informants, and I was conscious to let the informants speak for themselves, and also that the findings would speak for themselves. From the foregoing explanations the importance of methods to establish trustworthiness and the role of the researcher as insider/outsider are important to the authenticity of the qualitative findings. Another relevant process for the establishment of trustworthiness and credibility in qualitative research, and acknowledged in this study, is reflexivity.

3.15.7 Reflexivity

According to Pontin (1997, p. 322) a way of demonstrating 'trustworthiness' is to include *reflexive* elements in the work. Reflexivity, according to Dowling (2006, p. 17), 'is a means of adding credibility'. The subjective nature of the qualitative and less dominant component of this case study required efforts to ensure freedom from bias and as such reflexivity was a relevant consideration. Reflexivity, according to Hammersley and Atkinson (2007, p. 15) acknowledges that the orientations of researchers will be shaped by their socio-historical locations, including the values and interests that these locations confer upon them. The implication of this required, that I acknowledged my *personal values, interests and influences as well as my experiences* in the course of the research study. Awareness of this meant that I kept conscious the need to conduct the research study without the imposition of my values or what I wanted from the research. The views of the respondents or their *'emic'* perspective about critical thinking as they presented them were important.

Reflexivity can be considered a necessary process which requires the researcher to consider their subjective values, interests and experiences throughout all stages of a research study. The nature of the study determines, in a way, the depth of reflexivity. In this study the qualitative component was 'less-dominant' and reflexivity is not dealt with to the depth or degree had this study used a qualitative approach as the base method or dominant paradigm. However, it was important that I, as the sole researcher, was conscious of my values, interests, experiences and position from the inception of the research questions through to the findings. I valued the perspectives of the informants

and my main interest was to obtain their perspectives on critical thinking and present these as true findings. By keeping aside my experience and knowledge of critical thinking I was also able to ensure dependability of the findings. I was also aware of my position as an insider and I was able to ensure that the data and findings reported were those of the informants. I was conscious of any imposition on the informants which could distort their accounts of critical thinking as they presented them. This consciousness, together with the process for the establishment of trustworthiness, served to confirm that the findings of the qualitative component of this study could be interpreted as free from bias on my part, and present findings that were those of the informants, as they viewed critical thinking. To this point the methods for the qualitative data collection using a semi-structured interview and the methods to establish rigour have been addressed. In the next section the data analysis strategy and data analysis procedures are explained.

3.16 Data analysis approach

In this section, the approach to data analysis is explained while the specific steps to analyse the quantitative and qualitative data are explained in subsequent sections. *Seven sets of data* from three embedded units of analysis required to be analysed. The data sets were; dispositions and skills of first and third year nursing students, first and third year nursing students' views of critical thinking, as well as the views of nurse lecturers about critical thinking in the undergraduate nursing curriculum. The purpose of data analysis was to confirm critical thinking dispositions and skills and to provide insights about critical thinking in the nursing curriculum, and thus expand existing knowledge of critical thinking and add new knowledge about the participants in this study. The approach used to analyse the data was *parallel mixed analysis* in which both quantitative and qualitative data are independently analysed (Onwuegbuzie & Teddlie, 2003; Teddlie & Tashakkori, 2009). Parallel mixed analysis was underpinned and guided by a set of twelve pre-analysis decisions and a model for mixed methods data analysis recommended by Onwuegbuzie and Teddlie (2003). These are explained later as they influenced the approach to data analysis.

As this study used a single embedded case study approach the strategies and techniques for case study data analysis identified by Yin (2014) also guided data analysis. The case study strategies and techniques described by (Yin, 2014) and the

mixed methods pre-analysis decisions and model described by Onwuegbuzie and Teddlie (2003) were combined and provided an appropriate approach to guide and manage the analysis of the data. It was appropriate to use the combination of strategies as this study used an embedded case study approach which incorporated a concurrent triangulation mixed methods strategy. Following the process of analysis the data were then merged, integrated using data triangulation and legitimated in terms of explanations. The process of data triangulation to integrate the data is explained in a later section in this chapter. An overview of the data analysis approach is shown in Figure 3.4 and further explanations are provided in the following sections.

3.16.1 Case study data analysis approach

Four general strategies and five analytic techniques are identified by Yin (2014) to guide case study data analysis. The four strategies are, *theoretical propositions, case descriptions, working with your data from the 'ground up' and rival explanations* (Yin, 2014, pp. 136-142). According to Yin (2014, p. 142) one can use these four strategies or 'you can develop your own strategy'. The four strategies while they guide data analysis are broad and Yin (2014) also describes five techniques to add to the process of case study data analysis. The five techniques are, *pattern matching, explanation building, time-series analysis, logic models and cross-case synthesis.* These five techniques are underpinned by the four broad strategies identified above. The technique of explanation building facilitated explanations about critical thinking as the main case grounded in the mixed data from the embedded units of analysis. Data triangulation provided a process for the integration of the quantitative and qualitative data and enabled the emergence of patterns from the data sets and the process is explained in a later section in this chapter. As both quantitative and qualitative data were collected it was necessary to combine the strategies for mixed methods data analysis with the case study strategies and techniques. Yin's case study strategies were broad enough to incorporate a mixed methods data analysis approach and Yin's strategies also related to the mixed method data analysis approach. The relationship of both of these approaches, a case study, and mixed method is also shown in Figure 3.4.

3.16.2 Mixed methods data analysis approach

In relation to mixed methods data analysis Creswell et al. (2003, p. 232) state that, 'approaches to data analysis also need to be sensitive to the design being

implemented in a mixed methods study'. A concurrent triangulation mixed methods strategy was used in this study and an approach recommended by Creswell et al. (2003, p. 233) is to compare the results of qualitative data to the quantitative data and support statistical trends by qualitative themes or vice versa. This approach was used in combination with the strategies and techniques for case study data analysis already explained above. The strategies for mixed methods data analysis included a set of twelve pre-analysis decisions, a seven step model for mixed methods data analysis and a taxonomy to guide data analysis (Onwuegbuzie & Teddlie, 2003). The twelve mixed methods pre-analysis decisions influenced the approach to data analysis and these are shown in Figure 3.4 and outlined in more detail in Appendix 24. The twelve pre-analysis decisions were consistent with the strategies and techniques for case study data analysis identified by (Yin, 2014) and the relationship is identifiable in Appendix 24. The seven step mixed methods model which included, *data reduction, data display, data transformation, data correlation, data consolidation, data comparison, and data integration* is also shown in Figure 3.4 and outlined in Appendix 25. While the approaches identified in Figure 3.4 provide an overview of the overall strategy for data analysis the taxonomy for mixed methods data analysis described by (Onwuegbuzie & Teddlie, 2003, p. 379) also guided the data analysis process. The parallel mixed analysis pathway of the taxonomy is shown in Figure 3.5. The notation QUAN / Qual denotes the priority of the data and the 'slash' denotes a parallel mixed approach (Onwuegbuzie & Teddlie, 2003, p. 378). The shaded component of the taxonomy outlines the parallel mixed approach used to approach the analysis of the mixed sets of data in this study.

The first main step requires the identification of the purpose of data analysis and whether the purpose is to test theory, generate new or expand existing theory or if the study is a-theoretical or descriptive. In this study, the purpose was a-theoretical or descriptive to explain the critical thinking dispositions and skills in the undergraduate nursing students and also to explore the student's and lecturer's views about critical thinking in the undergraduate nursing curriculum. *The second main step* is to decide on whether confirmatory or exploratory data analysis is appropriate. As the purpose of data analysis was a-theoretical or descriptive, exploratory data analysis was used. The dominant quantitative component provided data which explained the critical thinking dispositions and skills of the undergraduate nursing students. The less-dominant qualitative component provided data to explore the views of the nursing students and

their lecturers about critical thinking in the undergraduate nursing curriculum. *The third main step* in the taxonomy was to decide the strategy to deal with the data during analysis and a *parallel mixed analysis* was used. The process commenced with the dominant quantitative data (QUAN) and the less-dominant qualitative data (Qual) was analysed in parallel. Initiation of the data analysis with quantitative data before the qualitative data was in keeping with the dominant less-dominant design as opposed to assumptions about the priority of quantitative over qualitative or vice-versa. This acknowledges, 'the dictatorship of the research question' over any paradigmatic approach, a major tenet of pragmatism (Teddlie & Tashakkori, 2003, p. 21). The combination of case study strategies and techniques, together with the mixed method strategy of parallel mixed analysis underpinned by the mixed methods pre-analysis decisions, the seven step mixed method model, and taxonomy for data analysis provide an overall approach which guided the analysis of the quantitative and qualitative data sets. In the next section, the methods used to analyse the quantitative data are explained and this is followed by the methods used to analyse the qualitative data.

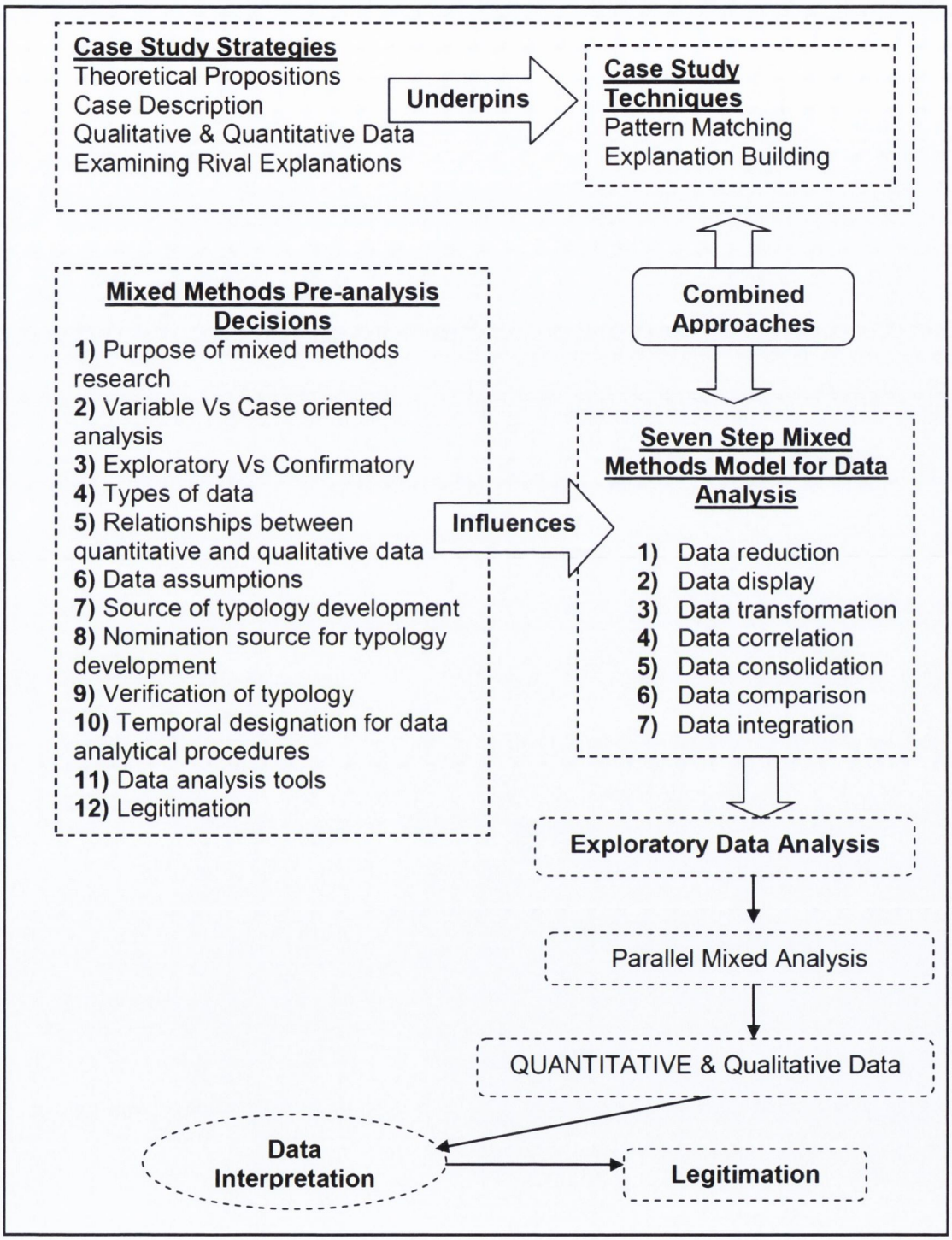


Figure 3.4 Approach to data analysis

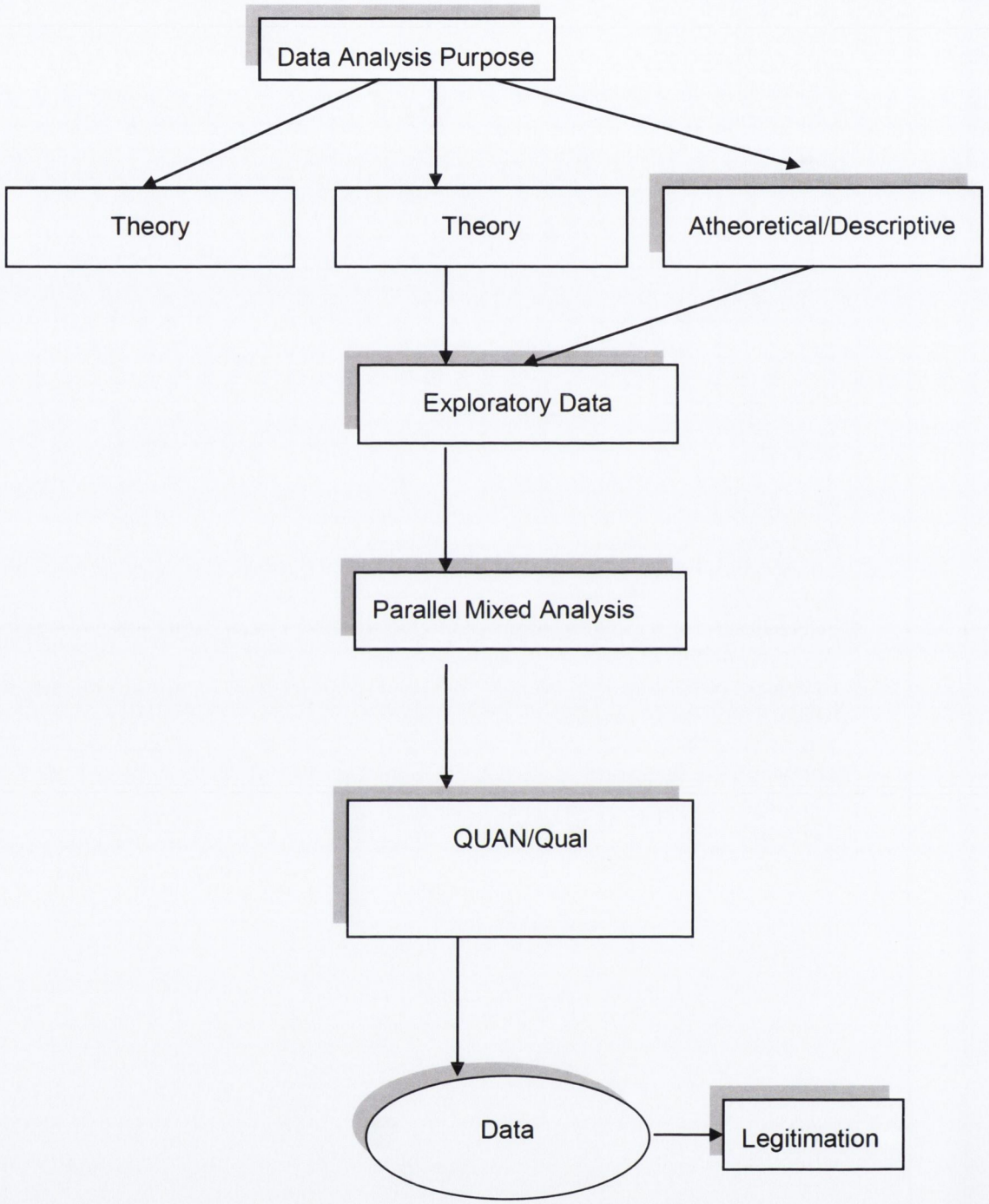


Figure 3.5 Parallel mixed analysis pathway of the taxonomy for mixed methods data analysis

3.17 Quantitative data analysis methods

This section explains the methods used to analyse the quantitative data guided by the data analysis approach explained in the previous section. The response rate, data preparation, data entry and levels of measurement are explained. Data analysis for the California Critical Thinking Disposition Inventory (CCTDI) and the Health Sciences Reasoning Test (HSRT) are explained as well as the assumptions which underpinned statistical tests are also explained. Before explaining the methods used to analyse the data it is important to consider the response rate.

3.17.1 Response Rate

The response rate in this study was influenced by voluntary participation which had the inherent risk of a low response rate. For the nursing students, their full teaching schedules, preparation of assignments and for examinations had an impact on the response rate. The need for the students to engage in part time employment also impacted the response rate. My own knowledge from casual conversations with nursing students in my scheduled course of teaching revealed these issues as significant challenges in the recruitment of the participants for this study. The administration of the CCTDI which took twenty minutes to complete, the HSRT which took fifty minutes to complete, as well as a semi-structured interview also impacted recruitment and response rates due to time commitments on the part of participants. Participants and non-participants had similar characteristics in terms of points for entry to the course as was described earlier in this chapter in Section 3.11.6. The target population of undergraduate nursing students at both sites and in both first and third year in this study were all new entrants to the undergraduate degree course having just completed formal secondary level education or Leaving Certificate. They all received the same information about the study and voluntarily self-selected to participate or decline. While the characteristics or demography of the respondents and non-respondents as the target population in this study were similar it is not possible to predict what the results would be had the entire target population of first and third years participated. Table 3.5 shows the breakdown of sample size and response rates for the quantitative component of this study. The highest response rates were for the CCTDI: first year 63% (N=237) and third year 59% (N=215). The response rates were lower for the HSRT: first year 34% (N=127) and third year 44% (N=166). The lowest response rate was for the first year HSRT at 34%.

UNIVERSITY SITE	FIRST YEAR COHORT	THIRD YEAR COHORT	TOTAL
SITE 1	**N = 210** CCTDI - 52% N=110 HSRT - 27% N= 57	**N = 210** CCTDI - 55% (N=116) HSRT - 30% (N= 64)	CCTDI - 226 HSRT - 121
SITE 2	**N = 168** CCTDI - 76% (N=127) HSRT- 42% (N= 70)	**N = 168** CCTDI - 59% (N=99) HSRT- 61% (N=102)	CCTDI - 226 HSRT - 172
TOTAL	**(N = 378)** CCTDI – 63% (N=237) HSRT – 34%(N=127)	**(N = 378)** CCTDI - 57%(N= 215) HSRT - 44%(N=166)	**CCTDI - 452** **HSRT - 293**

Table 3.5 Response rates for the CCTDI and HSRT

3.17.2 Data preparation for analysis

The first step in preparing for data analysis involved checking the completed critical thinking tests to ensure they were complete and that the demographic data was also complete. The tests from both university sites were categorised according to first and third year cohorts. For each cohort questionnaires were then categorised according to the tests which were completed, the CCTDI and the HSRT. There were a total of thirty respondents across the two sites and the two cohorts of first and third year who in the previous year had completed the first or the third year of the course. This gave them more than one year in the case of a first year and more than three years in the case of a third year at the time of data collection. At site one, for the first year cohort, there were five who completed the CCTDI, four who completed the HSRT and there were none in the third year. At site two, there were none in the first year cohort and in the third year cohort there were nine who completed the CCTDI and twelve who completed the HSRT. As these nine respondents in the third year cohort had more than three years on the course they were excluded from the analysis. This ensured that all in the first year cohort had entered the course in September 2009 and all in the third year cohort had entered in September 2007. The next step involved data entry.

3.17.3 Data entry

Data entry commenced in June 2011 and was completed by September 2011. Each questionnaire had a unique identification number to ensure anonymity and confidentiality of the respondents. To protect the integrity of the critical thinking test sub-scales data was entered into a data base provided by the Insight Assessment who supplied the tests and this method generated results on an excel spread sheet. To ensure security data was encrypted and password protected and only accessible to me as the test administrator. Demographic data was also entered and included, *identification number, nursing discipline, course level, gender, age, ethnic background, academic qualification, nursing discipline and completion of a critical thinking skills course* (Appendix 7). Nursing discipline was ascertained to identify participants undertaking the integrated children's and general nursing strand. The demographic data provides an opportunity for further analysis to examine critical thinking dispositions and skills in context of demographic variables. Data were then entered for the CCTDI for both the first and third year cohorts and this was followed by data entry for both cohorts for the HSRT. The output from excel provided a sub-scale score for each respondent who completed the CCTDI and the HSRT. A total scale score was also provided for each of the tests completed by a respondent. Data was then transferred to SPSS for further exploration and analysis.

When data or information are transferred from one data analysis system to another, in this case excel to SPSS, there is the potential risk of data loss. To ensure that this did not happen the data in the excel output for each respondent on each sub scale of the CCTDI and the HSRT were carefully crosschecked with data transferred to SPSS. One hundred per-cent degree of accuracy of the data transferred to SPSS was achieved. There is also the risk that the software for statistical analysis in Excel and in SPSS could vary in scores. To further confirm the accuracy of the data before and also during analysis, the statistical output for each of the scale scores as well as the total scale scores for each respondent were crosschecked between scores obtained in Excel and scores obtained in SPSS. These were found to be consistent and accurate and this added further confirmation that the data in SPSS could be relied on with one hundred per-cent accuracy for further analysis. After the data were transferred to SPSS variable labels and values were added for SPSS to interpret the data.

3.17.4 Analysis of the California Critical Thinking Disposition Inventory

The California Critical Thinking Disposition Inventory (CCTDI) has seven sub-scales measuring seven dispositions of critical thinking. Each subscale provided a score for each disposition and for each respondent. An overall or total disposition score was also calculated for each respondent. The scores on each of the seven sub-scales were calculated for the entire group for each of the seven dispositions. The overall disposition scores were calculated for the entire group and these were categorised as recommended by Facione and Facione (2010) as; *negative, ambivalent, positive and high positive* in relation to critical thinking dispositions (Table 3.1). Overall and subscale scores were available for both first and third year nursing students. This permitted the difference in the critical thinking dispositions for both cohorts to be explored using an independent samples t-test and addressed the research questions in relation to critical thinking dispositions of the undergraduate nursing students.

3.17.5 Analysis of the Health Sciences Reasoning Test

Data obtained using the Health Sciences Reasoning Test (HSRT) was analysed to reveal findings in relation to critical thinking skills. A score for five critical thinking skills was obtained as well as an overall or total critical thinking skill score. An overall and a sub-scale score was provided for each respondent. Overall and sub-scale scores for the critical thinking skills were obtained for both the first and third year respondents. Respondents were categorised as: *not manifested, moderate, strong* and *superior* for a particular critical thinking skill (Facione & Facione, 2012) (Table 3.2). Data was also provided to allow the difference in the critical thinking skills between first and third year nursing students be analysed. An independent samples t-test was used to confirm differences in the dispositions and skills of the first and third year cohorts and the results are presented in Chapter 9. It was important to assess the assumptions which underpinned the statistical tests to ensure that results were both accurate and meaningful. The assumptions are explained in the next section.

3.17.6 Assumptions of parametric statistical tests

In the course of data analysis it was necessary to confirm if there were differences in the critical thinking dispositions and skills for a small sub group in both the first and third year cohorts who were undertaking an integrated children's and general nursing strand. It was also necessary to find out if there were differences in the critical thinking

dispositions and skills for the first and third year cohorts. To address these differences it was necessary to test two *a-posteriori hypotheses*. To test the hypotheses an independent samples t-test was used to compare the average scores of the two independent or different groups. The hypotheses tested are presented later in the results chapters but first it is necessary to explain the assumptions of the test.

As mean scores were compared this constituted interval data and the use of an independent samples t-test as a parametric statistical test was appropriate (Cloft, 2006; Teddlie & Tashakkori, 2009, p. 263). Prior to conducting inferential statistical analysis with an independent samples t-test data was required to be assessed to determine if the assumptions for an independent samples t-test were met. This was to ensure that the results of the t-test could be interpreted as meaningful and accurate. According to Aron et al., (2008, p. 279), 'the goal of a t-test for independent means is to decide whether the difference between the means of your two actual samples is a more extreme difference on this distribution of differences between means'. Three assumptions require assessment for the results of an independent samples t-test to be both meaningful and accurate: *independence of the group, normal distribution and equal variance in the population* (Teddlie & Tashakkori, 2009, p. 263).

To test the first assumption of *independence,* each group was independent of the other and each individual was in one group only and thus the assumption of independence was accepted. To test the second assumption of *normality* it was possible to do so using both statistical and graphical methods. Graphical methods involve the use of histograms with a normal curve imposed and normality or Q-Q plots. While the graphical methods were assessed the methods reported in this study are the statistical methods. Statistical methods provide two tests of normality, the two tests are, the Kolmogorov-Smirnov test used for large data sets greater than 2000, and the Shapiro-Wilk test for data sets less than 2000. In this study the *Shapiro-Wilk* test was used as the data sets were less than 2000 (Lund & Lund, 2013). Skewness and kurtosis as a means of assessment of normality was also used. Tables showing skewness and kurtosis values for the dependent variables of critical thinking are reported in each of the chapters in which the results are reported. To determine the significance of the skew and kurtosis the standard error of skewness and kurtosis was multiplied by a value of two. If the value of skewness was within the range of -2 to +2 for the

calculated value it was considered acceptable (Acton & Miller, 2009, p. 69; Price, 2000).

To test the third assumption of *equal variance in the population* Levene's test was used. Levene's test for equality of variances is a test of whether the variances of the two populations are the same. It is a check on whether the assumption of equal population variance has been met. If Levene's test is significant, that is, if the value is less than 0.05, the assumption of equal population variance is brought into question. If the value is above 0.05, there is no reason to doubt the assumption of equal population variances. If the result of Levine's test is significant ($p < 0.05$) one uses the results for the t-test for equality of means as *'equal variances not assumed'.* If Levine's test is not significant ($p > 0.05$) then one reads the results for the t-test for equality of means as, *'equal variances assumed'* (Aron et al., 2008). The results of Levene's test are reported and interpreted for each a-posteriori hypothesis tested and reported later in each of the results chapters. In the next section methods used to analyse the qualitative data are explained.

3.18 Qualitative data analysis methods

This section explains the process of qualitative data analysis. Four main considerations were important at the outset which influenced the analysis of the qualitative data. *First,* the qualitative component of the study was less-dominant and the purpose of the qualitative findings was to compliment the dominant quantitative data. *Second,* parallel mixed analysis was used in which both quantitative and qualitative data were analysed independent of each other. *Third,* data triangulation was used in the interpretation phase of the study in which the data were integrated to achieve complimentarity and to add additional insights about critical thinking in the undergraduate nursing curriculum, thus expanding this study. *Fourth,* the Delphi conceptualisation of critical thinking and derived constructs of the dispositions and skills of critical thinking identified by Facione (1990) guided the integration and interpretation of the qualitative and quantitative findings. Meanings identified in the qualitative data were checked for patterns and the theoretical explanations of the constructs of the dispositions and skills identified by Facione and Facione (2012, 2014) also assisted to guide this process. The process of qualitative data analysis required a sequence of processes from coding the data to the development of analytic categories and themes. Throughout the process of qualitative

data analysis a constant comparison method was used and this is explained in the next section.

3.18.1 Constant comparison method

A constant comparison method according to Bryman (2012, p. 568), 'enjoins the researcher constantly to compare phenomena being coded under a certain category so that a theoretical elaboration of the category can emerge'. The constant comparison method identified by Glaser and Strauss (2008, p. 105) in the context of grounded theory has four stages: comparing incidents applicable to each category which involves; *coding of data, integration of categories and properties; delimiting the theory and writing the theory.* In this study the qualitative component was less-dominant and complimentary to the dominant quantitative component. The purpose was to integrate the qualitative findings to provide insights about critical thinking in the undergraduate nursing curriculum. With this in mind the first two steps of the constant comparative method, coding of data and integration of categories and properties was used. To achieve the first step each recorded interview was transcribed and codes were used to identify the data and the process is explained next.

3.18.2 Coding of the qualitative data

The first step in the qualitative data analysis process was *transcription.* Audio recordings of participant's interviews were transcribed verbatim. Each transcribed interview was then read through while listening to the audio recording and this was to confirm that transcribed text was a verbatim transcription of each recorded interview. A constant comparison method was used from an interpretative perspective to uncover meaning from the data (Berg, 2009). The aim was to find the meaning of the participant's view, or what Creswell (2013, p. 96) identifies as, an *'emic'* perspective, as opposed to my view as the researcher or *'etic'* perspective about critical thinking According to Berg (2009) both manifest or surface messages and latent or deeper interpretation can be used. The process of constant comparison of content and categories emerging from the transcribed data refined the emergent categories and themes. While the constant comparison method was an on-going process data coding or indexing was fundamental to the construction of categories and themes.

The second step in the analysis of the qualitative data was the *use of codes to identify the data* and according to Bryman (2012, p. 568), 'data are broken down and given names'. According to Bryman and Burgess (1994) a form of *indexing* is required, sometimes referred to as *coding*, which involves the principle of *'cut and paste'* in which chunks of speech are coded and cut out of the transcript or marked on the computer file and pasted with similar items under a category or topic heading, so that like is with like. I used the *'cut and paste'* method in Microsoft word. I could have used NVIVO as a method of organising the data but I decided to undertake the process using a *'cut and paste'* method as I felt more comfortable with this approach for two main reasons, one, I was new to the process of qualitative data analysis and two, I wanted to experience the manual process as opposed to using an electronic method. Each transcript was coded by writing key words and phrases on an expanded margin in each of the transcripts to identify segments of the data until the entire transcript was coded. In the coding process I coded segments of the transcribed data as *units of analysis* to provide meaning. According to Bryman and Burgess (1994) it is more usual to index complete segments of meaning (sentences or paragraphs) which can often be organized around responses to questions.

The approach to coding was that identified by Berg (2009) as both *open and axial coding*. Open coding was used in the first stage of the analysis to identify and account for the data. Open coding involved the attachment of labels as annotations or *'concepts'* to words and themes derived from phrases and sentences as units of analysis derived from the content of the transcriptions (Berg, 2009; Bryman, 2012; Flick, 2006). *The process of open coding generated 810 coded pieces of data* as *segments for the first year interviews, 790 for the third year interviews, and 1,358 for the lecturer's interviews (Appendix 26).* The coded data provided segments of data from which analytic categories were constructed using *axial coding.*

3.18.3 Development of analytic categories and themes

In the second stage of the coding process axial coding was used to organise and reduce the coded data into categories. Data were further organized and reduced using *axial coding* in which coded units of data were categorised and as Bryman (2012, p. 569) states, 'data are put back together in new ways after open coding, by making connections between categories'. Categories may be built around responses to

questions (Bryman & Burgess, 1994) or central themes (Berg, 2009). To reduce the total open codes for each group of participants using axial coding the topics explored using the interview schedules provided an organising category.

The process of categorisation was also facilitated by *axial coding* and the use of the topics explored as organising categories. According to Arskey and Knight (1999, p. 167), 'having organized the data through indexing (coding) the next step is to search for all the information about a particular topic or theme that has been indexed under the same code'. This step involved the *'cut and paste method'* during which coded or indexed data with the same code was *'cut'* and then *'pasted'* into a category. During this process it was important to ensure that each piece of data could be traced back to the transcript. To ensure this each piece of data cut was identified with a unique code. The coding in the case of the nursing students was: year, topic explored identified as a question and student numeric code. For example: *year one, question three student one was: Y1Q3S1.* For the lecturers the coding used was lecturer one, question one and a numeric code. For example: *L1Q11.0.* As explained above the topics explored using the topic guides provided an organizing category or axial codes around which to organize the large volume of coded segments of data.

The following is a description of the steps in the data analysis process and how the categories emerged from the data. Relevant documents are included in the appendices with shaded areas to delineate the process and show how the categories and emergent themes were developed. The steps of the process can also be traced backwards from the themes to the raw data and delineate the *'audit process'* and the *'audit trail'* necessary for confirmability to determine trustworthiness of the findings as described earlier in this chapter. The process described here is the *'audit process',* along with the *'audit trail'* for the interviews with ten first year undergraduate nursing students. The process was similar for the analysis of the interviews with the third year nursing students and for the lecturers' interviews.

An examination of the topic guide in Appendix 20 identifies nineteen topic areas which were explored with the undergraduate nursing students and each topic constituted the views of ten nursing students. For example, topic five (shaded in grey) explored *'critical thinking skills'.* Critical thinking skills constituted an axial code around which the open

coded data from the ten first year informants' transcripts was organised. In the process of organisation of the data all of the coded data from the ten informant's transcripts related to the topic five, *critical thinking skills,* was cut and pasted into a separate document with codes as identified above to trace the cut and pasted segments of data. Appendix 27 shows a sample of the raw data (shaded in grey) for student one and student two with the open codes in relation to topic five: *'critical thinking skills'.* Axial coding facilitated the organisation and reduction of the data into broad categories. The process involved *constant comparison* of the segments of data which further refined the categories. Appendix 28 shows seven emergent analytic categories identified by pink shading as well as their constitution using open coded segments of data traceable back to each transcript. At first these categories and their labels were tentative and the categorised data was read over and over using the constant comparative method to constantly compare and confirm the categories and their labels. Identification of the categories was determined by the data in the category and category labels emerged from the data as opposed to an imposed category in which data would be forced to fit a category. Coded data which did not fit a category was removed and re-categorised under a new category. At first this coded data was placed in a category identified as *'other'.* As I constantly compared the categories I began to see a fit between what at first seemed to be *'other'* data and this further reduced and refined the categories. The process of constant comparison, categorising and re-categorising continued until all of the data for a set of transcripts for each cohort of nursing students and for the nurse lecturers was categorised and accounted for. Open and axial coding was conducted for all the topics explored in the topic guide. Figure 3.6 outlines the steps in data organisation and reduction.

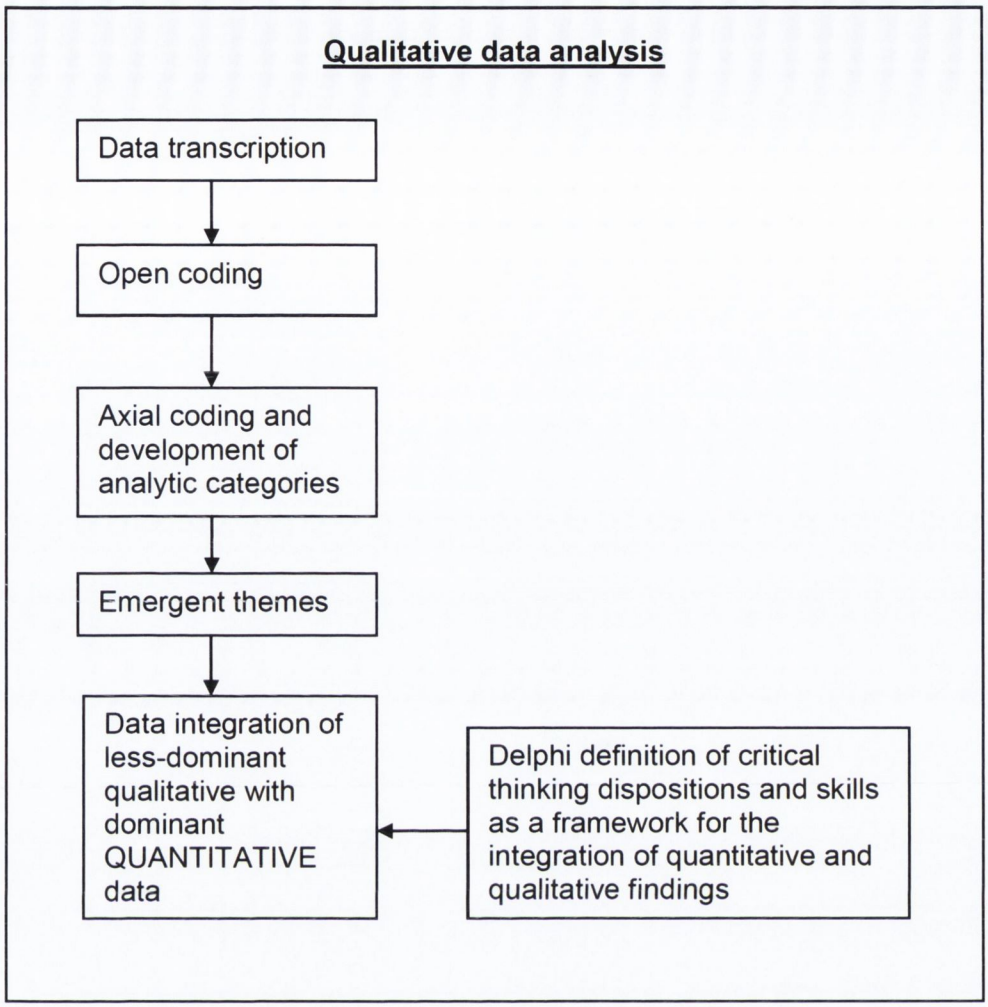


Figure 3.6 Steps in qualitative data analysis

The process of open and axial coding facilitated data organisation and reduction. Appendix 26 shows the count for the emergent categories and themes for the entire data set for the first and third year nursing students as well as for the nurse lecturers. The 810 coded segments of data for the first year interviews were reduced to 75 categories. Further analysis of the emergent categories resulted in the reduction of the 75 categories to 12 emergent themes. The twelve emergent themes for the first year undergraduate nursing students and their structure are shown in Appendix 29. Theme four, '*critical thinking skills'* with its categories (shaded in pink) can be traced back to the table in Appendix 30 which identifies its emergence from the categories (also shaded in pink). The constant comparison method, open and axial coding and data reduction was also conducted with the interview data for the ten third year nursing

students and eight nurse lecturers. The themes and their structure for the third year nursing students and the lecturers are shown in Appendices 31 and 32, respectively.

Analytic categories and emergent themes which indicate data reduction for the first year and third year nursing students as well as the lecturers is shown in Appendix 26. For example, in the case of the nurse lecturers, 54 analytic categories were reduced to nine main themes and the nine themes are shown in Appendix 32. Themes emerged across the categorised data and grounded in the entire data set for a group of informants interviewed as opposed to a set of responses to an individual topic or question. According to Braun and Clarke (2006, p. 15), 'thematic analysis involves searching across a data set to find repeated patterns of meaning'. Such an approach confirms a theme across the data set as opposed to data centred on a single topic. The individual topic or question explored facilitated axial coding for the organisation of the qualitative data set. The emergent themes constituted the qualitative findings for integration with the quantitative data sets.

Following the development of the themes the next step in the data analysis process was to interpret the findings. The findings were interpreted in context of critical thinking as the main case in this study. The qualitative component was less-dominant and complimentary to the dominant quantitative component. Quantitative and qualitative findings were merged and the less-dominant qualitative findings were integrated with the quantitative findings. It was not feasible to include all of the emergent themes in the integration of the findings as it was beyond the scope of this thesis. Data triangulation was used to integrate the data and this process is explained in the next section. The theoretical framework for this study had the Delphi theoretical statement of critical thinking and the derived constructs of the dispositions and skills of critical thinking identified by Facione and Facione (2012, 2014) as core components and this framework also facilitated data integration.

It became evident that the student's descriptions tended to reveal evidence of the dispositions and skills identified by Facione and Facione (2014) and Facione and Facione (2012), respectively. *Evidence of this consistency in the data analysis began to confirm the constructs measured using the critical thinking tests and led to convergence of the quantitative and qualitative data to achieve complimentarity.* The

convergence of the data also provided an expanded dimension about critical thinking as the main case in this study. Of significance was the evidence of data to support the dispositions or *'habits of mind'* more so than the skills of critical thinking and this is discussed in the findings chapters. While the integration of the quantitative and qualitative data was guided by the Delphi constructs as the theoretical framework data triangulation was also used and the model used and the process is explained in the next section.

3.18.4 Data triangulation

The method and the model of triangulation as well as the application of triangulation to integrate the data sets are explained in this section. Four types of triangulation are: *methodological triangulation, data triangulation, investigator triangulation and theoretical triangulation* (Arskey & Knight, 1999; Denscombe, 2012; Denzin, 1970). According to Jick (1979, p. 604) these four methods of triangulation are underpinned by one basic assumption in that the effectiveness of triangulation rests on the premise that, 'the weaknesses in each single method will be compensated by the counter-balancing strengths of another'. *Data triangulation* was used to integrate the quantitative and qualitative data sets in this study. Each set of data had different strengths and weaknesses and when integrated using data triangulation provided a perspective on critical thinking beyond either set of data independently. There were seven sets of data for integration which included; two sets of quantitative data for critical thinking dispositions and two sets for critical thinking skills for each of the first and third year cohorts as embedded units of analysis. The qualitative component consisted of a set of qualitative data for each of the first and third year undergraduate nursing students, and a set of qualitative data for the nurse lecturers.

Three models for the application of triangulation are identified by Erzberger and Kelle (2003); *mutual validation or convergence, complementarity* and *divergence*. In the complimentarity model of triangulation findings which are neither convergent nor divergent supplement each other and as such complement each other thus providing different perspectives of a broader and deeper nature about a phenomenon (Erzberger & Kelle, 2003, p. 469). The complimentarity model of triangulation was used to integrate the data sets to supplement each other in a complimentary way, thus providing different perspectives of critical thinking as the main case. Erzberger and

Kelle (2003, p. 485) state that, 'whether certain empirical results can be regarded as convergent, complimentary or divergent clearly depends on the chosen theoretical framework'. The Delphi definition and the derived meaning of the constructs of critical thinking dispositions and skills identified by Facione and Facione (2012, 2014) provided a theoretical framework to guide the integration of findings.

Erzberger and Kelle (2003, p. 469) state that the process of data triangulation requires the use of three forms of reasoning in the form of, '*induction, deduction, and abduction or retro-deductive inference'*. Engagement in these processes requires working at both a theoretical and an empirical level and Erzberger and Kelle (2003, p. 463) also state that, 'the production of scientific knowledge always requires the connection between theoretical and empirical knowledge'. The implication for this study was that the Delphi definition of critical thinking (Facione, 1990) provided a theoretical statement of the ideal critical thinker at one level while the quantitative and qualitative data provided empirical knowledge at a lower level and both levels of knowledge were related to each other. The integration of the qualitative and quantitative findings and the inferences drawn were achieved by the process of data triangulation.

Erzberger and Kelle (2003, p. 484) suggest the use of *'maps'* to show the links between theory or concepts at a higher level and empirical findings at a lower level connected with lines, continuous or broken, to indicate links and their strengths as statements about relationships. Figure 3.7 shows the relationship of the Delphi statement of critical thinking at a theoretical level and the empirical sets of quantitative and qualitative data at a lower level. The connecting lines show the relationships between the different levels thus depicting data triangulation. The continuous and broken lines identify the strength of the links between the less-dominant qualitative data and the dominant quantitative data and with the Delphi constructs at a theoretical level. The quantitative and qualitative results at the empirical level permitted interpretations about critical thinking in context of the Delphi construct and derived meaning of the constructs of critical thinking dispositions and skills at the theoretical level. The quantitative findings confirmed the dispositions and skills of critical thinking in the undergraduate nursing students and the integrated qualitative descriptive findings converged to provide rich descriptions about the students' perspectives of the

dispositions and skills of critical thinking. Findings for the perceptions of the nurse lecturers provided knowledge about critical thinking in the nursing curriculum.

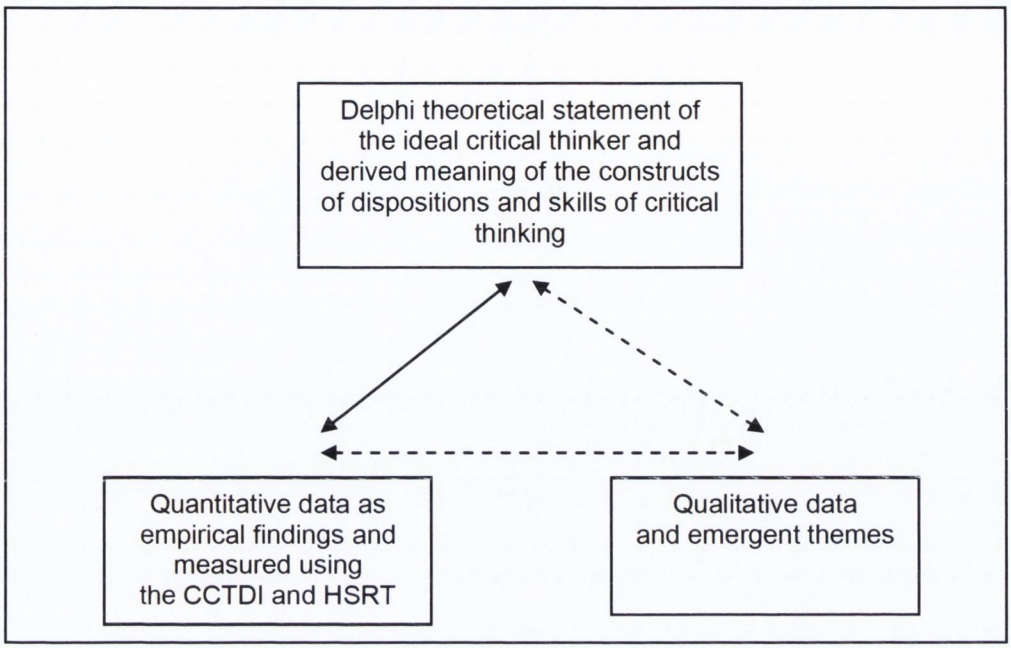


Figure 3.7 Triangulation metaphor showing theoretical and empirical levels of knowledge for critical thinking

Data triangulation and the complimentarity model of triangulation expanded this case study with the integration of qualitative findings from both the student's and the lecturer's perspectives about critical thinking in the undergraduate nursing curriculum. The integration of findings led to what Teddlie and Tashakkori (2009, p. 338) identify as, meta-inferences in which conclusions were drawn from the integration of both quantitative and qualitative data. The theoretical framework with the theoretical statements of the dispositions and skills focused the integration of the quantitative and qualitative findings and provided meaning in the integration of the data. Findings from the integration of the quantitative and qualitative data are discussed later in Chapters 10, 11, and 12. The theoretical framework which guided this study and the integration of the data is described in the next chapter. Before concluding this methodology chapter and of utmost importance are ethical principles which guided this study.

3.19 Ethical principles

Ethical principles are of paramount importance to the standards of research and to the protection of both the researcher and the study participants. The principles of ethics in

research are grounded in the Nuremberg Code formulated in 1947 following the Nazi atrocities of World War Π and which according to Shuster (1997, p. 1436), 'is the most important document in the history of the ethics of medical research'. Ethics in research is also underpinned by codes of ethical practice which stem from the Geneva Declaration and the Helsinki Declaration (Ryen, 2011, p. 418). The *Helsinki Declaration,* grounded in the Nuremberg Code, was adopted by countries engaged in health research and includes important principles of consent, benefit to society, avoidance of all unnecessary injury and harm, protection of participants and freedom to withdraw for the research at any time (Newell & Burnard, 2006). The principles of these international codes have influenced ethical codes of practice in relation to the conduct of research at all levels. At the outset of a research study a review of the proposed study is necessary to protect participants and this is the responsibility of institutional review boards (Creswell, 2003; Teddlie & Tashakkori, 2009). In relation to this study ethical approval was granted from three ethics review committees at the two university sites where the study was conducted (Appendices 9,10 & 11). While ethical approval was granted it was of utmost importance that I conducted this study in an ethical way, mindful at all times of the need for beneficence, *'to do good'* and non-maleficence *'to do no harm.'* To achieve this it was important that I upheld the principles of; *informed consent, confidentiality and anonymity, trust, justice, and avoidance of adverse outcomes.*

Informed consent according to Teddlie and Tashakkori (2009, p. 199) refers to a participant's agreement to participate in a research study, with explicit understanding of the risks involved. All the participants in this study were adults form non-vulnerable groups with the freedom to participate in the study without coercion. All of the participants were fully informed both verbally and by written information in an information sheet (Appendix 13). Participants were given at least seven days to decide to participate in data collection. Informed consent meant participants completed a consent form at the time of data collection (Appendix 15). An important aspect of informed consent according to Silverman (2011, p. 418) is 'the right to withdraw at any time'. Participants in this study were aware of their right to withdraw at any time. Some participants declined and interview after recruitment due to other work and study commitments and this right was respected.

The principles of *beneficence and non-maleficence* were also maintained through justice, confidentiality and anonymity. *Confidentiality* according to Silverman (2011, p. 419) means that the researcher is obliged to protect the participant's identity, the place and the location of the research. The principles of confidentiality and anonymity were achieved in that participants remained anonymous and this was achieved by ensuring that participants' names did not appear on data collection instruments. Numerical codes were used to identify instruments for statistical analysis. All documentation used in relation to the quantitative component of the study was carefully administered and collected and checks were done after testing to ensure this. Participant's names were not used on the transcriptions and again numerical codes were used. Participant's names were not used in the audio recordings and both audio recordings and transcriptions were only accessible to me as the sole researcher. Confidentiality and anonymity also applied to computer data. Transcribed audio-tapes were stored on a compact disc to avoid storage on a personal computer. This ensured safe storage and avoided any unauthorised person from having access to them. Data was not kept on a memory key in case of loss. Audio-tapes, compact discs and master copies of transcribed data were kept in a locked cabinet and I was the only person with access. All data was pass word protected.

The principle of *trust* was an important ethical concern in this study. Trust is recognised as essential for qualitative research and Silverman (2011, p. 419) states that trust refers to the relationship between the researcher and the participants. The voluntary nature of participation and the willingness of the participants to participate in the study indicated a level of trust between me as the researcher and the participants. Participants were treated in a fair and just way and *justice* was upheld in that, participation was voluntary and of their own free will once they had been provided with both verbal and written information.

A final issue was the need to *avoid harm* of a psychological nature in terms of stress, self-esteem or legal harm. According to Neuman (2011, p. 146) a sensitive researcher is aware of harm to a person's self-esteem and that researchers should never create unnecessary stress in participants. The focus of this research study was critical thinking and it was not a topic which was sensitive, embarrassing or upsetting in nature. I was available at all stages of data collection in the event that any issue would

arise which would have caused any concern for a participant or a gate keeper during the data collection process. This study was completed without any adverse events and the ethical principles to *'do good'* and to avoid harm *'non-maleficence'* were upheld by ensuring the principles of informed consent, confidentiality, anonymity, trust and justice were upheld. These are the fundamental principles of the Nuremberg Code, the Geneva Declaration and the Helsinki Declaration for ethical practice in research. While every effort was made throughout this study to ensure that the findings are truthful and reflect the aims of this study there are some limitations which require to be addressed.

3.20 Limitations of the study

Limitations of this study are identified in this section and are influenced by the nature of the study design that was used. A single embedded case study approach was used and the findings are generalized to critical thinking as the *main case* in the study. The findings of this study reflect critical thinking of the units of analysis investigated: first and third year undergraduate nursing students and lecturers in nursing. The following are the main limitations:

- This study addressed critical thinking in first and third year undergraduate nursing degree students as, *embedded units of analysis* and is limited in that respect. Critical thinking in second and fourth year nursing students was not investigated and the reason for this was explained earlier in Section 3.11.3 of this chapter.
- The study was conducted at two university sites and while it was appropriate to pool the sample the outcome may be perceived to be different if a larger sample was used at one site or if multiple sites had been used.
- The findings are limited to the participants and it is acknowledged that non-participants may have different dispositions, skills and perceptions in relation to critical thinking.
- An embedded case study approach incorporated a concurrent triangulation mixed methods strategy and if a sequential strategy had been used then the quantitative findings would have directed the qualitative component in a much more structured and guided way than the more, open orientation, used in the qualitative component of this study.

- The quantitative component of this study was the base method and dominant while the qualitative component was less-dominant and this limited the inclusion of all of the themes which emerged from the qualitative data thus limiting the scope of this study to the themes that were integrated.
- This study is limited to the undergraduate nursing curriculum as the context and the temporal issues which bounded this single embedded case study were identified earlier in Section 3.6.6
- During the collection of the qualitative data I was an *'insider'*, and as such, this may be considered as biased. An *'outsider'*, may have influenced a different perspective in relation to the collection of the qualitative data. The influence of insider-outsider perspective impacts on the knowledge claims in relation to bias. However, rigorous efforts were made to establish the trustworthiness of the findings in this study.
- Member checking was limited to validation of transcribed data. Had I used additional methods, such as a focus group to validate and confirm the data, then, this would contribute further to trustworthiness of the qualitative findings. This was not done in this case study as the qualitative component was less-dominant and integrated with the dominant quantitative findings. Validation of the transcribed data through member checking was used to confirm the data.
- The topic guides may be considered broad in focus and in hindsight a more limited topic guide would have permitted further depth.
- I was a novice in using mixed methods and its incorporation into a single embedded case study approach. Despite this, the principles and strategies of case study and mixed methods research design were rigorously applied to ensure threats to reliability and validity were eliminated.

While these limitations are relevant, the main strength of this study lies with the efforts that were made to ensure that the data from which the findings and conclusions were made were obtained and reported in a truthful and honest way. This was achieved by using tests of critical thinking with established reliability and validity. Careful and thorough documentation of an *audit trail* and an *audit process* served to establish trustworthiness of the qualitative findings.

3.21 Conclusion

This chapter explained the research methodology used to investigate critical thinking as the main case using a single embedded case study approach. The epistemological, ontological and axiological underpinnings of pragmatism were included as they underpinned the investigation using mixed quantitative and qualitative research questions. Quantitative data was collected using two tests with established reliability and validity which measured critical thinking dispositions and skills. Qualitative data was collected using semi-structured interviews and the methods used to establish trustworthiness were explained. While the qualitative component of the study was less-dominant every effort was made to ensure the methods to establish trustworthiness were rigorous and an audit process and audit trail is documented. The approach to data analysis was guided by case study strategies and techniques, as well as the principles for the analysis of mixed method data using parallel mixed analysis. Data triangulation and the complimentarity model of triangulation in context of the Delphi theoretical statement as a theoretical framework facilitated the integration of the quantitative and qualitative data. Ethical principles which underpinned the study were also explained. The application of the methods explained in this chapter explored critical thinking as the main case and defined in context of the Delphi conceptualisation of critical thinking. In the next chapter the Delphi conceptualisation and the derived constructs of dispositions and skills of critical thinking which formed the theoretical framework is explained.

Chapter 4 Theoretical Framework

4.1 Introduction

This chapter explains the theoretical framework which underpinned and provided a framework for this study. The first section of the chapter explains the purpose of a theoretical framework. The components of the theoretical framework are explained using a model to show the various components and their relationships. The Delphi conceptualisation of critical thinking and the derived constructs of dispositions and skills identified by Facione (1990), core to theoretical framework, are also explained.

4.2 Theoretical framework

A theoretical framework is defined by Neuman (2011, p. 85) as, 'a very general theoretical system with assumptions, concepts and specific social theories'. This definition identifies a theoretical framework as general and with scope to take account of assumptions, concepts and specific theories which inform and guide a research study. Theoretical frameworks are according to (Neuman, 2011, p. 85), 'at the widest range and the opposite extreme from empirical generalizations'. As a theoretical framework may include a theory or theories it serves to frame a study or provide what (Creswell, 2003, p. 120) identifies as, *a theoretical perspective,* and he identifies the purposes of a theoretical perspective as useful to identify the concepts/constructs/ or variables of interest in a research study. It shows the orientation of the variables of interest. It shows the relationship of the independent variable and the dependent variable.

The definition and purposes of a theoretical framework explained above by Neuman (2011) and Creswell (2003) informed the theoretical framework used in this research study. The theoretical framework for this study provided a structure to identify the components as well as the constructs of interest and also demonstrated the relationship of the components and constructs to each other. The theoretical framework and the relationships between the components are shown in Figure 4.1. The broken arrows represent the direction and tentative interaction and relationships between the various components to represent a dynamic theoretical framework.

The components of the theoretical framework shown in Figure 4.1 informed this study in the following ways; *first,* it identified the constructs or variables of interest which were the main focus. The Delphi conceptualization of critical thinking identified by Facione (1990) provided a theoretical conceptualisation of the ideal critical thinker. The constructs of critical thinking dispositions and skills derived from the Delphi conceptualisation provided meaningful and measurable constructs embedded in the Delphi conceptualisation of critical thinking. *Second,* studies explored in the literature review provided existing empirical data for the interpretation and understanding of the findings from this study. *Third,* the theoretical framework assisted to delineate the research questions in context of critical thinking as the main construct of interest and the main case in this study. The quantitative research questions focused the investigation of critical thinking dispositions and skills and formed the dominant component in this study. The qualitative research questions focused the investigation of the perceptions of the undergraduate nursing students as well a nurse lecturers about critical thinking as the less-dominant component of this study. *Fourth,* the theoretical framework provided for a deductive approach through the use of empirical measures of the dispositions and skills of critical thinking. An inductive approach underpinned the qualitative component of this study. *Fifth,* the theoretical framework enabled the use of a case study approach to investigate the quantitative and qualitative research questions. *Sixth,* the constructs of critical thinking dispositions and skills provided a framework which guided data analysis and more importantly the merging of the quantitative and qualitative data during the phase of integration. To expand the theoretical framework further it is necessary to explain the theoretical meaning of the Delphi constructs of the dispositions and skills of critical thinking as core constructs central to this study. In the following sections the Delphi conceptualisation of critical thinking is explained first and this is then followed by explanations of the constructs of the dispositions and skills of critical thinking.

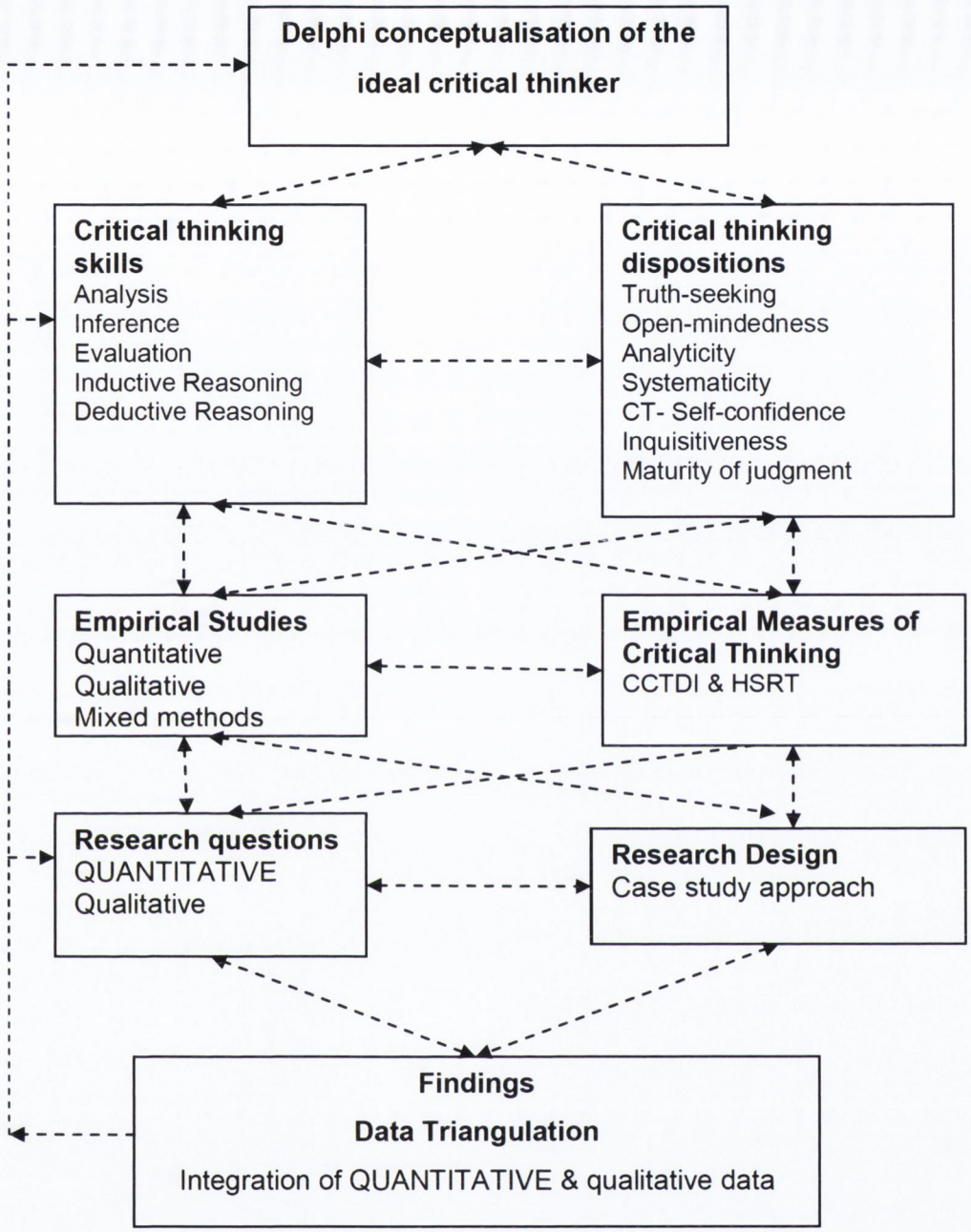


Figure 4.1 Components of the theoretical framework and their relationships

4.3 The Delphi consensus statement of critical thinking

This section explains the Delphi consensus statement of critical thinking which provided the core and main construct of the theoretical framework in this research study. In December 1987 the Committee on Pre-College Philosophy of the American

Philosophical Association instigated a systematic inquiry into critical thinking and critical thinking assessment (Facione, 1990). The qualitative approach known as the *Delphi method* was used and consisted of six rounds of questioning from February 1988 to November 1989. *The Delphi panel consisted of forty six experts (N=46) in critical thinking across the United States of America and was constituted as follows; Philosophy, 52%, Education 22%, Social Sciences 20%, and Physical Sciences 6%* (Facione, 1990, p. 34). The outcome of the Delphi inquiry resulted in the achievement of a consensus statement on critical thinking and the ideal critical thinker. The Delphi expert theorists consider critical thinking as:

> purposeful, self-regulatory judgement which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgement is based. CT is essential as a tool of inquiry. As such, CT is a liberating force in education and a powerful resource in one's personal and civic life. While not synonymous with good thinking, critical thinking is a pervasive and self-rectifying human phenomenon. The ideal critical thinker is habitually inquisitive, well informed, trustful of reason, honest in facing personal biases, prudent in making judgements, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and circumstances of inquiry permit. Thus, educating good critical thinkers, means working towards this ideal. It combines developing CT skills, nurturing those dispositions which consistently yield useful insights and which are the basis of a rational and democratic society. (Facione, 1990, p. 3)

According to Facione (1990, p. 6) *'the experts'* purpose in putting the *ideal* before the education community was for it to serve as a rich and worthy goal guiding critical thinking assessment and curriculum development at all educational levels'. This conceptualisation of critical thinking provided the core theoretical construct for the investigation of critical thinking in this study. A conceptual definition according to Neuman (2011, p. 201) is a statement of an idea in your head in specific words or theoretical terms that are linked to other ideas or constructs. Two sets of constructs derived from the Delphi consensus statement are *skills* and *dispositions* of critical thinking (Facione, 1990). These two sets of constructs also formed core components of the theoretical framework and informed the integration of the quantitative and qualitative findings during the integration phase of this study. An explanation of the

Delphi constructs of critical thinking is necessary to gain an understanding of the meaning of the constructs. An understanding of the meaning of the Delphi constructs provides the theoretical knowledge to understand and interpret the findings in this study.

4.4 Critical thinking dispositions

Seven constructs derived from the Delphi study conceptualisation of critical thinking provided a perspective on the disposition towards critical thinking in individuals. According to Facione (1990) in addition to possessing critical thinking skills the good critical thinker can be characterized by certain affective dispositions or *'habits of mind'. The majority of the experts (61%) in the Delphi study (N=46) regarded the dispositions as a component of the conceptualisation of critical thinking (Facione, 1990, p. 25). There was also a consensus among 83% of the experts that good critical thinking can be characterized as exhibiting these dispositions (Facione, 1990).* Each of the seven dispositions of critical thinking described here can be measured using the California Critical Thinking Disposition Inventory (CCTDI) (Facione et al., 2014, 18). The seven dispositional constructs which provided a core component of the theoretical framework and explained here are; *truth-seeking, open-mindedness, analyticity, systematicity, critical thinking self-confidence, inquisitiveness* and *maturity of judgment.*

4.4.1 Truth-seeking

Truth-seeking is the habit of always desiring the best possible understanding of a situation; it involves following reasons and evidence wherever they may lead, even if they lead one to question cherished beliefs. Truth-seekers ask hard, sometimes even frightening questions; they do not ignore relevant details, they strive not to let bias or preconception to colour their search for knowledge and truth. The opposite of truth seeking is bias which ignores good reasons and relevant evidence in order not to have to face difficult ideas (Facione et al., 2014, p. 18).

4.4.2 Open-minded

Open-minded is the tendency to allow others to voice views with which one may not agree. Open-minded people act with tolerance towards the opinions of others, knowing that often we all hold beliefs which make sense from our own perspectives. Open-

mindedness, as used here, is important for harmony in a complex and pluralistic society where people approach issues from different religious, political, social, family, cultural and personal backgrounds. The opposite of open-mindedness is closed-mindedness and intolerance for the ideas of others (Facione et al., 2014, p. 18).

4.4.3 Analyticity

Analyticity, also described as fore-sight-fullness, is the tendency to be alert to what happens next. It is the habit of always striving to anticipate both the good and the bad, potential consequences or outcomes of situations, choices, proposals and plans. The opposite of analyticity is being heedless of consequences, not attending to what happens next when one makes choices or accepts ideas uncritically (Facione et al., 2014, p. 18).

4.4.4 Systematicity

Systematicity is the tendency or habit of striving to approach problems in a disciplined, orderly and systematic way. The habit of being disorganized is the opposite characteristic to systematicity. The person who is strong in systematicity may or may not know or use a given strategy or any particular pattern in problem solving, but they have the mental desire and tendency to approach questions and issues in an organized way (Facione et al., 2014, p. 18).

4.4.5 Critical thinking self-confidence

Critical thinking self-confidence is the tendency to trust the use of reason and reflective thinking to solve problems is reasoning self-confidence. This habit can apply to individuals or to groups; as can the other dispositional characteristics measured by the CCTDI. We as a family, team, office, community or society can have the habit of being trustful of reasoned judgment as the means of solving our problems and reaching our goals. The opposite is the tendency to be mistrustful of reason, to consistently devalue or be hostile to the use of careful reason, and reflection as a means to solving problems or discovering what to do or what to believe (Facione et al., 2014, p. 18).

4.4.6 Inquisitiveness

Inquisitiveness is intellectual curiosity. It is the tendency to want to know things, even if they are not immediately or obviously useful at the moment. It is being curious and eager to acquire new knowledge and to learn the explanations for things even when the applications of that new learning are not immediately apparent. The opposite of inquisitiveness is indifference (Facione et al., 2014, p. 18).

4.4.7 Maturity of judgment

Maturity of judgment or cognitive maturity is the tendency to see problems as complex, rather than black and white. It is the habit of making a judgment in a timely way, not prematurely, and not with undue delay. It is the tendency of standing firm in one's judgment when there is reason to do so, but changing one's mind when that is the appropriate thing to do. It is prudence in making, suspending or revising judgment. It is being aware that multiple solutions may be acceptable while appreciating the need to accept closure in certain circumstances even in the absence of complete knowledge. The opposite, cognitive immaturity, is characterised by being imprudent, black- and-white thinking, failing to come to closure in a timely way, stubbornly refusing to change one's mind when reasons and evidence would indicate one is mistaken, or foolishly revising one's opinions willy-nilly without substantial reason for doing so (Facione et al., 2014, p. 18). Critical thinking dispositions formed a component of the theoretical framework and the above theoretical explanations provided for the interpretation of the findings. Critical thinking skills also formed a component of the theoretical framework and the theoretical explanations are explained in the next section.

4.5 Critical thinking skills

The Delphi panel of experts identified and achieved consensus on six critical thinking skills. The core skills about which the experts (N=46) were unanimous were, *analysis, inference* and *evaluation* (> 95%) as well as *interpretation, explanation* and *self-regulation* (Facione, 1990, p. 9). Each of these six core skills can be seen as a construct of cognitive ability core to critical thinking and they also formed the basis of instruments used to measure the critical thinking skills dimension of critical thinking. Two such instruments are the California Critical Thinking Skills Test (CCTST) and the Health Sciences Reasoning Test (HSRT) (Facione et al., 2014). Both the CCTST and the HSRT measure the following constructs; *analysis, evaluation, inference, deductive*

reasoning, and inductive reasoning. While the CCTST has been used extensively to measure these constructs the HSRT is specifically focused with content aimed at health science students (Facione & Facione, 2012). Each of the five constructs as identified by (Facione & Facione, 2014, p. 21) are explained here and while forming a component of the theoretical framework they also provide the theoretical meaning of the skills of critical thinking.

4.5.1 Analysis

Analytical reasoning skills enable people to identify assumptions, reasons and claims, and to examine how they interact in the formation of arguments. People with strong analytical skills attend to patterns and details. They identify the elements of a situation and determine how these elements interact. Strong interpretation skills can support high-quality analysis by providing insights into the significance of what a person is saying or what something means (Facione & Facione, 2014, p. 21).

4.5.2 Inference

Inference skills enable us to draw conclusions from reasons and evidence. We use inference when we offer thoughtful suggestions and hypotheses. Inference skills indicate the necessary or very probable consequences of a given set of facts and conditions. Conclusions, hypotheses, recommendations or decisions that are based on faulty analyses, misinformation, bad data or biased information can turn out to be mistaken, even if they have been reached using excellent inference skills (Facione & Facione, 2014, p. 21).

4.5.3 Evaluation

Evaluative reasoning skills enable us to assess the credibility of sources of information and the claims they make. We use these skills to determine the strength or weakness of arguments. Applying evaluation skills we can judge the quality of analyses, interpretations, explanations, inferences, options, opinions, beliefs, ideas proposals, and decisions. Strong explanation skills can support high-quality evaluation by providing the evidence, reasons, methods, criteria, or assumptions behind the claims made and the conclusions reached (Facione & Facione, 2014, p. 21).

4.5.4 Inductive reasoning

Decision making in contexts of uncertainty relies on inductive reasoning. We use inductive reasoning skills when we draw inferences about what we think must probably be true based on analogies, case studies, prior experience, statistical analysis, simulations, hypotheticals, and familiar circumstances and patterns of behaviour. As long as there is the possibility, however remote, that a highly probable conclusion might be mistaken, the reasoning is inductive. Although it does not yield certainty, inductive reasoning can provide a solid basis for confidence in our conclusions (Facione & Facione, 2014, p. 21).

4.5.5 Deductive reasoning

Decision making in precisely defined contexts where rules, operating conditions, core beliefs, values, policies, principles, procedures, and terminology completely determine the outcome depends on strong deductive reasoning skills. Deductive reasoning moves with exacting precision from the assumed truth of a set of beliefs to a conclusion that cannot be false if those beliefs are true. Deductive validity is rigorously logical and clear-cut. Deductive validity leaves no room for uncertainty, unless one alters the meanings of the words or the grammar of the language (Facione & Facione, 2014, p. 21).

The Delphi theoretical conceptualisation and the derived constructs of critical thinking dispositions and skills explained above formed core components of the theoretical framework. The theoretical explanations of the constructs of the dispositions and skills provided meaning for the interpretation of the findings in this study. Empirical research on critical thinking in nursing reported in the literature review further expanded the theoretical framework and also provided a knowledge base for the interpretation of the findings of this study in context of the existing body of empirical knowledge on critical thinking. The relationship of the theoretical constructs at an abstract level to the research findings at an empirical level is proposed through data triangulation to merge, integrate and interpret the findings using a complimenatrity model of data triangulation and this was explained earlier in Section 3.18.4 in the methodology chapter. The theoretical framework provided a structure for this investigation and it served to integrate the less-dominant qualitative findings with the dominant quantitative findings to expand this study. The theoretical framework can be considered as a dynamic

framework with the relationships between the components of the framework depicted in the connecting arrows in Figure 4.1, thus providing a unified framework to structure and inform this study. The theoretical framework also assisted to integrate the research questions to ensure consistency with the constructs measured. It also ensured that the research design was integrated and consistent with the research questions and the core constructs measured to achieve the aims of the study.

4.6 Conclusion

This chapter defined and explained the theoretical framework which underpinned and guided this investigation of critical thinking. It provided a model which depicted the components of the study and their integration and served to ensure there was consistency between core constructs of interest in relation to critical thinking, the research questions and the research design. It also provided scope for the integration and interpretation of the results. In the following chapters, five through to nine, the quantitative results for the dispositions and skills measured using the California Critical Thinking Disposition Inventory (CCTDI) and the Health Sciences Reasoning Test (HSRT) are presented. Later, in the discussion chapters, the theoretical meaning of the Delphi constructs of the theoretical framework explained above served to interpret the findings of this study.

Introduction to the results chapters

The quantitative results are presented in chapters five through to nine and address six quantitative research questions central to this study which investigated critical thinking in undergraduate general nursing students. Critical thinking dispositions were investigated using the California Critical Thinking Disposition Inventory (CCTDI). Critical thinking skills were investigated using the Health Sciences Reasoning Test (HSRT).

Chapters five and six present the results for the critical thinking dispositions and skills of the first year undergraduate nursing students.

Chapters seven and eight present the findings for the results of the critical thinking dispositions and skills of the third year nursing students.

Chapter nine presents the results for the differences in the critical thinking dispositions and skills of the first and third year nursing students.

There was a small cohort of nursing students undertaking the integrated children's and general strand in this study and it was important to assess if there was a difference in the critical thinking skills and dispositions of this sub-group. This was to ensure accurate and truthful findings for the critical thinking skills and dispositions of the first and third year nursing students. An independent samples t-test was used and the results are reported in chapters five through to nine. Assumptions of the independent samples t-test were explained in Chapter 3, in Section 3.17.6. Statistical findings specific to each *a-posteriori hypothesis* tested are explained in each of the results chapters. To interpret the results it is important to review the categories and score ranges for both the CCTDI and the HSRT in Chapter 3, Sections 3.8 and 3.10.

Chapter 5 Results for the Critical Thinking Dispositions of the First Year Undergraduate Nursing Students

5.1 Introduction

This chapter presents the results for the critical thinking dispositions of the first year cohort of undergraduate nursing students as measured using the California Critical Thinking Disposition Inventory (CCTDI) (Facione & Facione, 2014). The CCTDI derived from the Delphi construct of critical thinking measured the following dispositions: *truth-seeking, open-mindedness, analyticity, systematicity, critical thinking self-confidence, inquisitiveness and maturity of judgement as well as overall disposition to think critically* (Facione et al., 2014; Facione, 1990). The results presented answer the question which asked: *What are the critical thinking dispositions of first year undergraduate general nursing students as measured by the California Critical Thinking Disposition Inventory?*

In the *first section* of this chapter the demographic characteristics of the first year cohort of undergraduate nursing students are described. In the *second section*, results of an independent samples t-test are presented which explored the difference in dispositions between a sub-group of nursing students undertaking the *integrated children's and general nursing strand* and students undertaking general nursing only. As the integrated children's and general nursing students were a small group and part of the first year cohort it was important to confirm if they differed significantly from the general nursing students only. This was also to ensure that results would be an accurate reflection of the entire first year cohort of general nursing students. In the *third section,* results for the critical thinking dispositions are presented. In the *fourth section*, results for the critical thinking dispositions as a percentage proportion of the first year cohort of undergraduate nursing students are presented. A summary of the main findings is presented in the final section of this chapter. Findings for the critical thinking dispositions of the first year nursing students are integrated with the qualitative findings and discussed later in Chapter 10.

5.2 Demographic characteristics of the first year undergraduate nursing students

The demographic characteristics of the first year cohort of undergraduate nursing students are presented in this section. Frequency distribution Tables 5.1 to 5.8 show the results for each of the demographic variables. The response rate for the first year cohort who completed the California Critical Thinking Disposition Inventory (CCTDI) was 237. In relation to *gender* 96% (N=228) were female and 4% (N=9) were male. An analysis by *nursing discipline* revealed that 87% (N=206) were general nursing students and a smaller percentage of 13% (N=31) were undertaking an integrated children's and general nursing strand. In relation to *level of education* at entry 79% (N=188) did not have an academic qualification and were undertaking the nursing degree course as their first academic qualification. Five per-cent (5%; N=11) had a diploma and eight had a degree. Those with a degree were divided as 3% (N=7) with a primary degree and 0.4% (N=1) with a master degree which was the highest academic qualification of the first year cohort. Thirteen per-cent (13%; N=30) had an *'other'* qualification. The nature of the *'other'* qualification was a Higher Education and Training Award, which is a level six higher or advanced certificate award, above a level five or leaving certificate award and below level seven which is an ordinary bachelor degree award (National Qualifications Authority of Ireland, 2007).

Results in relation to *university site* revealed that 46% (N=110) were from university site one and 54% (N=127) were from university site two. Respondents were asked if they had completed a *thinking skills course* prior to entry and while the vast majority 95% (N=225) had not, a very small percentage of 5% (N=12) indicated they had undertaken a course to improve their thinking skills. Results in relation to ethnic origin revealed that the group were mainly Irish 92% (N=219) and a small percentage 8% (N=18) were of *'other'* ethnic origin. Results for age revealed that the youngest was 17 years, the oldest was 45 years and the mean age of the first year cohort was 20 (SD 4.30) (Table 5.7). Figure 5.1 shows the distribution for age. Age was re-coded into three categories 17-20, 21-25 and 26-45 (Table 5.8). These categories identified the younger from the older and more mature students.

In summary, the first year cohort of undergraduate nursing students was predominantly female (96%, N=228) undertaking a four year honours degree course in nursing. The

cohort was also predominantly Irish in origin and while there were mature entrants, those aged 26 and over (N=29), the cohort was mainly direct entrants from secondary school having completed their leaving certificate. Seventy eight per-cent (78%; N=186) were aged 20 years or younger (Table 5.8). In the next section results are presented for the critical thinking dispositions based on nursing discipline.

5.2.1 Frequency tables showing the demographic characteristics of the first year nursing students for the CCTDI

	Frequency	Percent	Valid Percent	Cumulative Percent
Female	228	96	96	96
Male	9	4	4	100
Total	237	100	100	

Table 5.1 Gender of the first year nursing students

	Frequency	Percent	Valid Percent	Cumulative Percent
General Nursing	206	87	87	87
Children's & General Nursing	31	13	13	100
Total	237	100	100	

Table 5.2 Nursing discipline of the first year nursing students

	Frequency	Percent	Valid Percent	Cumulative Percent
Diploma	11	5	5	5
Degree	7	3	3	8
Master Degree	1	0	0	8
None	188	79	79	87
Other	30	13	13	100
Total	237	100	100	

Table 5.3 Educational qualification of the first year nursing students

	Frequency	Percent	Valid Percent	Cumulative Percent
Site One	110	46	46	46
Site Two	127	54	54	100
Total	237	100	100	

Table 5.4 University site of the first year nursing students

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	12	5	5	5
No	225	95	95	100
Total	237	100	100	

Table 5.5 Thinking skills course completed by the first year nursing students

	Frequency	Percent	Valid Percent	Cumulative Percent
Irish	219	92	92	92
Other	18	8	8	100
Total	237	100	100	

Table 5.6 Ethnic origin of the first year nursing students

N	Valid	237
	Missing	0
Mean		20.19
Median		18.00
Mode		18
Std. Deviation		4.303
Range		28
Minimum		17
Maximum		45

Table 5.7 Statistics for age of the first year nursing students

	Frequency	Percent	Valid Percent	Cumulative Percent
17 - 20	186	78	78	78
21 - 25	22	9	9	88
26 - 45	29	12	12	100
Total	237	100	100	

Table 5.8 Age categories of the first year nursing students

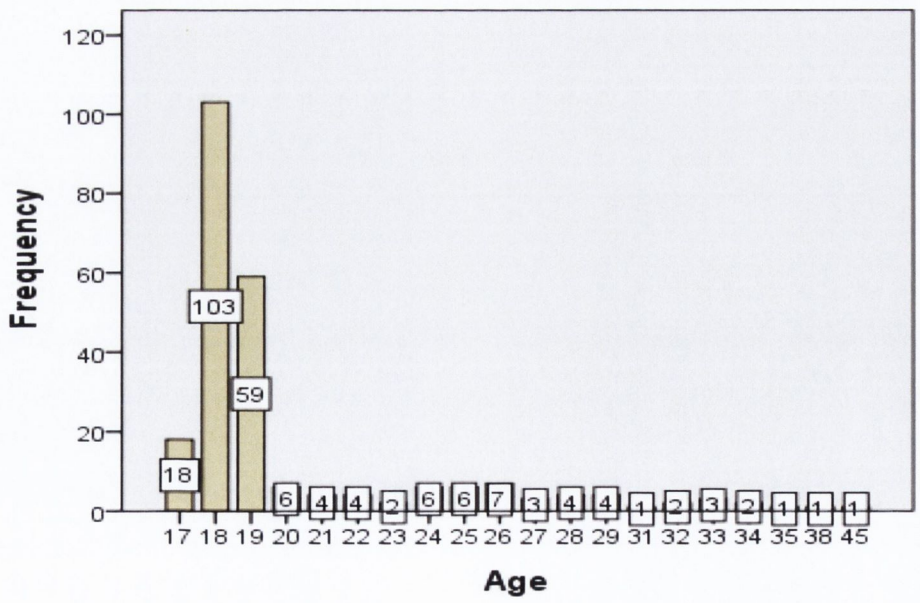


Figure 5.1 Bar chart showing age distribution of the first year nursing students

5.3 Critical thinking dispositions of the first year cohort of undergraduate nursing students by nursing discipline

5.3.1 Statement of hypothesis

In this section results are presented for the critical thinking dispositions of the first year cohort based on nursing discipline. The sample was made up of two subgroups and it was important to explore if the nursing students undertaking an integrated children's and general nursing strand (N=31) were different to the nursing students undertaking the general strand only in relation to disposition toward critical thinking. This was to ensure that the results for the critical thinking dispositions of the first year cohort would be accurate and truthful. To explore if there was a difference it was necessary to test the following hypothesis. *The hypothesis* was that there was a difference in the average critical thinking disposition subs-cale scores and overall disposition score for the general and the children's and general nursing discipline in the first year of the undergraduate nursing degree course. *The null hypothesis* was that there was no difference in the average critical thinking disposition sub-scale scores and overall disposition score for the general and the children's and general nursing discipline in the first year of the undergraduate nursing degree course. An independent samples t-test was used to test this hypothesis (Aron et al., 2008). Before testing it was necessary to assess the assumptions of; *independence, normal distribution* and *equality of variance in the population* to ensure that the results of the independent samples t-test were meaningful.

5.3.2 Assessment of assumptions of the independent samples t-test

In relation to the *assumption of independence* each group was independent and a respondent was in one group and one group only, thus, the assumption of independence was accepted. To test the *assumption of normality* or a normal distribution in the population, the Shapiro-Wilk test, as well as skewness and kurtosis was used and as explained, in the methodology chapter, in Section 3.17.6,. The results of the Shapiro-Wilk test revealed non-significant results for the dispositions of truth-seeking, open-mindedness analyticity, systematicity, and critical thinking self-confidence as well as overall disposition score and as such the assumption of normality was upheld (Table 5.9). A significant result was revealed for inquisitiveness and maturity of judgment and this indicated the assumption of normality was questionable for these variables. In this case skewness and kurtosis was used. The skewness values for inquisitiveness was -.390 and for maturity of judgment -.523 (Table 5.12).

These values were within the range of -2 to + 2 and as such skewness was not in the extreme and the assumption of normal distribution was upheld (Acton & Miller, 2009, p. 69). To test the third *assumption of homogeneity* of variance Levene's test of equality of variance was used and results read accordingly: *'equal variance assumed'* or *'equal variance not assumed'*. These results of Levene's test are shown in Table 5.11. Based on the assessment of the assumptions of independence, normality and equality of variance the results of the independent samples t-test as a parametric statistical test were accepted as meaningful and accurate.

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Truth-Seeking	.042	237	.200*	.995	237	.557
Open-mindedness	.069	237	.009	.992	237	.227
Analyticity	.046	237	.200*	.992	237	.245
Systematicity	.042	237	.200*	.995	237	.677
Critical Thinking Self Confidence	.048	237	.200*	.993	237	.307
Inquisitiveness	.072	237	.004	.984	237	.010
Maturity of Judgment	.064	237	.021	.981	237	.002
Total CCTDI Score	.048	237	.200*	.996	237	.865

a. Lilliefors Significance Correction

*. This is a lower bound of the true significance.

Table 5.9 Tests of normality for the critical thinking dispositions of the first year undergraduate nursing students

5.3.3 Average scores for critical thinking dispositions of the first year nursing students by nursing discipline

Table 5.10 shows the average scores for the two disciplines in the first year cohort. The smaller subgroup undertaking an integrated children's and general nursing strand revealed higher mean scores for the disposition subscales of; truth-seeking, open-mindedness, analyticity, systematicity, inquisitiveness, maturity of judgment and overall disposition towards critical thinking. They revealed a lower average score than the general nursing students for the disposition of critical thinking self-confidence. To confirm if the differences in these average scores were significant and independent samples t-teat was used.

	Nursing Discipline	N	Mean	Std. Deviation	Std. Error Mean
Truth-Seeking	General Nursing	206	34.7006	6.66347	.46427
	Children's & General Nursing	31	35.3495	6.74185	1.21087
Open-mindedness	General Nursing	206	41.3835	5.45995	.38041
	Children's & General Nursing	31	42.3387	5.43233	.97567
Analyticity	General Nursing	206	41.1518	5.77000	.40202
	Children's & General Nursing	31	42.5220	4.48266	.80511
Systematicity	General Nursing	206	37.1359	7.20488	.50199
	Children's & General Nursing	31	38.6510	5.61320	1.00816
Critical Thinking Self Confidence	General Nursing	206	40.0108	7.87740	.54884
	Children's & General Nursing	31	39.2115	5.66698	1.01782
Inquisitiveness	General Nursing	206	45.1990	7.26261	.50601
	Children's & General Nursing	31	47.5484	5.35935	.96257
Maturity of Judgment	General Nursing	206	41.4757	7.21630	.50278
	Children's & General Nursing	31	43.4194	6.19018	1.11179
Total CCTDI Score	General Nursing	206	281.0574	29.73064	2.07143
	Children's & General Nursing	31	289.0404	26.14359	4.69553

Maximum disposition sub-scale score = 60. Recommended cut-off sub-scale score = 40. Maximum overall disposition score = 420.

Table 5.10 Mean scores for the critical thinking dispositions of the first year cohort of undergraduate nursing students by nursing discipline

5.3.4 Results of an independent samples t-test for critical thinking dispositions of the first year undergraduate nursing students by discipline

Prior to interpreting the results of the t-test it was necessary to assess the assumption of equality of variance in the population using Levene's test. Table 5.11 shows the results for Levene's test which was significant for critical thinking self-confidence .012 ($p < 0.05$) and the *assumption of equal variance was questionable*. In this case, the results were read for, *'equal variance not assumed'*. Levene's test was not significant for the remaining disposition subscales or overall CCTDI score. The results for 'equal variance assumed' were interpreted. The independent samples t-test revealed the following results for the two disciplines for the critical thinking dispositions tested. There was no significant difference between the disciplines for the dispositions of; *truth-seeking, open-mindedness, analyticity* and *systematicity* and the results were as follows. For the subscale of *truth-seeking* results revealed a mean score for the general nursing students of 34.70 (SD 6.66) and the mean for the children's and general nursing students was 35.34 (SD 6.74), t (*df,* 235) = -.505, p= .614, <.05. For *open-mindedness* the mean score for the general nursing students was 41.38 (SD 5.45) and the mean for the children's and general nursing students was 42.33 (SD 5.43), t (*df,*

235) = -.909, p=.364, <.05. For *analyticity* the mean score for the general nursing students was 41.15 (SD 5.77) and the mean for the children's and general nursing students was 42.52 (SD 4.48), t (*df,* 235) = -1.265, p= .207, <.05. For *systematicity* the mean score for the general nursing students was 37.13 (SD 7.20) and the mean for the children's and general nursing students was 38.65 (SD 5.61), t (*df,* 235) = -1.120, p= .264, <.05.

Results of the t-test also revealed no significant difference between the disciplines for the dispositions; *critical thinking self-confidence, inquisitiveness* and *maturity of judgement.* For *critical thinking self-confidence* the mean score for the general nursing students was 40.01 (SD 7.87) and the mean for the children's and general nursing students was 39.21 (SD 5.66), t (*df,* 49. 372) =.691, p=.493, <.05. For *inquisitiveness* the mean score for the general nursing students was 45.19 (SD 7.26) and the mean score for the children's and general nursing students was 47.54 (SD 5.35), t (*df,* 235) =-1.730, p=.085, <.05. For *maturity of judgement* the mean score for the general nursing students of 41.47 (SD 7.21) and the mean for the children's and general nursing students was 43.41 (SD 6.19), t (*df,* 235) = -1.422, p=.156, <.05. The *overall CCTDI* mean score for the general nursing students was 281.05 (SD 29.73) and the mean for the children's and general nursing students was 289.04 (SD 26.14), t (*df,* 235) =-1.414, p=.159, <.05.

Based on the results of the independent samples t-test, *the null hypothesis was not rejected and the conclusion was that there was no significant difference in the average scores between the two disciplines in any of the seven subscales or in the overall average score on the CCTDI.* A comparison of the average scores in Table 5.10 with the categories identified by Facione and Facione (2014) in Table 5.13 revealed that both disciplines were in the positive category for open-mindedness, analyticity, inquisitiveness and maturity of judgment. They were ambivalent and therefore considered weak in truth-seeking and systematicity. In relation to critical thinking self-confidence the general nursing students were positive with a mean score of 40.01 (SD 7.87) while the children's and general nursing students were in the ambivalent category with a mean score of 39.21 (SD 5.66). *For the two disciplines there was no significant difference in any of the average subscale scores or the overall score for disposition towards critical thinking.*

In relation to the categories identified by Facione and Facione (2014) the only difference, although not significant, was noted for critical thinking self-confidence with the general nursing students revealing a higher average score compared to the integrated children's and general nursing students, however, this discipline was close to being positive. Confirmation of these results allowed for a more accurate and truthful interpretation of the critical thinking dispositions of the entire first year cohort and the results are presented in the next section.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Truth-Seeking	Equal variances assumed	.366	.546	-.505	235	.614	-.64882	1.28563	-3.18164	1.88401
	Equal variances not assumed			-.500	39.344	.620	-.64882	1.29682	-3.27116	1.97353
Open-mindedness	Equal variances assumed	1.240	.267	-.909	235	.364	-.95521	1.05116	-3.02611	1.11568
	Equal variances not assumed			-.912	39.680	.367	-.95521	1.04721	-3.07224	1.16181
Analyticity	Equal variances assumed	2.679	.103	-1.265	235	.207	-1.37018	1.08307	-3.50396	.76359
	Equal variances not assumed			-1.523	46.403	.135	-1.37018	.89990	-3.18116	.44079
Systematicity	Equal variances assumed	1.781	.183	-1.120	235	.264	-1.51510	1.35272	-4.18011	1.14991
	Equal variances not assumed			-1.345	46.303	.185	-1.51510	1.12622	-3.78167	.75147
Critical Thinking Self Confidence	Equal variances assumed	6.410	.012	.544	235	.587	.79932	1.47007	-2.09689	3.69552
	Equal variances not assumed			.691	49.372	.493	.79932	1.15637	-1.52405	3.12268
Inquisitiveness	Equal variances assumed	3.553	.061	-1.730	235	.085	-2.34936	1.35783	-5.02443	.32572
	Equal variances not assumed			-2.160	48.332	.036	-2.34936	1.08747	-4.53547	-.16325
Maturity of Judgment	Equal variances assumed	.578	.448	-1.422	235	.156	-1.94363	1.36655	-4.63588	.74862
	Equal variances not assumed			-1.593	43.261	.118	-1.94363	1.22019	-4.40395	.51669
Total CCTDI Score	Equal variances assumed	2.115	.147	-1.414	235	.159	-7.98299	5.64398	-19.10225	3.13628
	Equal variances not assumed			-1.555	42.577	.127	-7.98299	5.13213	-18.33590	2.36992

Table 5.11 Independent samples t-test for the critical thinking dispositions of the first year cohort of undergraduate nursing students by nursing discipline

5.4 Critical thinking dispositions of the first year cohort undergraduate nursing students

In this section, results for the *critical thinking dispositions* of the first year cohort of undergraduate nursing students are presented. The response rate was 63% (N=237) of the cohort at entry to the course (Table 3.5). Table 5.12 shows the results for each of the seven sub-scales along with the total score on the CCTDI. For the first year undergraduate nursing students, findings revealed that, for *truth-seeking* as a disposition towards critical thinking the mean score was 34.78 (SD 6.66), the lowest score was 14.17 and the highest score was 50.83. For *open-mindedness* as a sub scale the mean score was 41.50 (SD 5.45), the lowest score was 25.00 and the highest score was 58.33. In relation to *analyticity* as a subscale the mean score was 41.33 (SD 5.62), the lowest score was 25.45 and the highest score was 58.18. For *systematicity* as a subscale the mean score was 37.33 (SD 7.02), the lowest score was 15.45 and the highest score was 60.00. For *critical thinking self-confidence* as a subscale the mean score was 39.90 (SD 7.61), the lowest score was15.56 and the highest score was 58.89. In relation to *inquisitiveness* as a subscale the mean score was 45.50 (SD 7.07), the lowest score was 24.00 and the highest score was 60.00. For *maturity of judgment* as a subscale the mean score was 41.73 (SD 7.10), the lowest score was 12 and the highest score was 57.00. *The total or overall disposition* score for the cohort revealed a mean score of 282.10 (SD 29.35), the lowest score was 200.42 and the highest score was 377.18.

In summary, the results for the first year cohort of undergraduate nursing students for dispositions towards critical thinking revealed the highest mean score was evident in relation to *inquisitiveness* with a mean score of 45.50 (SD 7.07). The next highest subscales were *maturity of judgement* 41.73 (SD 7.10), *open-mindedness* 41.50 (SD 5.45), and *analyticity* 41.33 (SD 5.62). The next highest dispositions were *critical thinking self-confidence* 39.90 (SD 7.61) and *systematicity* 37.33 (SD 7.02). The disposition of *truth-seeking* had the lowest mean score of 34.78 (SD 6.66). A comparison of these average scores with the categories and range of scores recommended by Facione and Facione (2014) and shown in Table 5.13 revealed that the first year cohort were *positive* for inquisitiveness, maturity of judgment, open-mindedness and analyticity. They were *ambivalent* for critical thinking self-confidence, systematicity and truth-seeking. They were *positive* for overall disposition towards

critical thinking when compared in Table 5.14. In the next section results for the critical thinking dispositions as a percentage of the first year cohort are presented.

		Truth-Seeking	Open-mindedness	Analyticity	Systematicity	Critical Thinking Self Confidence	Inquisitiveness	Maturity of Judgment	Total CCTDI Score
N	Valid	237	237	237	237	237	237	237	237
	Missing	0	0	0	0	0	0	0	0
Mean		34.7855	41.5084	41.3310	37.3341	39.9062	45.5063	41.7300	282.1016
Std. Error of Mean		.43281	.35430	.36566	.45636	.49494	.45977	.46177	1.90709
Median		35.0000	41.6667	41.8182	37.2727	40.0000	46.0000	42.0000	278.7929
Mode		32.50	42.50	41.82[a]	37.27	38.89	53.00	45.00	265.60
Std. Deviation		6.66298	5.45441	5.62925	7.02559	7.61956	7.07803	7.10893	29.35922
Variance		44.395	29.751	31.688	49.359	58.058	50.098	50.537	861.964
Skewness		.008	-.221	-.057	-.063	-.153	-.390	-.523	.101
Std. Error of Skewness		.158	.158	.158	.158	.158	.158	.158	.158
Kurtosis		.047	.333	.342	.069	-.120	-.097	.749	.105
Std. Error of Kurtosis		.315	.315	.315	.315	.315	.315	.315	.315
Range		36.67	33.33	32.73	44.55	43.33	36.00	45.00	176.76
Minimum		14.17	25.00	25.45	15.45	15.56	24.00	12.00	200.42
Maximum		50.83	58.33	58.18	60.00	58.89	60.00	57.00	377.18
Percentiles	25	30.8333	37.5000	37.2727	32.7273	34.4444	41.0000	37.0000	261.9672
	50	35.0000	41.6667	41.8182	37.2727	40.0000	46.0000	42.0000	278.7929
	75	39.1667	45.0000	45.4545	41.8182	45.5556	51.0000	47.0000	302.3131

a. Multiple modes exist. The smallest value is shown

Maximum disposition sub-scale score = 60. Recommended cut-off sub-scale score = 40. Maximum overall disposition score = 420.

Table 5.12 Statistics for the critical thinking dispositions of the first year cohort of undergraduate nursing students

5.5 Critical thinking dispositions as a percentage proportion of the first year cohort of undergraduate nursing students

In this section results are presented which show the percentage proportions of the first year cohort of undergraduate nursing students (N=237) for dispositions toward critical thinking. The pie charts illustrate results with regard to whether the cohort was *negative, ambivalent, positive* or *highly positive* in disposition towards critical thinking (Figures 5.2 - 5.9). Percentages in the pie charts are rounded to whole percentages and in the rounding process SPSS in some cases rounded downwards and in other cases rounded upwards, thus, resulting in a cumulative total for some cases slightly over and in other cases slightly under one hundred per-cent. Frequency tables to accompany the pie charts are presented in Appendix 33 and the percentage values were not rounded.

To obtain the percentage proportions for the cohort it was necessary to recode the data into the categories and score ranges recommended by Facione and Facione (2014) and shown in Table 3.1. SPSS was used to categorise the data and it was necessary to use clear cut off points for each category and this was also necessary to ensure that a respondent was in one category only. The raw scores on the seven sub-scales were re-coded into the following categories: *low or negative* (10.00 - 29.99), *ambivalent* (30.00 - 39.99), *positive* (40.00 – 49.99) and *high* (50.00 - 60.00) (Table 5.13). The total CCTDI scale score was categorised as: *low* (70.00 - 209.99), *ambivalent* (210.00 - 279.99), *positive* (280.00 - 349.00), and *high* (350.00 - 420.00) (Table 5.14). This categorisation resulted in a 0.01% difference between the categories. A manual numeric count was done using the frequency distribution tables for each dispositional subscale of the CCTDI and the results in all cases were consistent with the frequency count in the frequency tables for each of the categorised dispositions (Appendix 33). This confirmed that the slight 0.01% difference in the categories did not impact on the categorisation of the cohort. Each respondent, based on their raw score, was in the appropriate category and the results were accurate.

Low	Ambivalent	Positive	High
10.00 - 29.99	30.00 - 39.99	40.00 - 49.99	50.00 - 60.00

Table 5.13 Categories and range of scores for the sub-scales of the CCTDI used in SPSS

Low	Ambivalent	Positive	High
70.00 - 209.99	210.00 - 279.99	280.00 - 349.99	350.00 - 420.00

Table 5.14 Categories and range of scores for the overall CCTD used in SPSS

Results revealed that in relation to *truth-seeking* 22% (N=51) were negative, 57% (N=135) were ambivalent, 20% (N=47) were positive and 2% (N=4) were in the high positive category. For *open-mindedness* 2% (N=4) were negative, 32% (N=77) were ambivalent, 60% (N=143) were positive and 5% (N=13) were in the high positive category. For *analyticity* 3% (N=7) were negative, 35% (N=82) were ambivalent, 56% (N=132) were positive and 7% (N=16) were in the high positive category. For *systematicity* 14% (N=32) were negative, 49% (N=117) were ambivalent, 34% (N=80) were positive and 3% (N=8) were in the high positive category. For *critical thinking self-confidence* 7% (N=17) were negative, 42% (N=99) were ambivalent, and 39% (N=93) were positive and 12% (N=28) were in the high positive category. For *inquisitiveness* 3% (N=6) were negative, 19% (N=44) were ambivalent, 47% (N=112) were positive and 32% (N=75) were in the high positive category. In relation to *maturity of judgment* 5% (N=13) were negative, 31% (N=73) were ambivalent, and 50% (N=119) were positive and 14% (N=32) were in the high positive category. In relation to the total or overall score on the CCTDI, a very low percentage of 0.4% (N=1), was negative, 51% (N=120) ambivalent, 49% (N=114) were positive and 1 % (N=2) was in the high positive category. These results for the percentage proportions are interpreted and discussed in relation to the results for the critical thinking dispositions of the first year cohort in Chapter 10. In the next and final section of this chapter the results for the critical thinking dispositions are summarised.

5.5.1 Pie charts showing the critical thinking dispositions as percentage proportions of the first year cohort of undergraduate nursing students

(Sample N= 237)

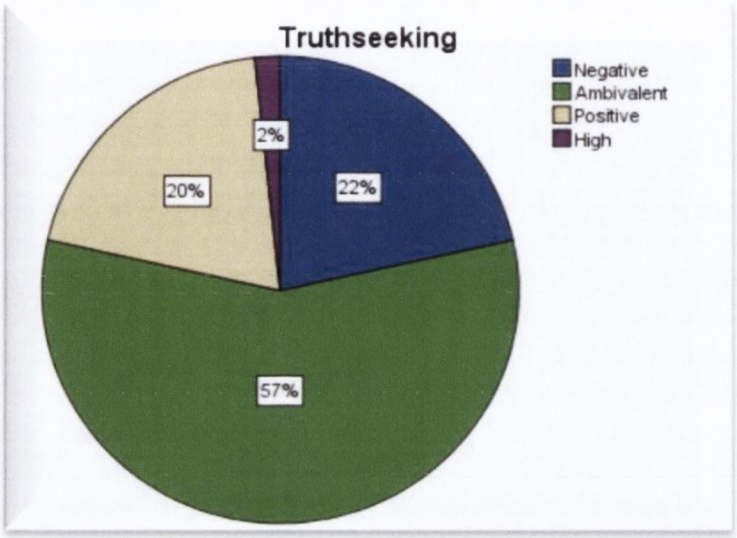


Figure 5.2 First year nursing students: Truth-seeking

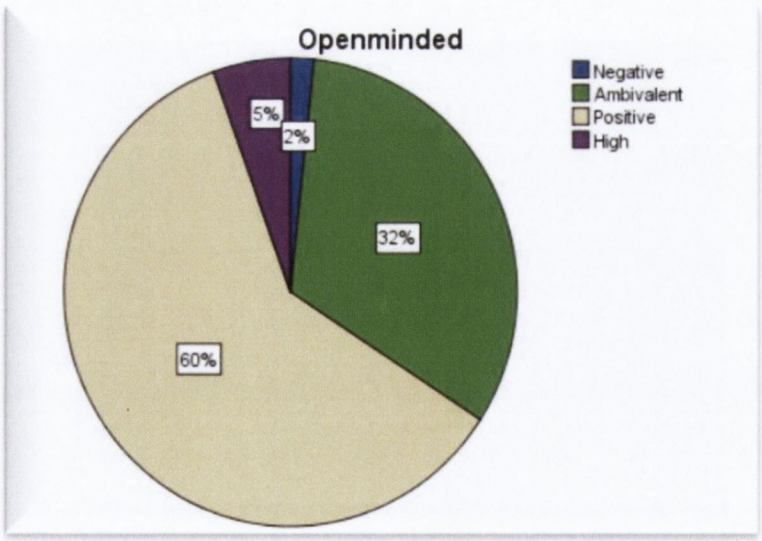


Figure 5.3 First year nursing students: Open-mindedness

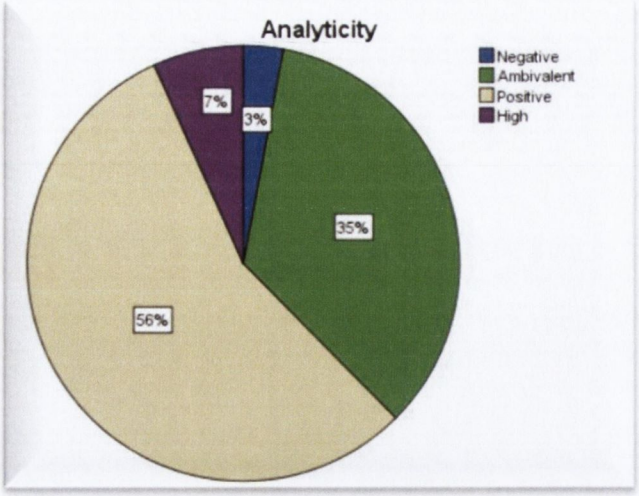


Figure 5.4 First year nursing students: Analyticity

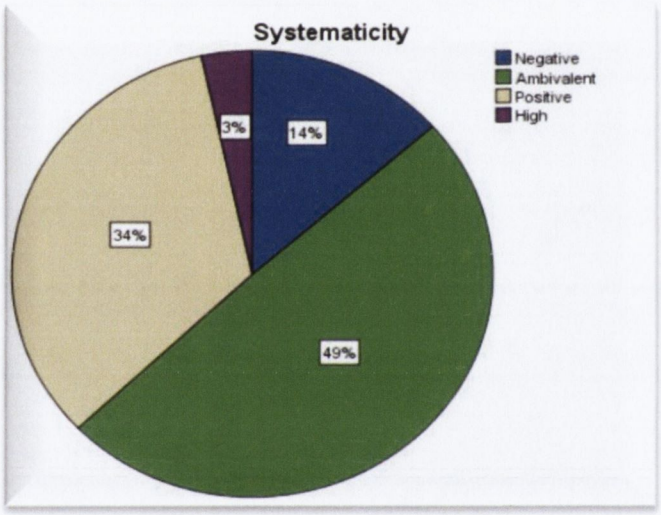


Figure 5.5 First year nursing students: Systematicity

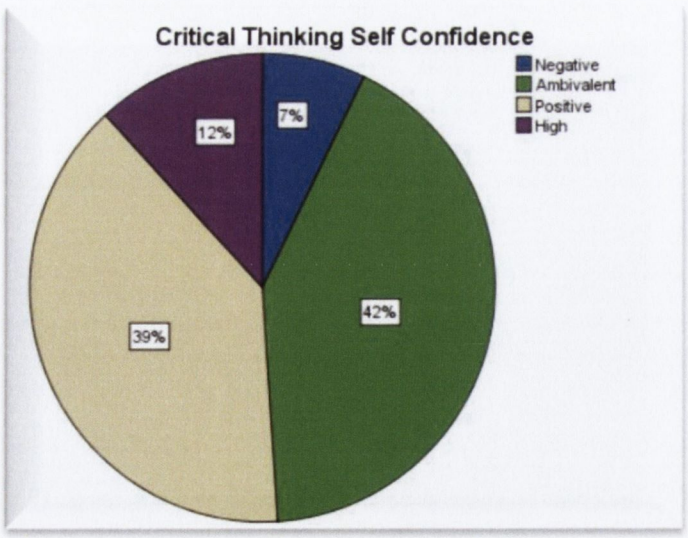


Figure 5.6 First year nursing students: Critical thinking self-confidence

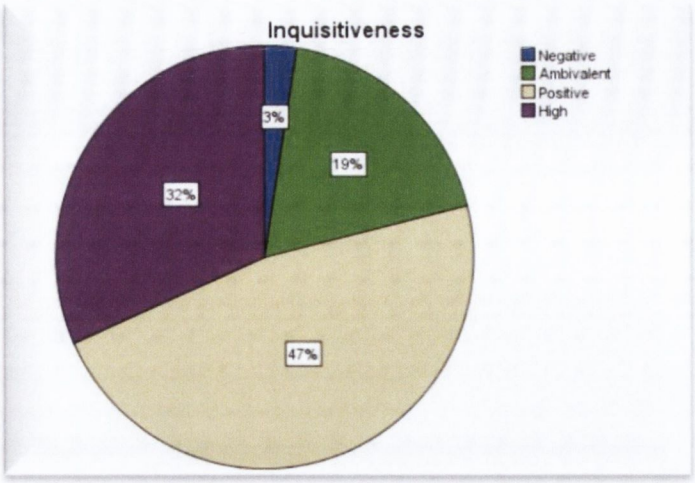


Figure 5.7 First year nursing students: Inquisitiveness

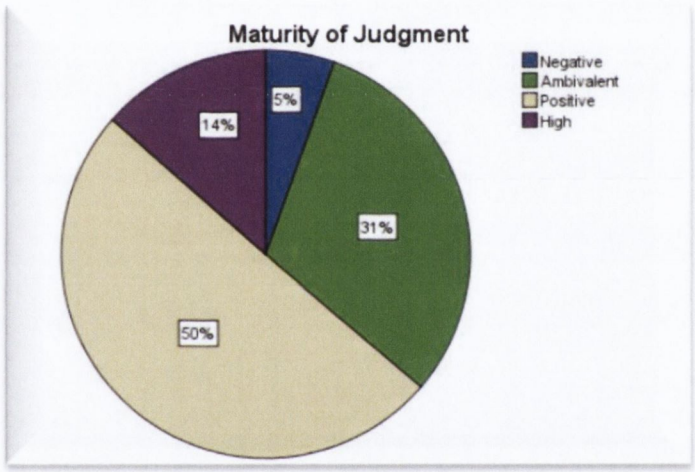


Figure 5.8 First year nursing students: Maturity of judgment

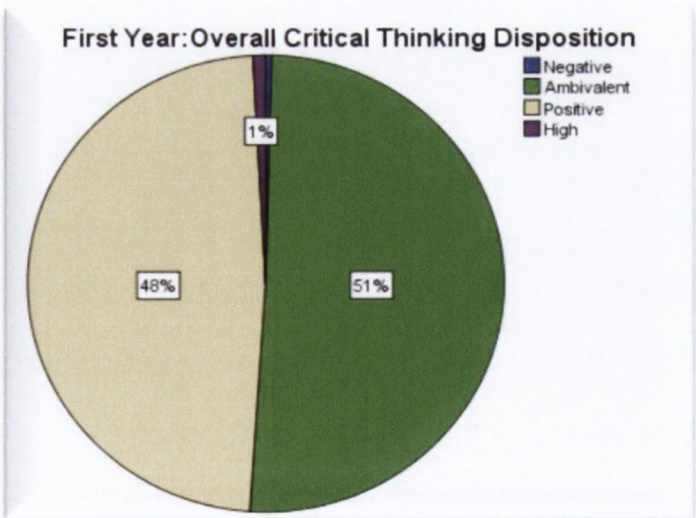


Figure 5.9 First year nursing students: Overall disposition to think critically

5.6 Summary of the critical thinking dispositions of the first year undergraduate nursing students

The main characteristics and findings for the critical thinking dispositions of the first year cohort of undergraduate nursing students are summarised here. The first year cohort was predominantly female (96%, N=228) undertaking a four year undergraduate honours degree in nursing as their first academic qualification (79%, N=188). The cohort was predominantly Irish in origin (92%, N=219) with a mean age of 20 years. Mature entrants, those aged 26 and over, constituted 13% (N=29) of the first year cohort. The majority, 95% (N=225) had never undertaken a thinking skills course.

5.6.1 Main findings for critical thinking dispositions of the first year cohort by nursing discipline

The first year cohort had a subgroup (N=31) who were undertaking an integrated children's and general nursing strand. An independent samples t-test was used to confirm if this sub group were different in terms of their critical thinking dispositions and to ensure accurate results for the critical thinking dispositions of the entire first year cohort. *The main finding was that there was no significant difference in the average scores between this subgroup and the students undertaking general nursing only for any of the seven disposition sub-scales or overall disposition towards critical thinking.* A comparison of the average scores (Table 5.10) with the categories for the CCTDI identified by Facione and Facione (2014) (Tables 5.13 & 5.14) revealed that both disciplines were *positive* for, open-mindedness, analyticity, inquisitiveness and maturity of judgment. They were *ambivalent* and considered weak for truth-seeking and systematicity. In relation to critical thinking self-confidence the general nursing students were *positive* with a mean score of 40.01 (SD 7.87) while the children's and general nursing students were in the *ambivalent* category with a mean score of 39.21 (SD 5.66) and were close to being positive. As was stated above, the difference was not statistically significant.

5.6.2 Main findings for critical thinking dispositions of the first year cohort of undergraduate nursing students

The main findings in relation to critical thinking dispositions of the first year cohort revealed the highest mean score was for inquisitiveness (45.50, SD7.07). The next highest subscales were maturity of judgement (41.73, SD7.10), open-mindedness (41.50, SD5.45) and analyticity (41.33, SD 5.62). The next highest dispositions were

critical thinking self-confidence (39.90, SD 7.61) and systematicity (37.33; SD7.02). The disposition of truth-seeking had the lowest mean score of the seven critical thinking sub scales (34.78, SD 6.66) (Table 5.12). A comparison of these average scores with the categories and range of scores recommended by Facione and Facione (2014) and shown in Table 5.13 revealed that the first year cohort were *positive* for inquisitiveness, maturity of judgment, open-mindedness and analyticity. They were *ambivalent* and considered weak for critical thinking self-confidence, systematicity and truth-seeking. They were *positive* for overall disposition towards critical thinking.

5.6.3 Main findings for the critical thinking dispositions as a percentage proportion of the first year undergraduate nursing students

The results for the percentage proportion of the first year cohort are summarised here. The pie charts (Figures 5.2 – 5.9) and frequency distribution tables in Appendix 33 show the results. The main findings for overall critical thinking disposition revealed that less than 1% (N=1) were negative, 51% (N=120) were ambivalent, 48% (N=114) were positive and approximately 1% (N=2) were highly positive in attitude towards critical thinking. Taking the highest percentage proportions in relation to the dispositions towards critical thinking, results revealed that over three quarters (79%, N=187) of the first year cohort were positive and highly positive in disposition towards inquisitiveness. Close to two thirds of the group were positively disposed in relation to maturity of judgment 64% (N=151), open-mindedness 65% (N=156), and being analytical 63% (N=148). Just over half of the first years at 51% (N=121) revealed a positive disposition in relation to confidence in critical thinking. Over half of the first year cohort, 57% (N=135) were ambivalent in relation to the disposition of truth-seeking and almost half at 49% (N=117) were also ambivalent in being systematic in their approach to thinking.

5.7 Conclusion

This chapter presented the results for the critical thinking dispositions of the first year cohort of undergraduate general nursing students who were predominantly female. First year nursing students were overall positively disposed to think critically. They had strengths and weaknesses in terms of disposition to think critically. They were positively disposed for inquisitiveness and as such curious about knowledge. They were positively disposed in open-mindedness and in accepting opinions of others. They had the capacity to think ahead as they were positive for analyticity and they had a disposition towards being mature about judgments. They were ambivalent or weak for

dispositions, self-confidence, systematicity, and truth-seeking. The results for the critical thinking dispositions of the first year nursing students are integrated with the qualitative findings and discussed later in Chapter 10. In the next chapter, the results are presented for the critical thinking skills of the first year undergraduate nursing students who completed the Health Sciences Reasoning Test (HSRT).

Chapter 6 Results for the Critical Thinking Skills of the First Year Undergraduate Nursing Students

6.1 Introduction

This chapter presents the results for the critical thinking skills of the first year cohort of undergraduate nursing students as measured using the Health Sciences Reasoning Test (HSRT) (Facione & Facione, 2012). The HSRT is derived from the Delphi construct of critical thinking and measured the critical thinking skills of, *analysis, inference, evaluation, inductive reasoning and deductive reasoning* (Facione & Facione, 2012; Facione, 1990). The results address research question three: *What critical thinking skills do undergraduate general nursing students have in the first year of the nursing degree course as measured by the Health Sciences Reasoning Test?*

In the first section of this chapter the demographic characteristics of the first year cohort of undergraduate nursing students who completed the HSRT are presented. In the second section, results of an independent samples t-test which explored critical thinking skills based on nursing discipline are presented. It was important to examine if there were differences in the critical thinking skills of a small subgroup undertaking the integrated children's and general nursing strand to ensure that the interpretation of the results for the critical thinking skills of the entire cohort were both accurate and truthful. In the third section, the critical thinking skills are presented. In the fourth section, critical thinking skills as a percentage proportion of the first year cohort are presented. A summary of the main findings is presented at the end of the chapter.

6.2 Demographic characteristics of the first year undergraduate nursing students for the Health Sciences Reasoning Test

This section presents the *demographic characteristics* of the first year cohort of undergraduate nursing students. The results are also presented in frequency distribution Tables 6.1- 6.8. One hundred and twenty seven nursing students (N=127) completed the Health Sciences Reasoning Test (HSRT). In relation to *gender* 92% (N= 117) were female and 8% (N=10) were male. For *nursing discipline,* 90% (N=114) were general nursing only and a smaller percentage (10%, N=13) were undertaking an integrated children's and general nursing strand. In relation *educational qualifications,* 81% (N=103) did not have an existing academic qualification and were undertaking the

nursing degree course as their first academic qualification. There were four with a degree and these were divided as 2% (N=3) with a primary degree and 1% (N=1) with a master degree which was the highest academic qualification of the cohort. Four per-cent (N=5) had a diploma and 12% (N=15) reported an *'other'* qualification. The *'other'* qualification was identified as a Higher Education and Training Award, which is a level six higher or advanced certificate award, above a level five or leaving certificate award and below a level seven, which is an ordinary bachelor degree award (National Qualifications Authority of Ireland, 2007).

In relation to *university site,* 45% (N=57) were from University site one and 55% (N=70) were from University site two. Respondents were asked if they had completed a thinking skills course prior to entry to the degree course and while the vast majority 91% (N=116) had not, a small percentage 9% (N=11) indicated they had undertaken a course to improve their thinking skills. In relation to *ethnic origin,* results revealed that the group were predominantly Irish, 91% (N=115), and a small percentage, 9% (N=12), were of *'other'* ethnic origin. An analysis of *age* revealed a mean age of 20 years with a standard deviation of 4.41 years, the youngest was 17 and the oldest was 45 years of age (Table 6.7). The bar chart in Figure 6.1 shows the distribution of age for the first years who had completed the Health Sciences Reasoning Test. Age was re-coded into three categories, 17-20, 21-25 and 26-45 and this was to identify the younger category of students from the older and more mature age category (Table 6.8).

In summary, the first year nursing students who completed the Health Sciences Reasoning Test were predominantly female (92%, N=117). While there were four with a degree and five with a diploma, the majority (93%, N=118) were undertaking the nursing degree as their first academic qualification. Ninety one per-cent (N=116) had never undertaken a thinking skills course before entry while a small percentage had (9%, N=11). The group were predominantly Irish in origin (91%, N=115) with a smaller percentage (9%, N=12) of *'other'* ethnic origin. The mean age of the group was 20 years and there were 14 mature students aged 26 years and over. These characteristics provide a picture of the first year cohort who completed the Health Sciences Reasoning Test and results are presented later in this chapter.

6.2.1 Frequency tables for the demographic characteristics of the first year undergraduate nursing students for the Health Sciences Reasoning Test

	Frequency	Percent	Valid Percent	Cumulative Percent
Female	117	92	92	92
Male	10	8	8	100
Total	127	100	100	

Table 6.1 Gender of the first year nursing students

	Frequency	Percent	Valid Percent	Cumulative Percent
General Nursing	114	90	90	90
Children's & General Nursing	13	10	10	100
Total	127	100	100	

Table 6.2 Nursing discipline of the first year nursing students

	Frequency	Percent	Valid Percent	Cumulative Percent
Diploma	5	4	4	4
Degree	3	2	2	6
Master Degree	1	1	1	7
None	103	81	81	88
Other	15	12	12	100
Total	127	100	100	

Table 6.3 Educational qualification of the first year nursing students

	Frequency	Percent	Valid Percent	Cumulative Percent
Site One	57	45	45	45
Site Two	70	55	55	100
Total	127	100	100	

Table 6.4 University site of the first year nursing students

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	11	9	9	9
No	116	91	91	100
Total	127	100	100	

Table 6.5 Thinking skills course completed by the first year nursing students

	Frequency	Percent	Valid Percent	Cumulative Percent
Irish	115	91	91	91
Other	12	9	9	100
Total	127	100	100	

Table 6.6 Ethnic origin of the first year nursing students

Age		
N	Valid	127
	Missing	0
Mean		20.17
Median		18.00
Mode		18
Std. Deviation		4.413
Range		28
Minimum		17
Maximum		45

Table 6.7 Statistics for age of the first year nursing students

Age Category

	Frequency	Percent	Valid Percent	Cumulative Percent
17-20	99	78.0	78.0	78.0
21-25	14	11.0	11.0	89.0
26-45	14	11.0	11.0	100.0
Total	127	100.0	100.0	

Table 6.8 Age categories of the first year nursing students

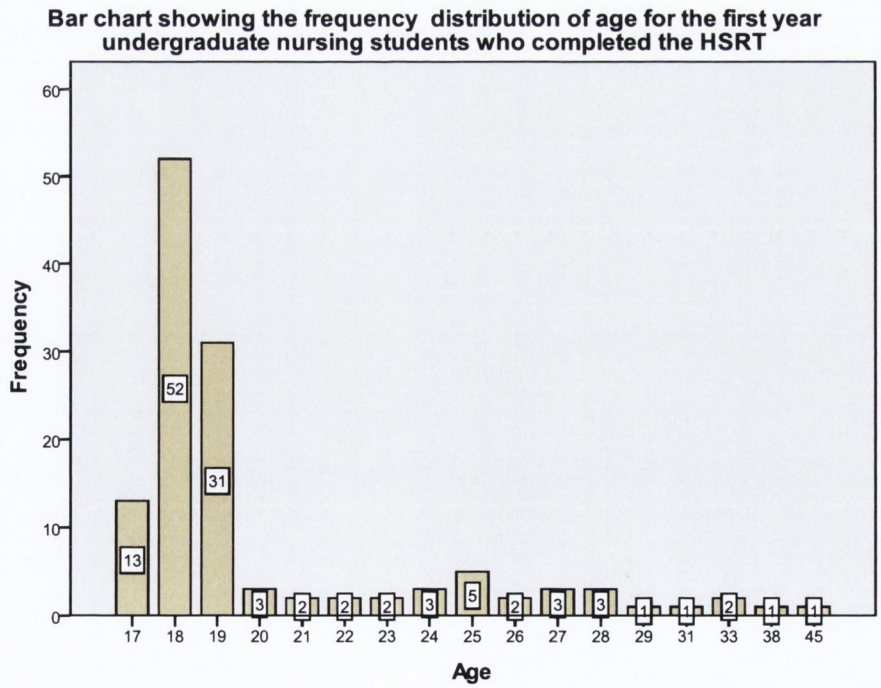


Figure 6.1 Bar chart showing the age distribution of the first years for the HSRT

6.3 Critical thinking skills of the first year cohort of undergraduate nursing students by nursing discipline

6.3.1 Statement of hypothesis

The first year cohort had a subgroup undertaking an integrated children's and general nursing strand (N=13) and it was important to confirm if there was a difference in the critical thinking skills of this subgroup compared to those taking the general strand only. This was to ensure that the results for the critical thinking skills of the first year cohort would be accurate. To explore the difference between the two groups a research and a null hypothesis were stated. The *hypothesis* was that there was a difference in the average overall critical thinking skill score and in the critical thinking sub-scale scores for the children's and general nursing and the general nursing disciplines in the first year of the undergraduate nursing degree course. The *null hypothesis* was that there was no difference in the average overall critical thinking skill score and in the critical thinking sub-scale scores for the children's and general nursing and general nursing disciplines in the first year of the undergraduate nursing degree course. An independent samples t-test was used to test this hypothesis (Aron et al., 2008).

6.3.2 Assessment of assumptions of the independent samples t-test

Prior to testing the hypothesis stated above it was necessary to assess the assumptions of; *independence, normal distribution and equality of variance in population*. This was to ensure that the results of the independent samples t-test could be interpreted as meaningful and accurate. In relation *independence,* each of the groups was independent and each respondent was in one group and one group only, thus, the assumption of independence was met. To test the assumption of *normal distribution in the population the Shapiro-Wilk test as well as skewness and kurtosis was used,* and as already explained, in Section 3.17.6, in the methodology chapter.

The results of the Shapiro-Wilk test to test the assumption of normality revealed a non-significant result for overall critical thinking skill ($p = 0.148$) (Table 6.9). The result was significant for the sub-scales of analysis, inference, evaluation, inductive reasoning and deductive reasoning ($p = 0.005$). *The assumption of normality was upheld for overall critical thinking skill but not for the five critical thinking sub-scales.* As the result was significant for the five critical thinking skills the skewness values were examined. Table 6.12 shows the skewness values for the five sub-skills. The skewness values for

analysis and interpretation was -.068, for inference -.068, for evaluation and explanation -.310, for inductive reasoning -.422 and for deductive reasoning .167. The standard error for all five sub scales was .215. These values were within the range of -2 to + 2 and as such the skewness was not in the extreme, thus, the assumption of normality was accepted (Acton & Miller, 2009, p. 69).

To test the third assumption of *homogeneity of variance,* Levene's test of equality of variance was used for the independent samples t-test and results read accordingly: *'equal variance assumed'* or *'equal variance not assumed'*. The results of Levene's test are presented in Table 6.11 and explained with the results for the independent samples test. Based on the assessment of the assumptions of independence, normality and equality of variance in the population, the assumptions which underpinned the independent samples t-test as a parametric statistical test were accepted.

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Total HSRT Score	.066	127	.200*	.984	127	.148
Analysis and Interpretation	.148	127	.000	.947	127	.000
Inference	.204	127	.000	.923	127	.000
Evaluation & Explanation	.187	127	.000	.922	127	.000
Inductive Reasoning	.151	127	.000	.948	127	.000
Deductive Reasoning	.127	127	.000	.969	127	.005

a. Lilliefors Significance Correction

*. This is a lower bound of the true significance

Table 6.9 Tests of normality for the critical thinking skills of the first year undergraduate nursing students

6.3.3 Average scores for critical thinking skills of the first year cohort by nursing discipline

Table 6.10 shows the mean scores and standard deviations for the critical thinking skills of the first year cohort of undergraduate nursing students. The children's and general nursing students had higher mean scores (16.69; SD 4.61) when compared to students taking general nursing only (19.62, SD 3.70) for *overall critical thinking skill* score as well as for all five critical thinking subscale of analysis, inference, evaluation, inductive reasoning and deductive reasoning. An independent samples t-test was used to find out if these mean differences were significant.

	Nursing Discipline	N	Mean	Std. Deviation	Std. Error Mean
Total HSRT Score	General Nursing	114	16.69	4.613	.432
	Children's & General Nursing	13	19.62	3.709	1.029
Analysis and Interpretation	General Nursing	114	3.18	1.352	.127
	Children's & General Nursing	13	4.15	1.068	.296
Inference	General Nursing	114	2.81	1.112	.104
	Children's & General Nursing	13	3.31	1.032	.286
Evaluation & Explanation	General Nursing	114	3.93	1.368	.128
	Children's & General Nursing	13	4.62	1.121	.311
Inductive Reasoning	General Nursing	114	6.34	1.909	.179
	Children's & General Nursing	13	7.00	1.581	.439
Deductive Reasoning	General Nursing	114	4.48	2.154	.202
	Children's & General Nursing	13	5.08	2.100	.582

Analysis, Inference, Evaluation: Not Manifested 0 – 2, Moderate 3 – 4, Strong > 5. Inductive and Deductive Reasoning: Not Manifested 0 – 4, Moderate 5 – 7, Strong > 8. Total HSRT Score: Not Manifested 0 -14, Moderate15 – 20, Strong 21 - 25, Superior > 26.

Table 6.10 Mean scores for the critical thinking skills of the first year cohort of undergraduate nursing students by nursing discipline

6.3.4 Results of an independent samples t-test for critical thinking skills of the third year cohort of undergraduate nursing students by discipline

Prior to interpreting the results of the independent samples t-test it was necessary to confirm the assumption of equal variance using Levene's test (Table 6.11). Levene's test for equality of variance revealed a non-significant result at an alpha level of 0.05 for the total HSRT score and all five critical thinking subscales. The assumption of equal variance in the population was upheld and the results for *'equal variance assumed'* were interpreted. Table 6.11 shows the results of the independent samples t-test for the overall critical thinking skills and the critical thinking subscales.

The independent samples t-test was significant for *overall critical thinking skills* with the children's and general nursing students having a statistically significantly higher

average score of 19.62 (SD 3.70) compared to the general nursing students mean score of 16.69 (SD 4.61), t (*df,* 125) = -2.202, p=.030, <.05. There was also a statistically significant difference for the critical thinking skill of *analysis* with the children's and general nursing students having a higher mean score of 4.15 (SD 1.06) than the general nursing students mean score of 3.18 (SD 1.35), t (*df,* 125) = -2.518, p= .013, <.05. *The null hypothesis was rejected and the research hypothesis was supported. The conclusion was a statistically significant difference between the groups in relation to overall critical thinking skill and in relation to the critical thinking skill of analysis*. Although the average mean scores were statistically significantly different both the integrated children's and general as well as the general nursing students when compared to the category scores identified by Facione and Facione (2012) were *moderate* in strength for overall critical thinking skill and for the skill of analysis (Tables 3.2 & 3.3).

The results of the independent samples t-test for the critical thinking skills of inference, evaluation, inductive and deductive reasoning were not significant. The null hypothesis was not rejected and thus the research hypothesis was not supported. The conclusion was no significant difference between the groups. For *inference* the children's and general nursing students had a mean score of 3.31(SD 1.03) and the general nursing students had a mean score of 2.81 (SD 1.11), t (*df,* 125) = -1584, p=.124, <.05. For *evaluation* the children's and general nursing students had a mean score of 4.62 (SD 1.12) compared to the general nursing student's mean score of 3.93 (SD 1.36), t (*df,* 125) = -1.740, p=.084, <.05. *Inductive reasoning* had a mean score for the children's and general nursing students of 7.00 (SD 1.58) and the mean for the general nursing students was 6.34 (SD 1.90), t (*df,* 125) = -1.196, p=.234, <.05. *Deductive reasoning* had a mean score for the children's and general nursing students of 5.08 (SD 2.10) and the mean for the general nursing students was 4.48 (SD 2.15), t (*df,* 125) = -.945, p=.347, <.05, *The null hypothesis was not rejected and the conclusion was that, there was no significant difference between the disciplines for the critical thinking skills of, inference, evaluation, inductive and deductive reasoning.*

In summary, there was a statistically significant difference between the children's and general nursing students and the general nursing students in the average score for overall critical thinking and for the critical thinking skill of analysis. Although the

differences were significant based on the categories identified by Facione and Facione (2012) both groups were *moderate* in strength for overall critical thinking skill and for the skill of analysis. Although the observed average scores in Table 6.10 are different for the critical thinking skills of inference, evaluation, inductive and deductive reasoning the differences were not statistically significant. A comparison of the average scores in Table 6.10 with the categories identified by Facione and Facione (2012) in Table 3.3 revealed the following results. The critical thinking skill of inference was *moderate* for the integrated children's and general nursing students and was *not manifested* for the general nursing students. For the critical thinking skills of evaluation and inductive reasoning both disciplines were *moderate* in strength. For the skill of deductive reasoning, the integrated children's and general nursing students were *moderate* in strength while the skill was *not manifested* for the general nursing students. These results allowed a meaningful and accurate interpretation of the results in relation to critical thinking skills for the first year cohort. These results are discussed later in Chapter 10. Results for the critical thinking skills are presented in the next section.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Total HSRT Score	Equal variances assumed	1.115	.293	-2.202	125	.030	-2.922	1.327	-5.549	-.296
	Equal variances not assumed			-2.619	16.552	.018	-2.922	1.116	-5.281	-.564
Analysis and Interpretation	Equal variances assumed	.569	.452	-2.518	125	.013	-.978	.389	-1.747	-.209
	Equal variances not assumed			-3.037	16.724	.008	-.978	.322	-1.659	-.298
Inference	Equal variances assumed	.174	.677	-1.548	125	.124	-.501	.323	-1.141	.139
	Equal variances not assumed			-1.644	15.363	.120	-.501	.304	-1.148	.147
Evaluation & Explanation	Equal variances assumed	1.577	.212	-1.740	125	.084	-.686	.394	-1.465	.094
	Equal variances not assumed			-2.039	16.372	.058	-.686	.336	-1.397	.026
Inductive Reasoning	Equal variances assumed	.398	.529	-1.196	125	.234	-.658	.550	-1.747	.431
	Equal variances not assumed			-1.389	16.272	.183	-.658	.474	-1.660	.345
Deductive Reasoning	Equal variances assumed	.111	.739	-.945	125	.347	-.594	.629	-1.840	.651
	Equal variances not assumed			-.964	15.030	.350	-.594	.616	-1.908	.719

Table 6.11 Independent samples t-test for the critical thinking skills of the first year cohort of undergraduate nursing students by nursing discipline

6.4 Critical thinking skills of the first year cohort of undergraduate nursing students

In this section, results are presented for the first year cohort of undergraduate general nursing students in relation to critical thinking skills as measured using the Health Sciences Reasoning Test (HSRT) (Facione & Facione, 2012). The response rate was 34% (N=127) of the cohort (N=378) who entered the course (Table 3.5). The total HSRT score provides a measure of overall skill in critical thinking. Five subscales provide a measure of the underlying critical thinking skills of; *analysis, inference, evaluation, inductive reasoning and deductive reasoning* (Facione & Facione, 2012). Results for the critical thinking skills of the first year cohort are shown in Table 6.12.

The mean score for the *total critical thinking skill* for the first year cohort was 16.99 (SD 4.60) and the median was 17, the lowest score was 4 (N=1) and the highest score was 26 (N=3). For *analysis* as a critical thinking skill, the mean score was 3.28 (SD 1.35), two students scored zero and the highest score was 6 (N=5). For *inference* the mean score was 2.86 (SD 1.11), one student scored zero and the highest score was 5 (N=9). For *evaluation* the mean score was 4.00 (SD 1.35), the lowest score was 1 (N=4) and the highest score was 6 (N=17). For *inductive reasoning* the mean score was 6.41 (SD 1.88), the lowest score was 2 (N=3) and the highest score was 10 (N=2). For *deductive reasoning* the mean score was 4.54 (SD 2.14), two students scored zero on this sub-scale and the highest score was 9 (N=6).

It is recommended by (Facione & Facione, 2012) that interpretation of the results of the Health Sciences Reasoning Test follow the following four steps. *First* interpret the overall critical thinking score, *second* examine the percentile rankings, *third*, determine the strength of the total score, and *fourth* interpret the scale scores. Having presented the results for the critical thinking skills the next step was to examine the percentile rankings. The mean or average score for the first year undergraduate nursing students for overall critical thinking skill was 16.99 (SD 4.60). A comparison of this mean score with the norms of a national aggregated sample of US undergraduate nursing students identified by Facione and Facione, (2012) revealed that the average Irish undergraduate nursing student, in this study, with an overall critical thinking skill mean score of 16.99 and rounded to 17.00 was very close to the 29th percentile and below the 48th or median percentile for US undergraduate nursing students (Appendix 8). This

means that the average first year undergraduate nursing student, in this study, compared to the US national norms for undergraduate nursing students, at the 29th percentile, would have 71 students out of 100 with a lower average score and 28 students out of 100 with a higher average score.

When compared to the norms of a US national aggregated sample of undergraduate health sciences students, identified by Facione and Facione (2012), the average Irish first year undergraduate nursing student in this study was in the 27th percentile and below the 53rd percentile or median for health sciences undergraduate students. Again, this meant that the average Irish undergraduate first year nursing student, in this study, was at the 27th percentile when compared to the US national aggregated sample of health science students. This meant that the average Irish nursing student, in this study, would have 26 students out of 100 with a higher score and 73 out of 100 with a lower score. These comparisons provide an approximation of the performance of the first year undergraduate nursing students compared to aggregate norms for US undergraduate nursing and undergraduate health sciences students.

A comparison of the average scores for overall critical thinking skill and for the critical thinking sub-skills with the categories and range of scores identified by Facione and Facione (2012) in Tables 3.2 and 3.3 revealed the following results. *In terms of strength of overall skill in critical thinking,* the average first year undergraduate nursing student with a mean score of 16.99 (SD 4.60) was in the *moderate* category. This meant that the skill of critical thinking was evident but in need of development to gain in the strength of overall critical thinking skill. In relation to the strength of the skills of critical thinking the average student in the first year cohort was *moderate* in terms of strength for the critical thinking skills of analysis with a mean of 3.28 (SD1.35), *moderate* for evaluation (4.00, SD1.35) and *moderate* for inductive reasoning (6.41, SD1.83). The results revealed that the critical thinking skills of inference with a mean score of 2.86 (SD1.11) and deductive reasoning with a mean score of 4.54 (2.14) while *not manifested* were close to *moderate strength* for the first year cohort of undergraduate nursing students. In the next section, results for the critical thinking skills as a percentage proportion of the first year cohort are presented.

		Total HSRT Score	Analysis and Interpretation	Inference	Evaluation	Inductive Reasoning	Deductive Reasoning
N	Valid	127	127	127	127	127	127
	Missing	0	0	0	0	0	0
Mean		16.99	3.28	2.86	4.00	6.41	4.54
Std. Error of Mean		.408	.120	.099	.120	.167	.191
Median		17.00	3.00	3.00	4.00	7.00	4.00
Mode		17	3	3	5	8	4
Std. Deviation		4.602	1.355	1.111	1.357	1.883	2.148
Variance		21.182	1.836	1.234	1.841	3.545	4.615
Skewness		-.180	-.068	-.068	-.310	-.422	.167
Std. Error of Skewness		.215	.215	.215	.215	.215	.215
Kurtosis		-.328	-.520	-.379	-.794	-.570	-.504
Std. Error of Kurtosis		.427	.427	.427	.427	.427	.427
Range		22	6	5	5	8	9
Minimum		4	0	0	1	2	0
Maximum		26	6	5	6	10	9
Percentiles	25	14.00	2.00	2.00	3.00	5.00	3.00
	50	17.00	3.00	3.00	4.00	7.00	4.00
	75	21.00	4.00	4.00	5.00	8.00	6.00

Analysis, Inference, Evaluation: Not Manifested 0 – 2, Moderate 3 – 4, Strong > 5. Inductive and Deductive Reasoning: Not Manifested 0 – 4, Moderate 5 – 7, Strong > 8. Total HSRT Score: Not Manifested 0 -14, Moderate15 – 20, Strong 21 - 25, Superior > 26.

Table 6.12 Statistics for the critical thinking skills of the first year undergraduate nursing students

6.5 Critical thinking skills as a percentage proportion of the first year cohort of undergraduate nursing students

In this section, results for the *percentage proportion* of the first year cohort of undergraduate nursing students for overall critical thinking skill as well as the critical thinking skills of; *analysis, inference, evaluation, inductive* and *deductive reasoning* are presented. The pie charts (Figures 6.2 - 6.7) and the frequency tables in Appendix 34 show the results for the percentage proportions of the first year cohort of undergraduate nursing students with regard to the strength of their critical thinking skills in terms of whether the skills of critical thinking were, *not manifested, moderate or strong* (Facione & Facione, 2012). In relation to the *total critical thinking skill score* this was *not manifested* for 32% (N=40) of students, *moderate* for 43% (N=55) *strong* for 23% (N=27) and *superior* for 2% (N=3) of the first year cohort. For the critical thinking

skill of *analysis* this was *not manifested* for 29% (N=32) of the students, moderate for 50% (N=64), and *strong* for 21% (N=26). For *inference* as a skill for critical thinking this was *not manifested* for 35% (N=44) students, *moderate* for 58% (N=74), and *strong* for 7% (N=9). For *evaluation* this was *not manifested* for 17% (N=21) of the students, *moderate* for 42% (N=53) and similarly 42% (N=53) were *strong* for this critical thinking skill. For *inductive reasoning* this was *not manifested* for 18% (N=22), *moderate* for 48% (N=61) and *strong* for 34% (n=43). For *deductive reasoning* as a skill for critical thinking this was *not manifested* for 53% (N=67), *moderate* for 37% (N=47) and *strong* for 10% (N=13). These results for these percentage proportions are discussed later in Chapter 10 in relation to the critical thinking skills for the cohort. In the next and final section of this chapter a summary of the main results for critical thinking skills of the first year cohort are presented.

6.5.1 Pie charts showing the critical thinking skills as percentage proportions of the first year cohort of undergraduate nursing students

(Sample N=127)

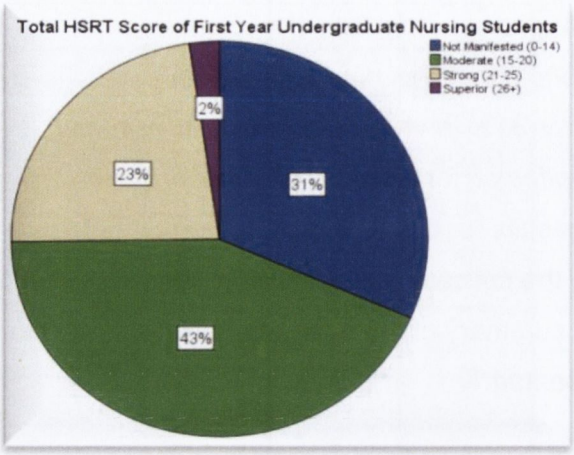


Figure 6.2 First year nursing students: Total HSRT score

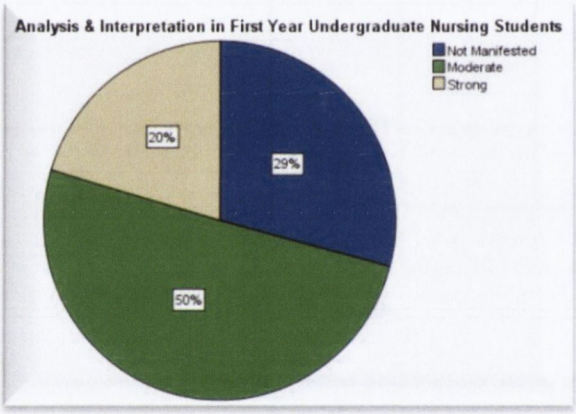


Figure 6.3 First year nursing students: Analysis

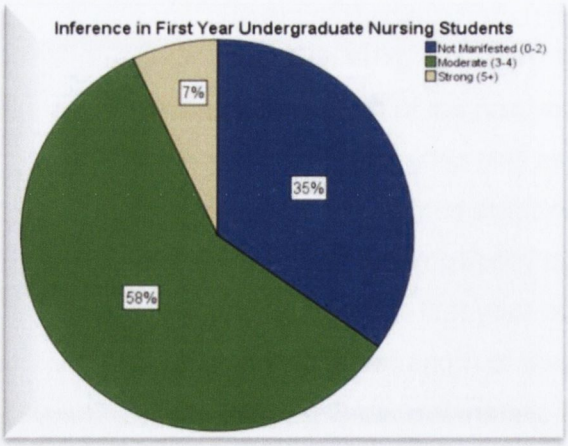


Figure 6.4 First year nursing students: Inference

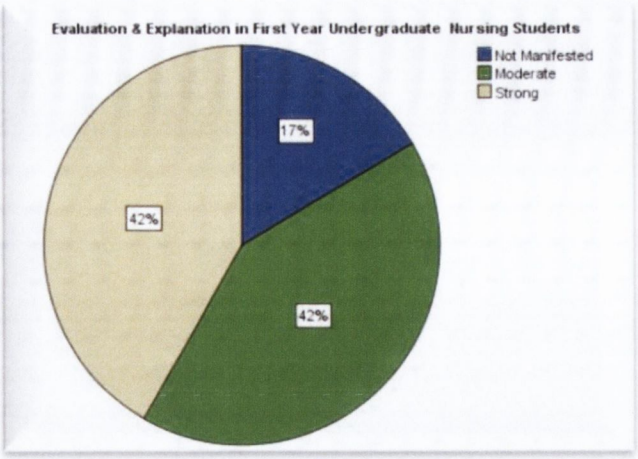


Figure 6.5 First year nursing students: Evaluation

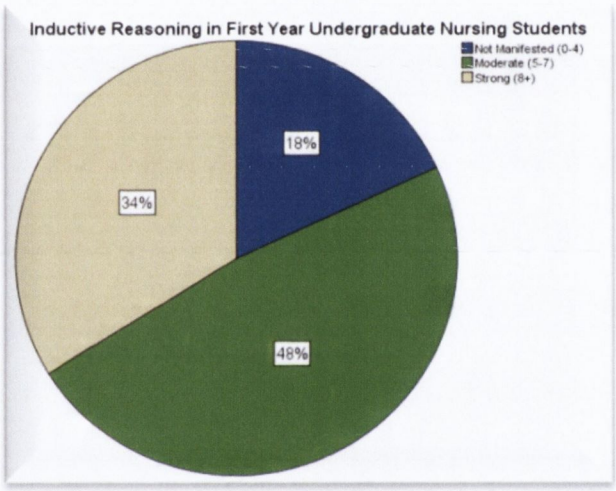


Figure 6.6 First year nursing students: Inductive reasoning

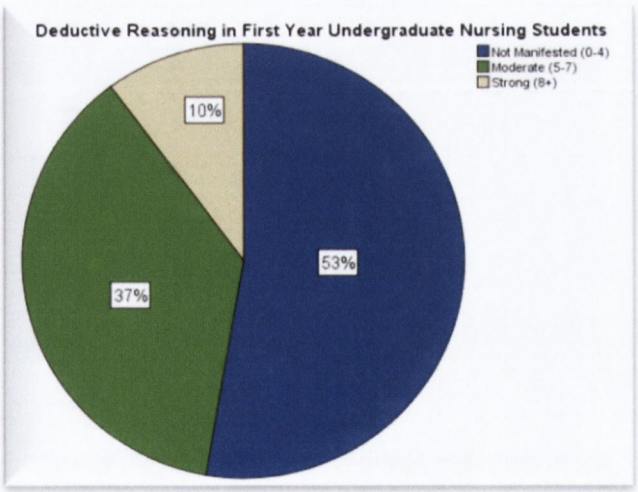


Figure 6.7 First year nursing students: Deductive reasoning

6.6 Summary of the main findings for critical thinking skills of the first year cohort of undergraduate nursing students

In this section, the main findings for the critical thinking skills of the first year cohort of undergraduate nursing students are summarised. The first year nursing students who completed the HSRT were predominantly female (92%, N=117). The majority were undertaking the nursing degree as their first academic qualification (93%, N=118). A majority of the cohort (91%, N=116) had not undertaken a thinking skills course before entry. The group were predominantly Irish in origin (91%, N=115). The mean age was 20 years and there were 14 students who were aged 26 years and older and the oldest was 45 years of age (N=1) (Tables 6.1-6.8).

6.6.1 Main findings for the critical thinking skills of the first year nursing students by nursing discipline

A small subgroup (N=13) of the cohort of first year undergraduate nursing students was undertaking the integrated children's and general nursing strand. An independent samples t-test was used to find out if they were different in terms of their critical thinking skills compared to the general nursing students only. *A main finding was, a statistically significant difference between the integrated children's and general nursing students and the general nursing students in the average score for overall critical thinking skill.* The children's and general nursing students revealed a statistically significantly higher average score of 19.62 (SD 3.70) compared to the general nursing students average score of 16.69 (SD 4.61), t (*df,* 125) =-2.202, p=.030, <.05. *A second main finding was a statistically significant difference for the critical thinking skill of analysis.* The children's and general nursing students had a higher average score of 4.15 (SD 1.06) compared to the general nursing students average score of 3.18 (SD 1.35), t (*df,* 125) = 2.518, p=.013, <.05. Although the difference in the average scores (Table 6.10) were statistically significant when compared to the categories identified by (Facione & Facione, 2012) both groups were *moderate* in strength for overall critical thinking skill and for the skill of analysis (Tables 3.2 & 3.3).

A third main finding was that, there was no significant difference between the disciplines for the critical thinking skills of inference, evaluation, inductive and deductive reasoning. A comparison of the average scores for these critical thinking skills (Table 6.10) with the categories identified by (Facione & Facione, 2012) (Table 3.3) revealed that the critical thinking skill of inference was *moderate* for the integrated children's and

general nursing students and was *not manifested* for the general nursing students. For the critical thinking skills of evaluation and inductive reasoning both disciplines were *moderate* in strength. For the skill of deductive reasoning, the integrated children's and general nursing students were *moderate* in strength while this skill was *not manifested* for the general nursing students.

6.6.2 Main findings for the critical thinking skill norms of the first year undergraduate nursing students

For *overall critical thinking skill,* the first year nursing students had a mean score of 16.99 (SD 4.60). Compared to the norms of a national aggregated sample of US undergraduate nursing students identified by (Facione & Facione, 2012) revealed, that in this case study, a first year nursing student with an average overall critical thinking skill average score of 16.99 was very close to the 29th percentile and below the 48th or median percentile (Appendix 8). When compared to the norms of a US national aggregated sample of undergraduate health sciences students identified by Facione and Facione (2012) a first year nursing student in this study was in the 27th percentile and below the 53rd or median percentile. These comparisons provide knowledge of the overall critical thinking skill of the first year undergraduate nursing students in this study compared to aggregate norms for US undergraduate nursing and health sciences students.

6.6.3 Main findings for the strength of the critical thinking skills of the first year cohort of undergraduate nursing students

The main findings in terms of *strength of overall skill in critical thinking* for a first year undergraduate nursing student with a mean score of 16.99 (SD 4.60) was in the *moderate* category. They also scored in the *moderate* category for the critical thinking skills of analysis with a mean score of 3.28 (SD1.35), evaluation (4.00, SD1.35) and inductive reasoning (6.41, SD1.83). Results revealed that the critical thinking skills of inference with a mean score of 2.86 (SD1.11) and deductive reasoning with a mean score of 4.54 (2.14) were *not manifested* in the first year undergraduate nursing students. These results are discussed later in Chapter 10.

6.6.4 Main findings for the critical thinking skills as a percentage proportion of the first year undergraduate nursing students

The main findings for the percentage proportions of the first year undergraduate nursing students for critical thinking skills revealed that *overall critical thinking skill* was not manifested in 32% (N=40) of the cohort, moderate for 43% (N=55), strong for 23% (N=27) and superior for 2% (N=3). For the critical thinking skill of *analysis* this was not manifested for 29% (N=32) of the students, moderate for 50% (N=64), and strong for 21% (N=26). For *inference* as a skill for critical thinking this was not manifested for 35% (N=44) students, moderate for 58% (N=74), and strong for 7% (N=9). For *evaluation* as a skill for critical thinking this was not manifested for17% (N=21) of the students, moderate for 42% (N=53) and similarly 42% (N=53) were strong for this critical thinking skill. For *inductive reasoning* as a skill for critical thinking this was not manifested for 18% (N=22), moderate for 48% (n=61) and strong for 34% (N=43). For *deductive reasoning* as a skill for critical thinking this was not manifested for 53% (N=67), moderate for 37% (N=47) and strong for 10% (N=13). These results for the critical thinking skills as a percentage proportion of the first year cohort are discussed later in Chapter 10.

6.7 Conclusion

This chapter presented the results for the critical thinking skills of the first year undergraduate nursing students as measured by the Health Sciences Reasoning Test. The first year nursing students had moderate strength for overall critical thinking skill and for the skills of analysis, evaluation and inductive reasoning. Moderate strength in these skills indicate that these first year nursing students had the potential to analyse and evaluate situations, issues and problems in both the academic and clinical practice settings. They did not manifest the skills of inference and deductive reasoning. Weakness in these important skills appears to suggest lack of ability to grasp the best meaning from situations and to effectively consider the outcomes of situations as influenced by empirical evidence. The results for the critical thinking skills presented provide evidence for consideration in the development of critical thinking skills among first year undergraduate nursing students. The final section of this chapter presented a summary of the main results. These results are integrated with the qualitative findings and discussed later in Chapter 10. In the next chapter, the results for the critical thinking dispositions of the third year cohort of undergraduate nursing students are presented.

Chapter 7 Results for the Critical Thinking Dispositions of the Third Year Undergraduate Nursing Students

7.1 Introduction

This chapter presents the results for the critical thinking dispositions of the third year cohort of undergraduate nursing students as measured using the California Critical Thinking Disposition Inventory (CCTDI) (Facione et al., 2014). The CCTDI derived from the Delphi construct of critical thinking measured the dispositions: *truth-seeking, open-mindedness, analyticity, systematicity, critical thinking self-confidence, inquisitiveness, maturity of judgement and overall disposition to think critically* (Facione et al., 2014; Facione, 1990). The results address research question two which asked: *What are the critical thinking dispositions of the third year undergraduate general nursing students as measured by the California Critical Thinking Disposition Inventory?*

In the first section of this chapter the demographic characteristics of the third year cohort of undergraduate nursing students are presented. In the second section, results of an independent samples t-test which explored the difference between a small sub-group of students undertaking the integrated children's and general nursing strand and those undertaking taking general nursing only are presented. It was important to examine if there were differences in the critical thinking dispositions of this group of integrated children's and general nursing students to ensure that the interpretation of the results for the critical thinking skills of the cohort were accurate. In the third section, the critical thinking dispositions are presented. In the fourth section, critical thinking dispositions as a percentage proportion of the third year cohort are presented. A summary of the main findings is presented in the last section of this chapter.

7.2 Demographic characteristics of the third year undergraduate nursing students

The *demographic characteristics* of the third year cohort of undergraduate nursing students are presented in this section. Tables 7.1 to 7.8 show the results for each of the demographic variables. The response rate for the third year nursing students who completed the California Critical Thinking Disposition Inventory (CCTDI) was 57% (N= 215 of 378) (Table 3.5). In relation to *gender,* 93% (N=201) were female and 7% (N=14) were male. For *nursing discipline,* 85% (N=183) were general nursing only and

a smaller percentage (15%, N=32) were undertaking an integrated children's and general nursing strand. In relation to *level of education,* 88% (N=190) were undertaking the nursing degree course as their first academic qualification. Three per-cent (N=7) had a degree, 2% (N= 5) had a diploma, and 6% (N=13) had an *'other'* qualification. The nature of this *'other'* qualification was a Higher Education and Training Award, a level six higher or advanced certificate award, above a level five or leaving certificate award and below a level seven which is an ordinary bachelor degree award (National Qualifications Authority of Ireland, 2007).

In relation to u*niversity site*, 55% (N=119) were from university site one and 45% (N=96) were from university site two. Respondents were asked if they had completed a *thinking skills course* and while the majority, 96% (N=207) had not, a small percentage, 4% (N=8), had undertaken a course to improve their thinking skills. Results in relation to *ethnic origin* revealed that the group were mainly Irish, 98% (N=210), and a small percentage, 2% (N=5) were of *'other'* ethnic origin. The results for *age* revealed a mean age of 22 years (SD 3.87), the youngest was 19 years of age, while the oldest was 42 years of age (Table 7.7). The distribution for age is shown in the bar chart in Figure 7.1. Age was re-coded into three categories 17-20, 21-25, and 26-45 (Table 7.8). These categories identified the younger from the older and more mature students in the third year cohort.

In summary, the third year cohort was mainly female, (93%, N=201), undertaking a four year undergraduate honours degree in nursing. They were predominantly Irish and the majority, 94% (N=203), were undertaking the nursing degree as their first academic qualification. The mean age was 22 years and mature students, those aged 26 and over, constituted 17% (N=36) of the third year cohort. These characteristics provide a description of the third year cohort of undergraduate nursing students who completed the CCTDI. In the following sections results are presented for the critical thinking dispositions.

7.2.1 Frequency tables showing the demographic characteristics of the third nursing students for the CCTDI

	Frequency	Percent	Valid Percent	Cumulative Percent
Female	201	93	93	93
Male	14	7	7	100
Total	215	100	100	

Table 7.1 Gender of the third year nursing students

	Frequency	Percent	Valid Percent	Cumulative Percent
General Nursing	183	85	85	85
Children's & General Nursing	32	15	15	100
Total	215	100	100	

Table 7.2 Nursing discipline of the third year nursing students

	Frequency	Percent	Valid Percent	Cumulative Percent
Diploma	5	2	2	2
Degree	7	3	3	6
None	190	88	88	94
Other	13	6	6	100
Total	215	100	100	

Table 7.3 Educational qualification of the third year nursing students

	Frequency	Percent	Valid Percent	Cumulative Percent
Site One	119	55	55	55
Site Two	96	45	45	100
Total	215	100	100	

Table 7.4 University site of the third year nursing students

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	8	4	4	4
No	207	96	96	100
Total	215	100	100	

Table 7.5 Thinking skills course completed by the third year nursing students

	Frequency	Percent	Valid Percent	Cumulative Percent
Irish	210	98	98	98
Other	5	2	2	100
Total	215	100	100	

Table 7.6 Ethnic origin of the third year nursing students

N	Valid	215
	Missing	0
Mean		22.23
Median		21.00
Mode		21
Std. Deviation		3.878
Range		23
Minimum		19
Maximum		42

Table 7.7 Statistics for age of the third year nursing students

Age	Frequency	Percent	Valid Percent	Cumulative Percent
17-20	73	34	34	34
21-25	106	49	49	83
26-45	36	17	17	100
Total	215	100	100	

Table 7.8 Age categories of the third year nursing students

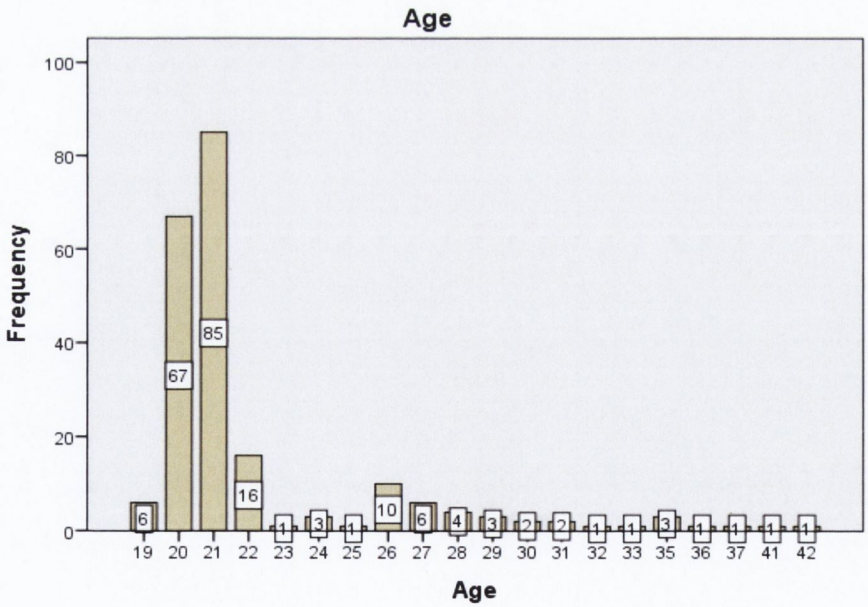


Figure 7.1 Bar chart showing age distribution of the third year nursing students

7.3 Critical thinking dispositions of the third year cohort of undergraduate nursing students by nursing discipline

7.3.1 Statement of hypothesis

In this section, results are presented for the critical thinking dispositions of the third year cohort based on nursing discipline. It was important to examine if the nursing students taking the integrated children's and general nursing strand (N=32) were different from students undertaking the general strand. This was to ensure that the results for the critical thinking dispositions of the third year cohort would be accurate. To explore if there was a difference it was necessary to test the *hypothesis* that there was a difference in the average critical thinking disposition sub-scale scores and overall critical thinking disposition score for the general and the children's and general nursing disciplines in the third year of the undergraduate nursing degree course. The *null hypothesis* was that, there was no difference in the average critical thinking disposition sub-scale scores and overall critical thinking scores for the general and the children's and general nursing disciplines in the third year of the undergraduate nursing degree course. An independent samples t-test was used to test this hypothesis (Aron et al., 2008). Before testing it was necessary to assess the assumptions of *independence, a normal distribution and equality of variance in population* to ensure that the results of the independent samples t-test were meaningful.

7.3.2 Assessment of assumptions of the independent samples t-test

In relation to the assumption of *independence* each group was independent and a respondent was in one group and one group only, thus, the assumption of independence was accepted. To test the assumption of a *normal distribution* in the population *the Shapiro-Wilk test, as well as skewness and kurtosis was used*, and as was explained, in the methodology chapter, in Section 3.17.6. The results of the Shapiro-Wilk test revealed non-significant results for truth-seeking, analyticity, systematicity, and critical thinking self-confidence and the assumption of normality was upheld (Table 7.9). A significant result was revealed for open-mindedness, inquisitiveness, maturity of judgment as well as overall disposition score and this indicated the assumption of normality was not met for these variables. The skewness value for open-mindedness was -.217, inquisitiveness was -.457 and for maturity of judgment was -.636. The skewness value for the overall CCTDI was .127 (Table 7.12). These values were within the range of -2 to + 2 and as such the skewness was not in

the extreme and on this basis the assumption of normality was accepted (Acton & Miller, 2009, p. 69).

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Truth-seeking	.059	215	.071	.991	215	.188
Open-mindedness	.090	215	.000	.987	215	.043
Analyticity	.061	215	.048	.991	215	.230
Systematicity	.050	215	.200*	.996	215	.828
Critical Thinking Self Confidence	.064	215	.035	.993	215	.384
Inquisitiveness	.091	215	.000	.983	215	.009
Maturity of Judgment	.084	215	.001	.974	215	.001
Total CCTDI Score	.059	215	.064	.983	215	.011

a. Lilliefors Significance Correction

*. This is a lower bound of the true significance.

Table 7.9 Tests of normality for critical thinking dispositions of the third year undergraduate nursing students

To test the third assumption of *homogeneity of variance,* Levene's test for equality of variance was used and results read accordingly; *'equal variance assumed'* or *'equal variance not assumed'* depending on the significance value for each dependent variable of the CCTDI. The results of Levene's test are reported with the results of the independent samples test (Table 7.11). Based on the assessment of the assumptions of independence, normality and equality of variance the results of the independent samples t-test as a parametric statistical test were accepted as meaningful in relation to third year cohort of undergraduate nursing students.

7.3.3 Average scores for critical thinking dispositions in the third year nursing students by nursing discipline

Table 7.10 shows the mean scores and standard deviation for the two groups of nursing students. The students undertaking the children's and general nursing (N=32) when compared to those taking general nursing only (N=183) had higher mean scores for the overall disposition towards critical thinking and the subscales of open-mindedness, analyticity, systematicity, critical thinking self-confidence, inquisitiveness and maturity of judgment. The children's and general nursing students had a lower

average score than the general nursing students in relation to truth-seeking. An independent samples t-test was used to find out if these differences were significant.

	Nursing Discipline	N	Mean	Std. Deviation	Std. Error Mean
Truth-seeking	General Nursing	183	35.5055	6.22987	.46053
	Children's & General Nursing	32	33.3594	5.63799	.99667
Open-mindedness	General Nursing	183	41.1020	5.54493	.40989
	Children's & General Nursing	32	41.8229	3.71738	.65715
Analyticity	General Nursing	183	41.2419	5.82900	.43089
	Children's & General Nursing	32	41.4773	3.94409	.69722
Systematicity	General Nursing	183	36.4878	7.28507	.53853
	Children's & General Nursing	32	39.7727	5.52255	.97626
Critical Thinking Self Confidence	General Nursing	183	38.9132	6.97784	.51582
	Children's & General Nursing	32	39.4792	7.32684	1.29521
Inquisitiveness	General Nursing	183	43.9235	7.43356	.54950
	Children's & General Nursing	32	44.8438	5.23702	.92578
Maturity of Judgment	General Nursing	183	41.9016	7.23553	.53487
	Children's & General Nursing	32	43.2813	5.46091	.96536
Total CCTDI Score	General Nursing	183	279.0755	31.07322	2.29700
	Children's & General Nursing	32	284.0365	15.00160	2.65193

Maximum disposition sub-scale score = 60. Recommended cut-off sub-scale score = 40. Maximum overall disposition score = 420.

Table 7.10 Mean scores for the critical thinking dispositions of the third year cohort of undergraduate nursing students by nursing discipline

7.3.4 Results of an independent samples t-test for critical thinking dispositions of the third year undergraduate nursing students by discipline

Prior to interpreting the results of the t-test it was necessary to assess the assumption of equality of variance in the population using Levene's test. Table 7.11 shows the results of the independent samples t-test for the seven disposition subscales. Levene's

test was significant at an alpha level of 0.05 for the total disposition score (p =.001) and the subscale of open-mindedness (p =.041). The results were read for, *'equal variance not assumed'*. Levene's test was not significant for truth-seeking (p =.779), analyticity (p =.067), systematicity (p =.101), critical thinking self-confidence (p =.975), inquisitiveness (p =.121) and maturity of judgment (p =.199) and the results for, *'equal variance assumed'* were read.

The independent samples t-test revealed a significant difference in relation to *systematicity,* with the children's and general nursing students having a higher average score 39.77 (SD 5.52) compared to the general nursing students 36.48 (SD7.28), t (*df,* 213) = 2.430, p=.016, <.05. *The null hypothesis was rejected thus supporting the research hypothesis of a significant difference between the groups in the average score for the critical thinking disposition of systematicity.* The results of the independent samples t-test for the critical thinking dispositions of, truth-seeking, open-mindedness, analyticity and critical thinking self -confidence were not significant. In relation to *truth-seeking*, the general nursing students had a higher mean score of 35.50 (SD 6.22) than the children's and general nursing students mean score of 33.35 (SD 5.63), t (*df,* 213) = 1.822, p=.070, <.05. For *open-mindedness* the children's and general nursing students had a mean score of 41.82 (SD 3.71) compared to the general nursing students mean score of 41.10 (SD 5.54), t (*df,* 58.311) = -.931, p=.356, <.05. For *analyticity* the mean score for the children's and general nursing students was 41.47 (SD 3.94) and the mean for the general nursing students was 41.24 (SD 5.82), t (*df,* 213) = -.220, p=.826, <.05. *Critical thinking self-confidence* had a mean score for the children's and general nursing students of 39.47 (SD 7.32) and the mean for the general nursing students was 38.91 (SD 6.97), t (*df,* 213) = -.420, p=.675, <.05.

Results of the independent samples t-test were not significant for, inquisitiveness and maturity of judgment. For *inquisitiveness* the mean score for the children's and general nursing students was 44.84 (SD 5.23) and the mean for the general nursing students was 43.92 (SD 7.43), t (*df,* 213) = -.671, p=.503, <.05. *Maturity of judgement* had a mean score for the children's and general nursing students of 43.28 (SD 5.46) and the mean for the general nursing students was 41.90 (SD 7.23), t (*df,* 213) = -1.028, p=.305, <.05. *There was no significant difference between the groups in relation to the overall critical thinking disposition mean score.* The children's and general nursing

students mean score was 284.03 (SD 15.00) and the mean for the general nursing students was 279.07 (SD 31.07), t (*df,* 86.65) = -1.414, p=.161, <.05. *The null hypothesis was not rejected and the conclusion was that, there was no significant difference between the groups for the dispositions of truth-seeking, open-mindedness, analyticity, critical thinking self-confidence, inquisitiveness, maturity of judgment and for the overall disposition towards critical thinking.*

In summary, there was a statistically significant difference between the children's and general and general nursing students in the average score for the critical thinking disposition of systematicity with the children's and general nursing students having a higher mean score of 39.77 (SD 5.52) compared to the general nursing students' mean score of 36.48 (SD7.28), t (df, 213) = -2.430, p=.016, <.05. Although this difference between the groups was statistically significant both groups were in the *ambivalent category* in relation to systemaicity or having a systematic approach as a *'habit of mind'* based on the category scores identified by Facione et al. (2014) (Table 3.1). Therefore, both groups were considered weak for this disposition.

There was no significant difference in the subscale scores between the groups for the critical thinking dispositions of truth-seeking, open-mindedness, analyticity, critical thinking self- confidence, inquisitiveness, and maturity of judgment. Based on their mean scores (Table 7.10) and the categories identified by Facione et al. (2014) students in both disciplines were *positive* for open-mindedness, analyticity, inquisitiveness and maturity of judgment (Table 3.1). Being positive meant they were disposed to these attributes in relation to critical thinking. They were *ambivalent* for truth-seeking, systematicity, as mentioned above, and for critical thinking self-confidence (Table 3.1). Being ambivalent meant they were somewhat weak and as such not disposed to these attributes. There was no significant difference in the average scores between the groups in relation to the overall disposition to think critically and when compared to the categories identified by Facione and Facione (2010) the integrated children's and general nursing students were *positive,* while those in the general strand were *ambivalent* in overall disposition to think critically (Tables 7.10 & 3.1). Based on these results, the critical thinking dispositions presented in the next section provide an accurate and truthful account of the critical thinking dispositions of the third year cohort of undergraduate nursing students.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Truth-seeking	Equal variances assumed	.079	.779	1.822	213	.070	2.14609	1.17788	-.17571	4.46789
	Equal variances not assumed			1.955	45.299	.057	2.14609	1.09792	-.06483	4.35701
Open-mindedness	Equal variances assumed	4.237	.041	-.707	213	.480	-.72091	1.01901	-2.72955	1.28772
	Equal variances not assumed			-.931	58.311	.356	-.72091	.77450	-2.27107	.82924
Analyticity	Equal variances assumed	3.383	.067	-.220	213	.826	-.23535	1.07193	-2.34829	1.87760
	Equal variances not assumed			-.287	57.767	.775	-.23535	.81963	-1.87615	1.40546
Systematicity	Equal variances assumed	2.717	.101	-2.430	213	.016	-3.28490	1.35200	-5.94991	-.61989
	Equal variances not assumed			-2.946	51.918	.005	-3.28490	1.11494	-5.52227	-1.04752
Critical Thinking Self Confidence	Equal variances assumed	.001	.975	-.420	213	.675	-.56599	1.34696	-3.22108	2.08910
	Equal variances not assumed			-.406	41.436	.687	-.56599	1.39415	-3.38063	2.24865
Inquisitiveness	Equal variances assumed	2.421	.121	-.671	213	.503	-.92025	1.37115	-3.62301	1.78251
	Equal variances not assumed			-.855	55.517	.396	-.92025	1.07658	-3.07732	1.23682
Maturity of Judgment	Equal variances assumed	1.662	.199	-1.028	213	.305	-1.37961	1.34228	-4.02546	1.26624
	Equal variances not assumed			-1.250	52.117	.217	-1.37961	1.10363	-3.59409	.83487
Total CCTDI Score	Equal variances assumed	11.723	.001	-.884	213	.378	-4.96092	5.61183	-16.02277	6.10092
	Equal variances not assumed			-1.414	86.655	.161	-4.96092	3.50841	-11.93466	2.01282

Table 7.11 Independent samples t-test for the critical thinking dispositions of the third year cohort of undergraduate nursing students by nursing discipline

7.4 Critical thinking dispositions of the third year cohort of undergraduate nursing students

In this section, the results for the critical thinking dispositions of the third year cohort of undergraduate nursing students are presented. The response rate for those who completed the CCTDI was 57% (N=215) of the cohort who entered the course in September 2007 (Table 3.5). Table 7.12 shows the findings for each of the seven sub-scales as well as a total score on the CCTDI. In relation to *truth-seeking* as a disposition towards critical thinking, the mean score was 35.18 (SD 6.18), the lowest score was 19.17 and the highest score was 58.33. For *open-mindedness,* the mean score was 41.20 (SD5.31), the lowest score was 25.00 and the highest score was 55.00. For *analyticity*, the mean was 41.27 (SD 5.58), the lowest score was 24.55 and the highest score was 57.27. For *systematicity,* the mean score was 36.97 (7.13), the lowest score was 17.27 and the highest score was 56.36. For *critical thinking self-confidence*, the mean score was 38.99 (SD 7.01), the lowest score was 21.11 and the highest score was 60.00. For *inquisitiveness,* the mean score was 44.06 (SD 7.14), the lowest score was 16.00 and the highest score was 60.00. For *maturity of judgment*, the mean score was 42.10 (SD 7.00), the lowest score was 17.00 and the highest score was 57.00. The *total CCTDI score* for the cohort revealed a mean score of 279.81 (SD 29.27), the lowest score was 184.26 and the highest score was 373.32.

In summary, the results for the third year cohort of undergraduate nursing students for the dispositions towards critical thinking revealed that the highest mean score was evident for *inquisitiveness* 44.06 (SD 7.14). The next highest sub-scales were *maturity of judgment* with a mean score of 42.10 (SD 7.00), *analyticity* 41.27 (SD 5.58) and *open-mindedness* 41.20, (SD5.31). The next highest dispositions were *critical thinking self-confidence* with a mean score of 38.99 (SD 7.01) and *systematicity* 36.97 (SD7.13). The disposition of *truth-seeking* had the lowest mean score of the seven disposition sub-scales 35.18 (SD 6.18). A comparison of these average scores with the recommended categories identified by Facione and Facione (2014) (Table 3.1) revealed that the third year cohort were *positive* for inquisitiveness, maturity of judgment, analyticity and open-mindedness and therefore, they were disposed to these attributes. They were *ambivalent* towards critical thinking self-confidence, systematicity, and truth-seeking, and as such they were weak in these dispositions in relation to critical thinking. The overall or total disposition score at 279.81 (SD 29.27) was just short of the cut-off score of 280.00 and ambivalent (Table 7.14). In the next section

results for the critical thinking dispositions as a percentage proportion of the third year cohort are presented.

		Truth-seeking	Open-mindedness	Analyticity	Systematicity	Critical Thinking Self Confidence	Inquisitiveness	Maturity of Judgment	Total CCTDI Score
N	Valid	215	215	215	215	215	215	215	215
	Missing	0	0	0	0	0	0	0	0
Mean		35.1860	41.2093	41.2770	36.9767	38.9974	44.0605	42.1070	279.8139
Std. Error of Mean		.42151	.36227	.38068	.48670	.47850	.48740	.47782	1.99639
Median		35.0000	41.6667	40.9091	36.3636	38.8889	45.0000	42.0000	279.7374
Mode		34.17	43.33	38.18	34.55	38.89	46.00	42.00	251.81[a]
Std. Deviation		6.18050	5.31193	5.58185	7.13636	7.01617	7.14673	7.00619	29.27280
Variance		38.199	28.217	31.157	50.928	49.227	51.076	49.087	856.897
Skewness		.262	-.217	.150	-.070	-.100	-.457	-.636	.127
Std. Error of Skewness		.166	.166	.166	.166	.166	.166	.166	.166
Kurtosis		.514	.251	.412	-.008	.053	.768	.670	1.188
Std. Error of Kurtosis		.330	.330	.330	.330	.330	.330	.330	.330
Range		39.17	30.00	32.73	39.09	38.89	44.00	40.00	189.06
Minimum		19.17	25.00	24.55	17.27	21.11	16.00	17.00	184.26
Maximum		58.33	55.00	57.27	56.36	60.00	60.00	57.00	373.32
Percentiles	25	30.8333	38.3333	38.1818	32.7273	34.4444	40.0000	38.0000	264.8889
	50	35.0000	41.6667	40.9091	36.3636	38.8889	45.0000	42.0000	279.7374
	75	39.1667	44.1667	44.5455	41.8182	43.3333	49.0000	47.0000	295.1010

a. Multiple modes exist. The smallest value is shown

Maximum overall disposition score = 420. Maximum dispositional sub-scale score = 60 Recommended cut-off sub-scale score = 40

Table 7.12 Statistics for the critical thinking dispositions of the third year cohort of undergraduate nursing students

7.5 Critical thinking dispositions as a percentage proportion of the third year cohort of undergraduate nursing students

In this section, results are presented which show the percentage proportions of the third year cohort of undergraduate nursing students for the dispositions towards critical thinking. The pie charts (Figures 7.2 – 7.9) illustrate the proportions of the cohort who were *negative, ambivalent, positive* or *highly positive* in their disposition towards critical thinking. The percentages in the pie charts have been rounded to whole percentages. In the rounding process SPSS in some cases rounded downwards and in other cases rounded upwards, thus, resulting in a cumulative total in some cases slightly over and in other cases slightly under 100%. Frequency tables to accompany the pie charts are presented in Appendix 35 and percentage values were not rounded.

To obtain the percentage proportions for the cohort it was necessary to recode the data into the categories and score ranges recommended by Facione et al. (2014) and shown in Table 3.1. SPSS was used to categorise the data and it was necessary to use clear cut off points for each category and this was also necessary to ensure that a respondent was in one category and one category only. The raw scores on the seven subscales were re-coded into the following categories: *low or negative* (10.00 - 29.99), *ambivalent* (30.00 - 39.99), *positive* (40.00 - 49.99) and *high* (50.00 - 60.00) (Table 7.13). The total CCTDI scale score was categorised as: *low* (70.00 - 209.99), *ambivalent* (210.00 - 279.99), *positive* (280.00 - 349.00), and *high* (350.00 - 420.00) (Table 7.14). This categorisation resulted in a 0.01% difference between the categories. A manual numeric count was done using the frequency distribution tables for each dispositional subscale of the CCTDI and the results in all cases were consistent with the frequency count in the frequency tables for each of the categorised dispositions (Appendix 35). This confirmed that the slight 0.01% difference in the categories did not impact the categorisation of the cohort. Each respondent, based on their raw score, was in the appropriate category and the results were accurate.

Low	Ambivalent	Positive	High
10.00 - 29.99	30.00 - 39.99	40.00 - 49.99	50.00 - 60.00

Table 7.13 Categories and range of scores for the sub-scales of the CCTDI used in SPSS

Low	Ambivalent	Positive	High
70.00 - 209.99	210.00 - 279.99	280.00 - 349.99	350.00 - 420.00

Table 7.14 Categories and range of scores for overall CCTDI score used in SPSS

Results revealed that in relation to *truth-seeking,* 16% (N=34) were negative, 62% (N=134) were ambivalent, 20% (N=44) were positive and 1% (N=3) were in the high positive category. For *open-mindedness,* 2% (N=4) were negative, 33% (N=70) were ambivalent, 61% (N=132) were positive and 4% (N=9) were in the high positive category. For *analyticity,* 1% (N=3) were negative, 39% (N=83) were ambivalent, 53% (N=115) were positive and 7% (N=14) were in the high positive category. For systematicity, 14% (N=30) were negative, 50% (N=107) were ambivalent, 33% (N=72) were positive and 3% (N=6) were in the high positive category. *For critical thinking self-confidence*, 9% (N=19) were negative, 45% (N=96) were ambivalent, 39% (N=84) were positive and 7% (N=16) were in the high positive category. For *inquisitiveness,* 4% (N=8) were negative, 20% (N=44) were ambivalent, 55% (N=119) were positive and 20% (N=44) were in the high positive category. For *maturity of judgment,* 6% (N=12) were negative, 26% (N=56) were ambivalent, 54% (N=117) were positive and 14% (N=30) were in the high positive category. In relation to the total or *overall disposition* score 1% (N=3) were negative, 50% (N=108) were ambivalent, 47% (N=100) were positive and 2% (N=4) were in the high positive category. These results for the are interpreted and discussed in relation to the results for the critical thinking dispositions of the third year cohort later in Chapter 11. In the next and final section of this chapter the results for the critical thinking dispositions are summarised.

7.5.1 Pie charts showing the critical thinking dispositions as percentage proportions of the third year cohort of undergraduate nursing students

(Sample N= 215)

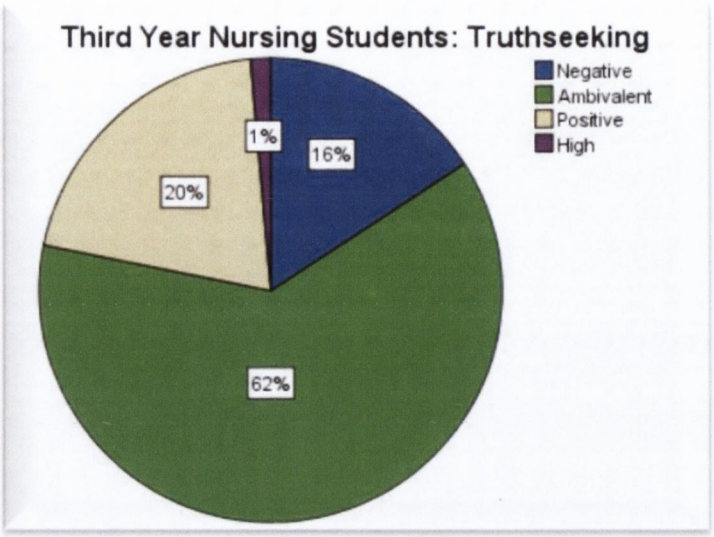


Figure 7.2 Third year nursing students: Truth-seeking

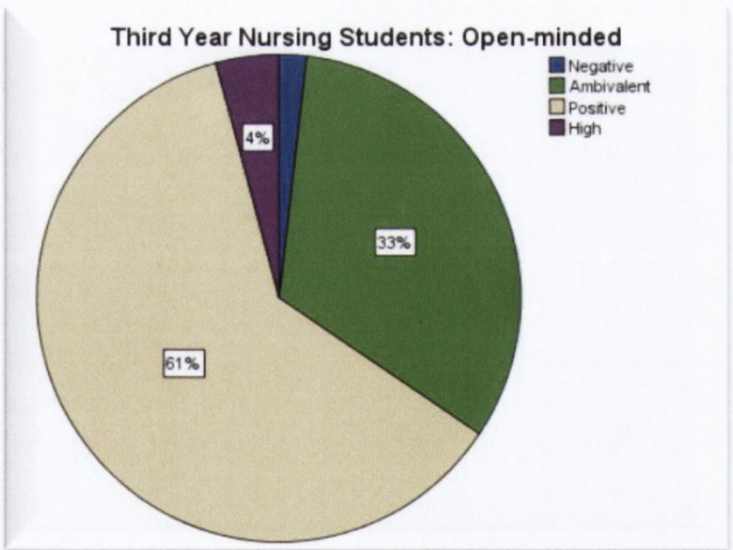


Figure 7.3 Third year nursing students: Open-mindedness

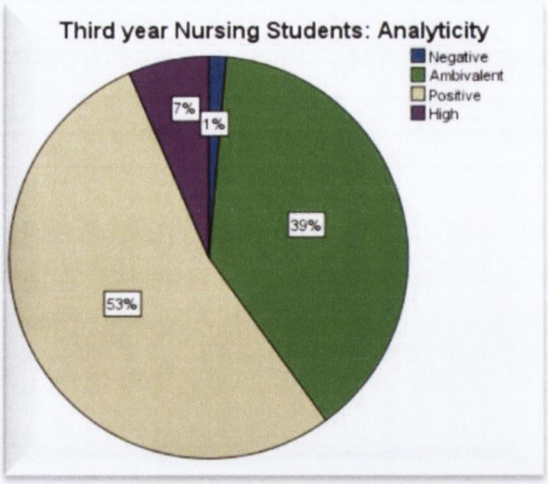


Figure 7.4 Third year nursing students: Analyticity

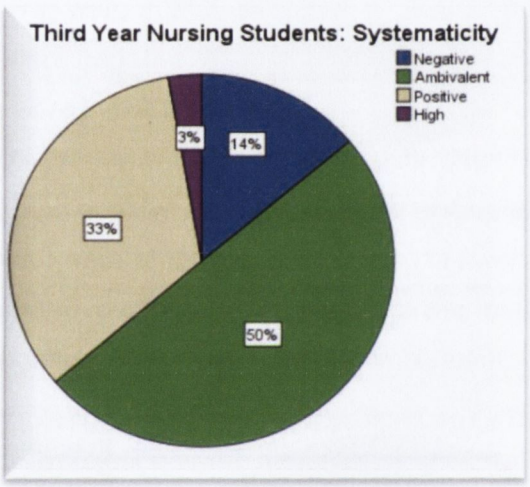


Figure 7.5 Third year nursing students: Syatematicity

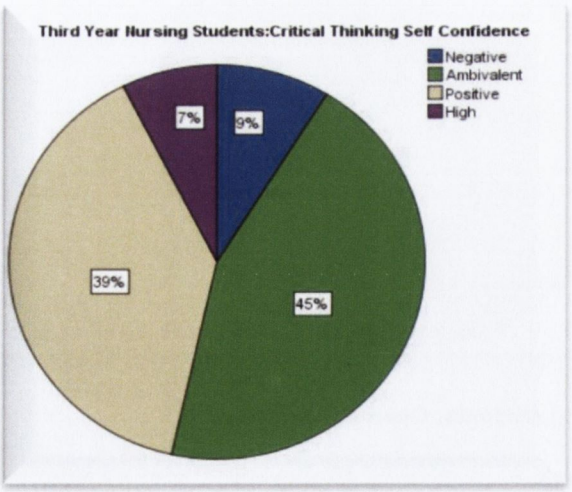


Figure 7.6 Third year nursing students: Critical thinking self-confidence

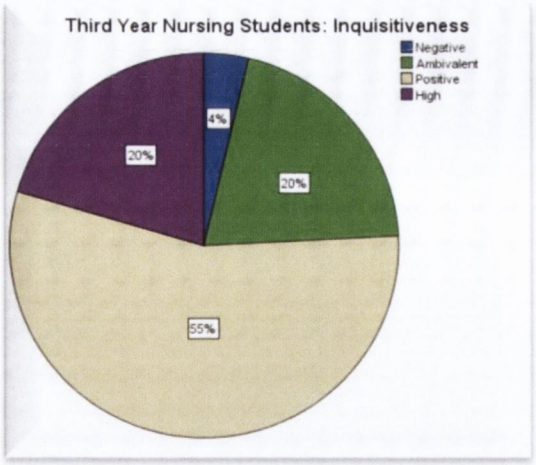


Figure 7.7 Third year nursing students: Inquisitiveness

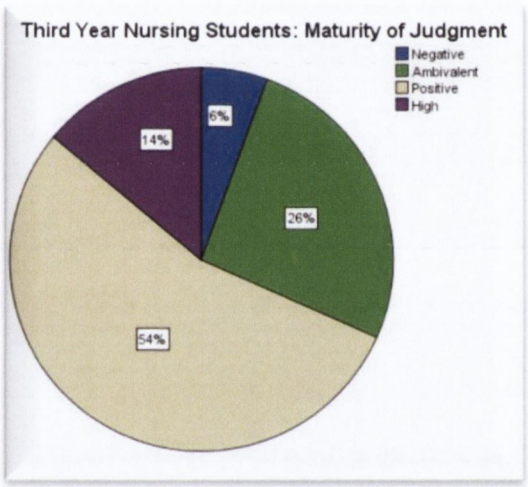


Figure 7.8 Third year nursing students: Maturity of judgment

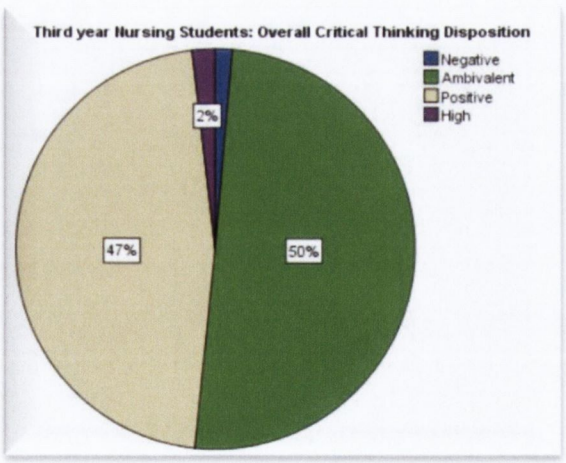


Figure 7.9 Third year nursing students: Overall disposition to think critically

7.6 Summary of the critical thinking dispositions of the third year cohort of undergraduate nursing students

The main characteristics and findings for the third year cohort of undergraduate nursing students are summarised here. The third year cohort was predominantly female (93%, N=201) and undertaking a four year honours degree in nursing as their first academic qualification. The cohort was predominantly Irish in origin (98%, N=210) with a mean age of 22 years. Mature entrants, those aged 26 and over, constituted 17% (N=36) of the third year cohort.

7.6.1 Main findings for critical thinking dispositions of the third year cohort by nursing discipline

As was explained earlier in this chapter, the third year cohort had a subgroup (N=32) who were undertaking the integrated children's and general nursing strand. An independent samples t-test was used to confirm if this subgroup was different in terms of their critical thinking dispositions to ensure more accurate results for the critical thinking dispositions of the entire first year cohort. *The first main finding was a significant difference between the average scores for the two disciplines in relation to the disposition of systematicity or using a systematic approach as a 'habit of mind'.* When compared to the category scores identified by Facione and Facione (2014) both disciplines were in the *ambivalent category* and as such considered weak (Tables 7.10 & 3.1). *The second main finding was that there was no significant difference between the two disciplines for the dispositions of, truth-seeking, open-mindedness, analyticity, critical thinking self-confidence, inquisitiveness, maturity of judgment and for overall disposition to think critically.* Based on their mean scores, and the categories identified by Facione and Facione (2014), both disciplines were *positive* for open-mindedness, analyticity, inquisitiveness, and maturity of judgment and therefore disposed to these attributes in relation to thinking critically. They were *ambivalent* for truth-seeking and critical thinking self- confidence and as such weak and therefore inconsistent in these attributes in relation to thinking critically (Tables 3.1, 7.14). *A third main finding was that there was no significant difference in the average scores between the groups in relation to the overall disposition to think critically. When compared to the categories identified by Facione and Facione (2014) the integrated children's and general nursing students were positive while those in the general strand were ambivalent in overall disposition to think critically (Tables 7.10, 7.14).*

7.6.2 Main findings for critical thinking dispositions of the third year cohort of undergraduate nursing students

The main findings in relation to disposition towards critical thinking revealed the highest mean score was in relation to the disposition *inquisitiveness* (44.06, SD7.14). The next three highest subscales were, *maturity of judgment* (42.10, SD 7.00), *analyticity* (41.27, SD 5.58) and *open-mindedness* (41.20, SD5.31). The next highest dispositions were, *critical thinking self-confidence* (38.99, SD 7.01) and *systematicity* (36.97, SD 7.13). The disposition of *truth-seeking* had the lowest mean score (35.18, SD 6.18) of the seven critical thinking disposition subscales. A comparison of these average scores with the categories recommended by Facione and Facione (2014) revealed that the third year cohort were *positive* for inquisitiveness, maturity of judgment, analyticity and open-mindedness. They were *ambivalent* in overall disposition as well as for critical thinking self-confidence, systematicity, and truth-seeking.

7.6.3 Main findings for the critical thinking dispositions as a percentage proportion of the third year undergraduate nursing students

The main findings for the percentage proportion of the third year cohort are summarised here and in the pie charts in Figures 7.2 - 7.9 and in the frequency distribution tables in Appendix 35. The main findings in relation to the *overall score* on the CCTDI for the third year nursing students revealed that 50% were ambivalent, 49% were positive and highly positive while 1% were negative in *overall disposition* towards critical thinking. For the third year cohort of nursing students, the highest percentage proportions, when combined, were positive in attitude towards *inquisitiveness* (75%, N=163), *maturity of judgment* (68%, N=147), *open-mindedness* (65%, N=141), and *analyticity* (60%, N=129). Almost two thirds (62%, N=134) were ambivalent in disposition or attitude for *truth-seeking* and half of the group (50 %, N=107) were ambivalent in relation to *systematicity.* In relation to *critical thinking self-confidence* or confidence in reasoning 45% (N=96) were ambivalent, 46% (N=100) were positive and 9% (N=19) were negative.

7.7 Conclusion

This chapter presented the results of the critical thinking dispositions of the third year cohort of undergraduate general nursing students as measured using the California Critical Thinking Disposition Inventory (CCTDI). Results were presented for the seven disposition subscales and the overall disposition towards critical thinking. Results for

the percentage proportions were also presented. Being positive for inquisitiveness meant these third year nursing students had a curiosity about knowledge and this was their strongest disposition. Being positive for maturity of judgment, analyticity and open mindedness meant they were seeing beyond the black- and- white of situations or events, potential to think ahead and were open to the opinions and views of others. It could be expected that they would be in the strong category for these dispositions as they in the third year of their nursing degree course. They were ambivalent and as such weak for critical thinking self-confidence, systematicity and truth-seeking. This appears to suggest their confidence in their reasoning was not what it could be, they were weak in being organised and disciplines in approach to situations and also weak in seeking out the truth in situations. These are important dispositions and weaknesses in these indicate the need to enhance these by the third year of the nursing degree course. The main findings were summarised in the final section of the chapter and are discussed later in Chapter 11. In the next chapter, the results for the critical thinking skills of the third year cohort of undergraduate nursing students are presented as measured using the Health Sciences Reasoning Test (HSRT).

Chapter 8 Results for the Critical Thinking Skills of the Third Year Undergraduate Nursing Students

8.1 Introduction

This chapter presents the results of the critical thinking skills of the third year cohort of undergraduate nursing students as measured using the Health Sciences Reasoning Test (HSRT) (Facione & Facione, 2012). The HSRT derived from the Delphi construct of critical thinking measured the following critical thinking skills: *analysis, inference, evaluation, inductive reasoning, deductive reasoning and overall critical thinking skill* (Facione & Facione, 2012; Facione, 1990). Results address research question four which asked: *What critical thinking skills do undergraduate general nursing students have in year three of the nursing degree course as measured by the Health Sciences Reasoning Test?*

The first section of this chapter presents the demographic characteristics of the third year cohort of undergraduate nursing students who completed the HSRT. In the second section, results of an independent samples t-test which explored critical thinking skills based on nursing discipline are presented. It was important to examine if there were differences in the critical thinking skills of a small subgroup undertaking the integrated children's and general nursing strand to ensure that the interpretation of the results for the critical thinking skills of the cohort were accurate. In the third section, findings for the critical thinking skills are presented. In the fourth section, critical thinking skills as a percentage proportion of the third year cohort are presented. A summary of the main results is presented in the final section of this chapter.

8.2 Demographic characteristics of the third year cohort of undergraduate nursing students for the Health Sciences Reasoning Test

This section presents the *demographic characteristics* of the third year cohort of undergraduate nursing students and is accompanied by frequency distribution Tables 8.1– 8.8. One hundred and sixty six (N=166) students completed the Health Sciences Reasoning Test (HSRT). In relation to *gender* 96% (N= 159) were female and 4% (N=7) were male. An analysis in relation to *nursing discipline* revealed that 83% (N=137) were general nursing only and a smaller percentage 17% (N=29) were

undertaking an integrated children's and general nursing strand. In relation *educational qualifications* 90% (N=149) were undertaking the nursing degree course as their first academic qualification. Two per-cent (N=4) had an existing qualification at degree level and 3% (N=5) had a diploma. Five per-cent (N=8) reported an *'other'* qualification. The nature of the *'other'* qualification was a Higher Education and Training Award, which is a level six higher or advanced certificate award, above a level five or leaving certificate award and below a level seven which is an ordinary bachelor degree award (National Qualifications Authority of Ireland, 2007).

In relation to *university site*, 39% (N=64) were from university site one and 61% (N=102) were from university site two. Respondents were asked if they had completed a thinking skills course prior to entry to the nursing degree course and while the vast majority had not (96%, N=160), a small percentage of 4% (N=6) indicated they had undertaken a course to improve their thinking skills. Results in relation to *ethnic origin* revealed that the group were mainly Irish (98%, N=162) and a small percentage (2%, N=4) were of *'other'* ethnic origin. The bar chart in Figure 8.1 shows the age distribution of the third year respondents. Results for *age* revealed the mean age was 22 (SD 4.24), the youngest was 19 years and the oldest was 48 years (Table 8.7). Age was re-coded into three categories, 17-20, 21-25 and 26 - 48 and this identified the younger category of students from the older and more mature age categories (Table 8.8).

In summary, the third year cohort of nursing students were predominantly female (96%, N=159). There were four with a degree, five with a diploma and the majority (95%, N=157) were undertaking the nursing degree as their first academic qualification. Ninety six per-cent (N=160) had never undertaken a thinking skills course before entry. The cohort was predominantly Irish in origin (98%, N=162) with a mean age of 22 (SD 4.24) years and there were 29 students who were aged 26 years and older. These characteristics provide a picture of the third year cohort who completed the Health Sciences Reasoning Test. The results of the HSRT are presented in later sections in this chapter. The findings based on nursing discipline are analysed in the next section.

8.2.1 Frequency tables for the demographic characteristics of the third year undergraduate nursing students for the Health Sciences Reasoning Test

	Frequency	Percent	Valid Percent	Cumulative Percent
Female	159	96	96	96
Male	7	4	4	100
Total	166	100	100	

Table 8.1 Gender of the third year nursing students

	Frequency	Percent	Valid Percent	Cumulative Percent
General Nursing	137	83	83	83
Children's & General Nursing	29	17	17	100
Total	166	100	100	

Table 8.2 Nursing discipline of the third year nursing students

	Frequency	Percent	Valid Percent	Cumulative Percent
Diploma	5	3	3	3
Degree	4	2	2	5
None	149	90	90	95
Other	8	5	5	100
Total	166	100	100	

Table 8.3 Educational qualification of the third year nursing students

	Frequency	Percent	Valid Percent	Cumulative Percent
Site One	64	39	39	39
Site Two	102	61	61	100
Total	166	100	100	

Table 8.4 University site of the third year nursing students

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	6	4	4	4
No	160	96	96	100
Total	166	100	100	

Table 8.5 Thinking skills course completed by the third year nursing students

	Frequency	Percent	Valid Percent	Cumulative Percent
Irish	162	98	98	98
Other	4	2	2	100
Total	166	100	100	

Table 8.6 Ethnic origin of the third year nursing students

N	Valid	166
	Missing	0
Mean		22.34
Median		21.00
Mode		21
Std. Deviation		4.244
Range		29
Minimum		19
Maximum		48

Table 8.7 Statistics for age of the third year nursing students

	Frequency	Percent	Valid Percent	Cumulative Percent
17-20	60	36.1	36.1	36.1
21-25	77	46.4	46.4	82.5
26-48	29	17.5	17.5	100.0
Total	166	100.0	100.0	

Table 8.8 Age categories of the third year nursing students

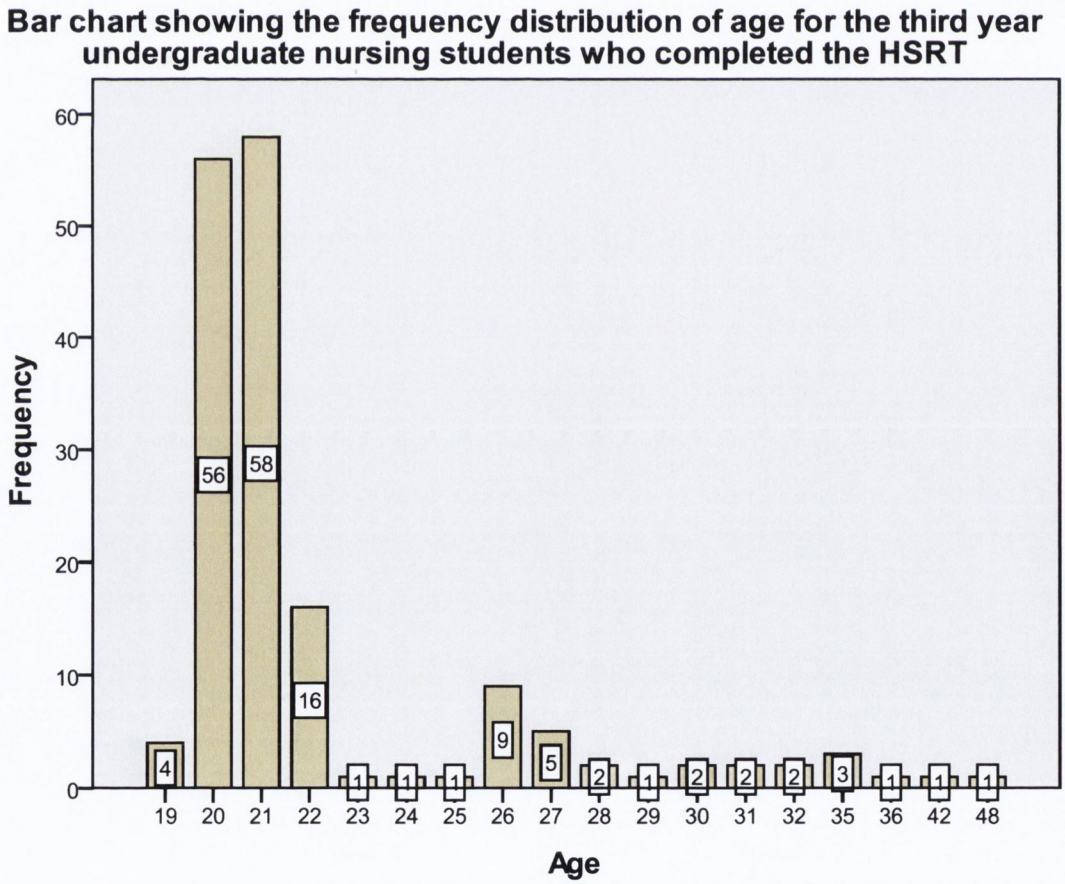


Figure 8.1 Bar chart showing the distribution of age for the third year nursing students who completed the HSRT

8.3 Critical thinking skills of the third year cohort of undergraduate nursing students by nursing discipline

8.3.1 Statement of hypothesis

In this section, results are presented for a sub-group of the third year cohort who were undertaking an integrated children's and general nursing strand (N=29). It was necessary to confirm if there was a difference in the critical thinking skills of this subgroup compared to those taking the general strand only (N=137). This was to ensure that the results for the critical thinking skills of the third year cohort would be accurate. To explore if there was a difference between the two groups a research and a null hypothesis were stated. The *hypothesis* was that, there was a difference in the average overall critical thinking skill score and in the critical thinking sub-scale scores for the children's and general nursing and the general nursing disciplines in the third year of the undergraduate nursing degree course. The *null hypothesis* was that, there was no difference in the average overall critical thinking skill score and in the critical thinking subscale scores for the children's and general nursing and general nursing disciplines in the third year of the undergraduate nursing degree course. An independent samples t-test was used to test this hypothesis (Aron et al., 2008).

8.3.2 Assessment of assumptions of the independent samples t-test

Prior to conducting inferential statistical analysis with parametric statistical tests such as an independent samples t-test it was necessary to determine if the assumptions underpinning this test were met. This was to ensure that the results could be interpreted as meaningful. Three assumptions were assessed; *independence, normal distribution and equality of variance in the population.* In relation to *independence,* each of the groups was an independent group and each respondent was in one group and one group only, thus, the assumption of independence was met. To test for *normality* or *a normal distribution* in the population the *Shapiro-Wilk test*, as well as skewness and kurtosis was used, and as explained in the methodology chapter, in Section 3.17.6. The results of the Shapiro-Wilk test revealed a non-significant result for overall critical thinking skill and the assumption of normality was upheld (Table 8.9). The result was significant for the sub-scales of, analysis, inference, evaluation, inductive reasoning (p = 0.005) and deductive reasoning (p = 0.003) and as such the assumption of normality was questionable. In this case the skewness values were examined. Table 8.12 shows the skewness values for the five sub-skills. The skewness values for analysis and

interpretation was -.301, for inference .456, for evaluation -.361, for inductive reasoning -.249 and for deductive reasoning -.005. The standard error of skewnwss for all five sub scales was .188. These values were within the range of -2 to + 2 and as such the skewness was not in the extreme, thus, the assumption of normality was accepted (Acton & Miller, 2009, p. 69) .

To test the third assumption of *homogeneity of variance,* Levene's test for equality of variance was used for independent samples t-test and results read accordingly; *'equal variance assumed'* or *'equal variance not assumed'*. The results of Levene's test are presented in Table 8.11 and explained in the results below. Based on the assessment of the assumptions of independence, normality and equality of variance the results of the independent samples t-tests can be accepted as meaningful.

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Total HSRT Score	.080	166	.012	.991	166	.347
Analysis and Interpretation	.189	166	.000	.929	166	.000
Inference	.205	166	.000	.914	166	.000
Evaluation & Explanation	.194	166	.000	.897	166	.000
Inductive Reasoning	.154	166	.000	.949	166	.000
Deductive Reasoning	.102	166	.000	.974	166	.003

Lilliefors Significance Correction

Table 8.9 Tests of normality for the critical thinking skills of the third year undergraduate nursing students

8.3.3 Average scores for critical thinking skills of the third year cohort by nursing discipline

Table 8.10 shows the mean scores and standard deviations for the third year cohort of undergraduate nursing students. The children's and general nursing students had a higher mean score (20.34, SD 3.77) compared to general nursing students (18.53, SD3.42) for overall critical thinking skill. The integrated children's and general nursing students also had higher average scores for all five critical thinking sub-scales of, analysis, inference, evaluation, inductive reasoning and deductive reasoning. An independent samples t-test was used to confirm if these average differences were significant.

	Nursing Discipline	N	Mean	Std. Deviation	Std. Error Mean
Total HSRT Score	General Nursing	137	18.53	3.422	.292
	Children's & General Nursing	29	20.34	3.773	.701
Analysis and Interpretation	General Nursing	137	3.64	1.271	.109
	Children's & General Nursing	29	4.34	1.143	.212
Inference	General Nursing	137	2.88	1.114	.095
	Children's & General Nursing	29	2.93	.998	.185
Evaluation & Explanation	General Nursing	137	4.51	1.079	.092
	Children's & General Nursing	29	4.79	1.082	.201
Inductive Reasoning	General Nursing	137	7.23	1.367	.117
	Children's & General Nursing	29	7.31	1.538	.286
Deductive Reasoning	General Nursing	137	4.84	1.986	.170
	Children's & General Nursing	29	5.76	1.921	.357

Analysis, Inference, Evaluation: Not Manifested 0 – 2, Moderate 3 – 4, Strong > 5. Inductive and Deductive Reasoning: Not Manifested 0 – 4, Moderate 5 – 7, Strong > 8. Total HSRT Score: Not Manifested 0 -14, Moderate15 – 20, Strong 21 - 25, Superior > 26.

Table 8.10 Mean scores for the critical thinking skills of the third year cohort of undergraduate nursing students by nursing discipline

8.3.4 Results of an independent samples t-test for critical thinking skills of the third year cohort of undergraduate nursing students by discipline

Prior to interpreting the results of the independent samples t-test it was necessary to confirm the *assumption of equal variance* in the population using Levene's test (Table 8.11). Levene's test was not significant at an alpha level of 0.05 for the total HSRT score and all five of the critical thinking subscales. The assumption of equal variance in the population was upheld and the results for *'equal variance assumed'* were interpreted. The independent samples t-test was significant for the overall critical thinking skill score with the children's and general nursing students having a statistically significantly higher average score of 20.34 (SD 3.77) compared to the general nursing students mean score of 18.53 (SD 3.42), t (*df,*164) = -2.555, p=.012, <.05. There was also a statistically significant difference for the critical thinking skill of analysis as well as for deductive reasoning. For analysis the children's and general nursing students had a higher mean score of 4.34 (SD 1.14) than the general nursing students mean score of 3.64 (SD 1.27), t (*df,* 164) = -2.778, p=.006, <.05. For deductive reasoning the children's and general nursing students had a higher mean

score of 5.76 (SD 1.92) compared to the general nursing students mean score of 4.84 (SD 1.98), t (*df,* 164) = -2.777, p=.024, <.05. The null hypothesis was rejected and the research hypothesis was supported. *The conclusion was a statistically significantly higher average score between the groups in relation to the critical thinking skills of analysis and deductive reasoning as well as for overall critical thinking skill.*

The results of the independent samples t-test were not significant for the critical thinking skills of inference, evaluation and inductive reasoning. For *inference* the children's and general nursing students had a mean score of 2.93 (SD .998) while the general nursing students had a mean score of 2.88 (SD 1.11), t (*df,* 164) = -.246, p=.806, <.05. For *evaluation* the children's and general nursing students had a mean score of 4.79 (SD 1.08) compared to the general nursing students mean score of 4.51 (SD 1.07), t (*df,* 164) = -1.279, p=.203, <.05. For *inductive reasoning* the mean score for the children's and general nursing students was 7.31 (SD 1.53) and the mean score for the general nursing students was 7.23 (SD 1.36), t (*df,* 164) = -.294, p=.769, <.05. *The null hypothesis was not rejected and thus the research hypothesis was not supported. The conclusion was that, there was no significant difference between the disciplines for the critical thinking skills of inference, evaluation and inductive reasoning.*

In summary, for the third year cohort of undergraduate nursing students, there were statistically significantly higher average scores for the integrated children's and general nursing students compared to the general nursing students for overall critical thinking skill and for the critical thinking sub-skills of analysis and deductive reasoning (Tables 8.10 & 8.11). Although the differences in the average scores were statistically significant, a comparison with the categories and range of scores identified by Facione and Facione (2012) revealed that both disciplines were *moderate* in strength (Tables 3.2 - 3.3). Therefore, the two disciplines of third year nursing students had potential for the use of analysis and deductive reasoning. *There was no significant difference between the two disciplines in relation to the critical thinking skills of inference, evaluation, and inductive reasoning.* A comparison of the average scores with the category score range identified by Facione and Facione (2012) revealed that for both disciplines, inference, was *'not manifested',* but close to *moderate strength* (Tables 3.3 & 8.10). Both disciplines were *moderate in strength* for the critical thinking skills of

evaluation and inductive reasoning. In conclusion, while there was a statistically significant difference between the disciplines for analysis and deductive reasoning both were *moderate in strength* for these dispositions and for the dispositions of inference, evaluation and deductive reasoning. Having explored the differences in the critical thinking dispositions of the small sub-group of integrated children's and general nursing students and those in the general nursing discipline the next step was to examine the critical thinking skills for the first year nursing students as a single cohort and the results are presented in the next section.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Total HSRT Score	Equal variances assumed	.038	.845	-2.555	164	.012	-1.819	.712	-3.225	-.413
	Equal variances not assumed			-2.397	38.359	.022	-1.819	.759	-3.356	-.283
Analysis and Interpretation	Equal variances assumed	1.468	.227	-2.778	164	.006	-.710	.256	-1.214	-.205
	Equal variances not assumed			-2.978	43.973	.005	-.710	.238	-1.190	-.229
Inference	Equal variances assumed	.869	.353	-.246	164	.806	-.055	.224	-.497	.387
	Equal variances not assumed			-.265	44.114	.793	-.055	.208	-.475	.365
Evaluation & Explanation	Equal variances assumed	.106	.745	-1.279	164	.203	-.282	.221	-.718	.153
	Equal variances not assumed			-1.277	40.658	.209	-.282	.221	-.729	.164
Inductive Reasoning	Equal variances assumed	.746	.389	-.294	164	.769	-.084	.286	-.648	.480
	Equal variances not assumed			-.273	37.927	.787	-.084	.308	-.709	.540
Deductive Reasoning	Equal variances assumed	1.387	.241	-2.277	164	.024	-.919	.404	-1.716	-.122
	Equal variances not assumed			-2.327	41.668	.025	-.919	.395	-1.717	-.122

Table 8.11 Independent samples t-test for the critical thinking skills of the third year cohort of undergraduate nursing students by nursing discipline

8.4 Critical thinking skills of the third year cohort of undergraduate nursing students

In this section results are presented for the critical thinking skills of the third year cohort of undergraduate nursing students as measured using the Health Sciences Reasoning Test (HSRT) (Facione & Facione, 2012). The response rate was 44% (N=166) of the cohort (N=378) who had entered in September 2007 (Table 3.5). The total score provides a measure of *overall critical thinking skills*. Five sub-scales provide a measure of the underlying critical thinking skills of, *analysis, inference, evaluation, inductive reasoning and deductive reasoning* (Facione & Facione, 2012). Results for the critical thinking skills are shown in Table 8.12.

		Total HSRT Score	Analysis and Interpretation	Inference	Evaluation & Explanation	Inductive Reasoning	Deductive Reasoning
N	Valid	166	166	166	166	166	166
	Missing	0	0	0	0	0	0
Mean		18.84	3.76	2.89	4.56	7.24	5.00
Std. Error of Mean		.275	.099	.085	.084	.108	.155
Median		19.00	4.00	3.00	5.00	7.00	5.00
Mode		18[a]	4	3	5	7	5
Std. Deviation		3.542	1.275	1.092	1.081	1.393	2.000
Variance		12.545	1.626	1.193	1.169	1.942	4.000
Skewness		-.009	-.301	.456	-.361	-.249	-.005
Std. Error of Skewness		.188	.188	.188	.188	.188	.188
Kurtosis		-.063	-.542	.495	-.535	-.195	-.406
Std. Error of Kurtosis		.375	.375	.375	.375	.375	.375
Range		19	5	6	4	7	10
Minimum		9	1	0	2	3	0
Maximum		28	6	6	6	10	10
Percentiles	25	16.00	3.00	2.00	4.00	6.00	4.00
	50	19.00	4.00	3.00	5.00	7.00	5.00
	75	21.00	5.00	4.00	5.00	8.00	6.00

a. Multiple modes exist. The smallest value is shown

Analysis, Inference, Evaluation: Not Manifested 0 – 2, Moderate 3 – 4, Strong > 5. Inductive and Deductive Reasoning: Not Manifested 0 – 4, Moderate 5 – 7, Strong > 8. Total HSRT Score: Not Manifested 0 -14, Moderate15 – 20, Strong 21 - 25, Superior > 26.

Table 8.12 Statistics for the critical thinking skills of the third year undergraduate nursing students who completed the HSRT

The mean score for the *total critical thinking skill* of the group was 18.84 (SD3.54), the lowest score was 9.00 (N=1) and the highest score was 28 (N=2). For *analysis,* the mean score was 3.76 (SD 1.27), the lowest score was 1 (N=8) and the highest score was 6 (N=11). For *inference,* the mean score was 2.89 (SD 1.09), one student scored zero and the highest score was 6 (N=4). For *evaluation,* the mean score was 4.56 (SD 1.08), the lowest score was 2.00 (N=6) and the highest score was 6.00 (N=37). For *inductive reasoning*, the mean score was 7.24 (SD 1.39), the lowest score was 3.00 (N=1) and the highest score was 10.00 (N=6). For *deductive reasoning*, the mean score was 5.00 (SD 2.00), one student scored zero on this subscale and the highest score was 10 (N=2).

It is recommended by Facione and Facione (2012) that the interpretation of the HSRT results follow a process of *four steps*. The *first step* is to interpret the overall critical thinking score, *second* examine the percentile rankings, *third* determine the strength of the total score and the *fourth* step is the interpretation of the scale scores. The mean score for the third year cohort of undergraduate nursing students for overall critical thinking skill was 18.84 (SD 3.54). Compared to the norms of a national aggregated sample of US undergraduate nursing students, identified by Facione and Facione (2012), the average student, in this case study, with an overall critical thinking skill mean score of 18.84 (SD 3.54), rounded to 19.00, was in the 48th or median percentile (Appendix 8). *In this percentile ranking, the average third year undergraduate nursing student, in this study, has 52 students out of 100 with a lower overall average score and 47 students out of 100 with a higher overall average score.*

When compared to the norms for the HSRT of a US national aggregated sample of undergraduate health sciences students identified by Facione and Facione (2012), the average third year undergraduate nursing student in this study was in the 41st percentile and below the 53rd or median percentile for undergraduate health sciences students. *This means that the average third year undergraduate nursing student in this study at the 41st percentile when compared to the HSRT norms for a US national aggregated sample of health science students has 40 students out of 100 with a higher overall average score and 59 out of 100 with a lower overall average score.* These comparisons provide an indication of the overall critical thinking skill of the average student in the third year cohort of undergraduate nursing students in this study

compared to aggregate norms for overall critical thinking skill for undergraduate nursing and undergraduate health sciences students in the US.

Considered in terms of *strength of overall skill in critical thinking*, the average third year undergraduate nursing student with a mean score of 18.84 (SD 3.54) was *moderate in strength*. In relation to the strength of critical thinking sub-skills, the average third year nursing student, in this study, was *moderate in strength* for analysis with a mean score of 3.76 (SD 1.27), *moderate* for inductive reasoning 7.24 (SD 1.39), and *moderate* for deductive reasoning with a mean score of 5.00 (2.00). Inference was *not manifested* with a mean score of 2.89 (SD 1.09). Evaluation was *moderate in strength* and moving towards strong with a mean score of 4.56 (1.08) (Tables 8.12, 3.2 & 3.3). These results are discussed later in Chapter 11. In the next section, results are presented for the critical thinking skills as a percentage proportion of the third year cohort of undergraduate nursing students.

8.5 Critical thinking skills as a percentage proportion of the third year cohort of undergraduate nursing students

In this section, results for the percentage proportions of the third year cohort for *overall critical thinking skill* as well as the critical thinking skills of *analysis, inference, evaluation, inductive reasoning, and deductive reasoning are presented.* Results are presented in pie charts (Figures 8.2 – 8.7) and in the frequency tables in Appendix 36. The *strength of critical thinking skills* in terms of whether the skills were, *not manifested, moderate* or *strong* is also explained. In relation to the *overall critical thinking skill* score critical thinking was not manifested in 10% (N=16) of the cohort, it was moderate for 59% (N=98), strong for 29% (N=48) and superior for 2% (N=4). *Analysis* was not manifested for 18% (N=30), moderate for 51% (N=85), and strong for 31% (N=51) of the students. For *inference* as a skill for critical thinking it was not manifested for 38% (N=63), moderate for 55% (N=92), and strong for 7% (N=11) of the students. For *evaluation,* it was not manifested for 4% (N=6) of the students, moderate for 43% (N=71) and strong for 54% (N=89) for this critical thinking skill. For *inductive reasoning* as a skill for critical thinking this was not manifested in 2% (N=4), moderate for 55% (N=91) and strong for 43% (N=71) of the students. *Deductive reasoning* as a skill for critical thinking this was not manifested for 40% (N=66), moderate for 48% (N=80) and strong for 12% (N=20) of the students. The results for the percentage

proportions are discussed with the results for critical thinking skills later in Chapter 11. In the next and final section of this chapter a summary of the main results is presented

8.5.1 Pie charts showing the critical thinking skills as percentage proportions of the third year cohort of undergraduate nursing students

(Sample N=166)

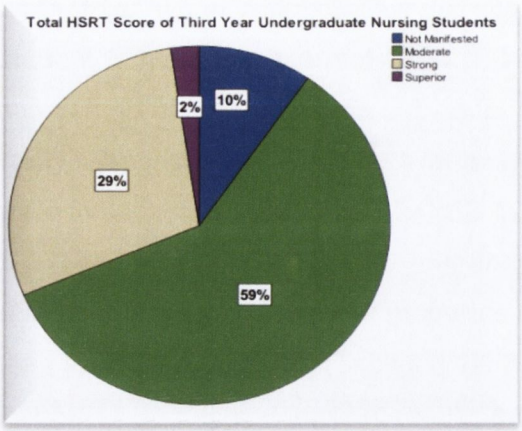


Figure 8.2 Third year nursing students: Total HSRT score

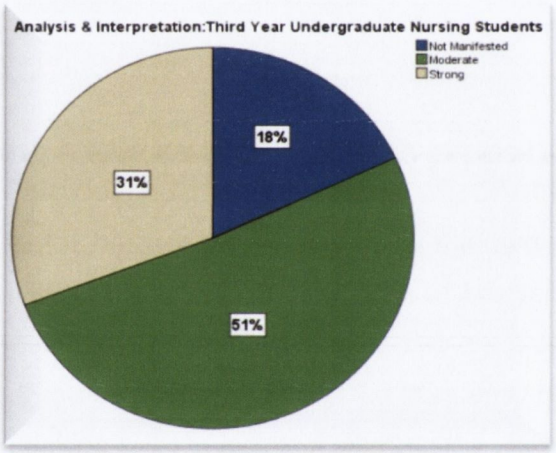


Figure 8.3 Third year nursing students: Analysis

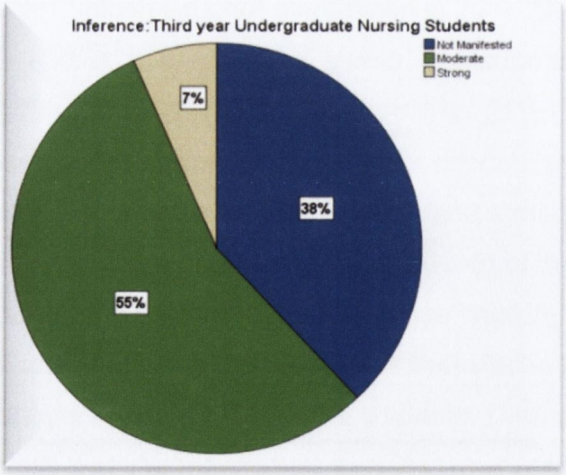


Figure 8.4 Third year nursing students: Inference

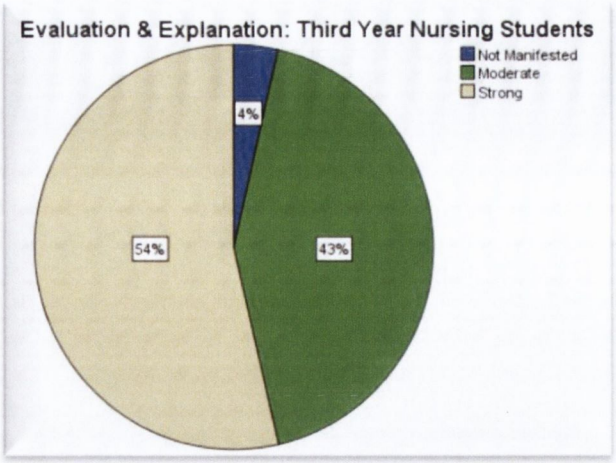


Figure 8.5 Third year nursing students: Evaluation

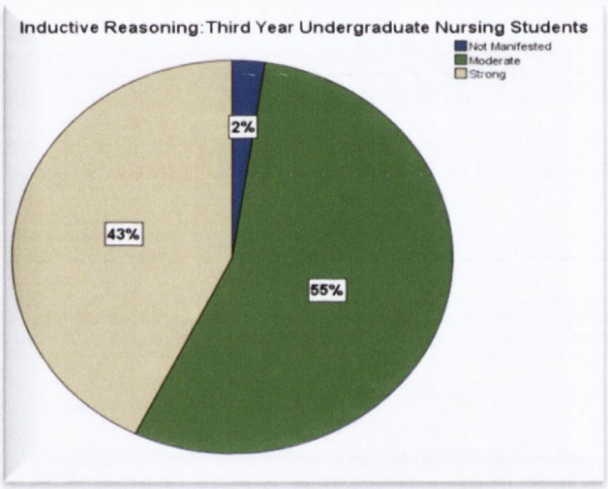


Figure 8.6 Third year nursing students: Inductive reasoning

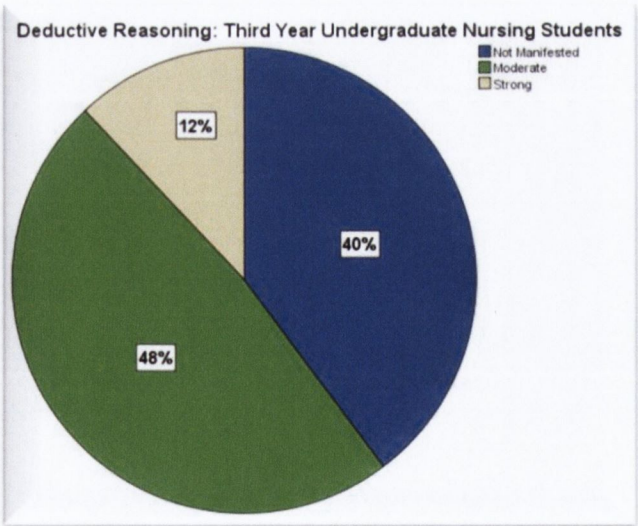


Figure 8.7 Third year nursing students: Deductive reasoning

8.6 Summary of the main findings for critical thinking skills of the third year cohort of undergraduate nursing students

In this section, the main findings for the critical thinking skills of the third year cohort of undergraduate nursing students are summarised. The third year nursing students who completed the HSRT were predominantly female (96%, N=159). The majority (95%, N=157) were undertaking the nursing degree as their first academic qualification. The cohort were predominantly Irish in origin (98%, N=162) with a mean age of 22 years (SD 4.24). There were 29 students who were aged 26 years and over (Tables 8.1-8.7)

8.6.1 Main findings for the critical thinking skills of the third year nursing students by nursing discipline

A small cohort of students (N=29) undertaking the integrated children's and general nursing strand were part of the main cohort (N=166). An independent samples t-test was used to determine if they were significantly different from the students taking the general strand only (Tables 8.10 & 8.11). *A main finding was that there was a statistically significant difference in the average scores between the students taking the integrated children's and general strand compared to the general nursing student for overall critical thinking skill.* The children's and general nursing students had a statistically significantly higher average score of 20.34 (SD 3.77) compared to the general nursing students mean score of 18.53 (SD 3.42). *A second main finding was a statistically significant difference for the critical thinking skill of analysis.* For *analysis*, the children's and general nursing students had a higher average score of 4.34 (SD 1.14) than the general nursing students mean score of 3.64 (SD 1.27). *A third main finding was a statistically significant difference for deductive reasoning with the children's and general nursing students revealing a higher mean score of 5.76 (SD 1.92) compared to the general nursing students mean score of 4.84 (SD 1.98).*

Although there were statistically significant differences in the average scores between the two cohorts, a comparison with the categories and range of scores recommended by Facione and Facione (2012), revealed they were *moderate in strength* for overall critical thinking skill, for analysis, and also for deductive reasoning (Tables 3.2, 3.3, 8.10 & 8.11). *A fourth main finding was that there was no significant difference between the two cohorts in relation to the critical thinking skills of inference, evaluation and inductive reasoning.* A comparison of the average scores with the category score range identified by Facione and Facione (2012), revealed that for both disciplines, inference

was *not manifested*, but close to *moderate strength*. Both cohorts were *moderate in strength* for the critical thinking skills of evaluation and inductive reasoning.

8.6.2 Main findings for the critical thinking skills of the third year undergraduate nursing students

In relation to critical thinking skills, the average score for a third year undergraduate nursing students in relation to *overall critical thinking skill* was 18.84 (SD3.54). When this mean score was rounded to 19.00 and compared to the norms of a national aggregated sample of US undergraduate nursing students identified by Facione and Facione (2012), the average third year nursing student in this study reached the 48th or median percentile (Appendix 8). When compared to the norms of a US national aggregated sample of undergraduate health sciences students identified by Facione and Facione (2012), the average third year undergraduate nursing student in this study was very close to the 41st percentile and below the 53rd percentile or median for health sciences undergraduate students. These comparisons provide knowledge of the overall critical thinking skill of the third year undergraduate nursing students, in this study, compared to aggregate norms for US undergraduate nursing and health sciences students.

8.6.3 Main findings for the strength of the critical thinking skills of the third year undergraduate nursing students

The main findings in terms of *strength of overall* critical *thinking skill* revealed that the average third year undergraduate nursing student with a mean score of 18.84 (SD 3.54) was *moderate in strength* (Tables 3.2 & 8.12). In relation to the strength of the sub-skills of critical thinking, the average third year nursing student was *moderate in terms of strength* for the critical thinking skills of analysis, evaluation, inductive and deductive reasoning. Inference was not manifested but the score was very close to the category of moderate strength.

8.6.4 Main findings for the critical thinking skills as a percentage proportion of the third year undergraduate nursing students

Critical thinking skills as a percentage proportion of the third year nursing students revealed that *total critical thinking skill* was not manifested in 10% (N=16), of students, moderate for 59% (N=98) strong for 29% (N=48) and superior for 2% (N=4) of the

cohort (Figure 8.2). Figures 8.3 – 8.7 show that the critical thinking skill of *analysis* was not manifested for 18% (N=30) of the students, moderate for 51% (N=85), and strong for 31% (N=51). For *inference* as a skill for critical thinking this was not manifested for 38% (N=63) students, moderate for 55% (N=92), and strong for 7% (N=11). E*valuation* as a skill for critical thinking was not manifested for 4% (N=6) of the students, moderate for 43% (N=71) and strong for 53% (N=89) for this critical thinking skill. For *inductive reasoning* as a skill for critical thinking this was not manifested in 2% (N=4), moderate for 55% (N=91) and strong for 43% (N=71). Deductive reasoning as a skill for critical thinking was not manifested for 40% (N=66), moderate for 48% (N=80) and strong for 12% (N=20) of the third year cohort of undergraduate nursing students. These results for the critical thinking skills as a percentage proportion of the third year cohort are discussed later in Chapter 11.

8.7 Conclusion

This chapter presented the results for the critical thinking skills of the third year cohort of undergraduate general nursing students as measured using the Health Sciences Reasoning Test. The demographic characteristics were described in the first section and the sample was predominantly female. Results for the critical thinking skills as well as results for the percentage proportions of the cohort were presented. The main results were summarised in the final section of this chapter. The third year nursing students revealed moderate strength for overall critical thinking skill indicating they had an overall general ability to think critically. They were moderate in strength for the skills of, analysis, evaluation, inductive and deductive reasoning thus indicating they had the potential to analyse and evaluate situations and to draw conclusion from situations even though their conclusions could be false in light of more concrete evidence. Inference was not manifested indicating a potential for weakness in determining accurately the facts of a situation. These findings are further analysed and discussed in more detail later in Chapter 11. In the next chapter, results are presented which reveal differences in critical thinking dispositions and skills between the first and third year cohorts of undergraduate nursing students in context of the nursing curriculum.

Chapter 9 Results for Differences in Critical Thinking of Undergraduate Nursing Students

9.1 Introduction

In this chapter, the differences in critical thinking dispositions and skills of the undergraduate general nursing students are presented. In the first section, assumptions which underpin an independent samples t-test, a parametric statistical test, to explore and confirm differences in critical thinking dispositions and skills are explained. The second section presents the results for the differences in the critical thinking dispositions of the first and third year cohorts. In the third section, differences in the results for the critical thinking skills measured using the HSRT are presented. In the fourth and final section the results are summarised. To understand the interpretation of the results in this chapter it is important to review the categories and score ranges for both the CCTDI and the HSRT as explained in Sections 3.8 and 3.10 in Chapter 3.

9.2 Assumptions of parametric statistical tests

An independent samples t-test was used to explore the differences in the critical thinking dispositions of the first and third year cohorts of undergraduate nursing students (Aron et al., 2008). The first step was to state the hypothesis to be tested and assess the assumptions of; *independence, normal distribution and equality of variance in the population.* This was to ensure that the results of the independent samples t-test could be interpreted as meaningful. In relation to the first assumption of *independence,* the first and third year cohorts of nursing students were two independent groups. Each individual was in one group only and thus the assumption of independence was met. To test the second assumption of *normality, the Shapiro-Wilk test* was used, as well as skewness and kurtosis, as was already explained, in Section 3.17.6 in the methodology chapter. To determine the significance of skew and kurtosis the standard error of skewness and kurtosis was multiplied by a value of two. If the value of skewness as calculated was within the range of -2 to +2 it was considered acceptable (Acton & Miller, 2009, p. 69)

The results of the Shapiro-Wilk test revealed a non-significant value for truth-seeking (p = 0.338), systematicity (p = 0.562) and for critical thinking self-confidence (p = 0.157)

(Table 9.1). The assumption of normality was upheld. A significant value was revealed for open-mindedness ($p = 0.009$), analyticity ($p = 0.040$), inquisitiveness ($p = 0.0005$), maturity of judgment ($p = 0.000$) and for the total disposition score ($p = 0.046$). The assumption of normality was questionable, and in this case, skewness and kurtosis was used. Table 9.2 shows the skewness and kurtosis values for each of these dispositions and as the values were within the range of -2 to +2 skewness was not in the extreme and as such the assumption of normality was accepted.

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Truth-seeking	.046	452	.025	.996	452	.338
Open-mindedness	.078	452	.000	.991	452	.009
Analyticity	.045	452	.027	.993	452	.040
Systematicity	.038	452	.130	.997	452	.562
Critical Thinking Self-Confidence	.046	452	.025	.995	452	.157
Inquisitiveness	.075	452	.000	.987	452	.000
Maturity of Judgment	.072	452	.000	.979	452	.000
Total CCTDI Score	.041	452	.065	.993	452	.046

a. Lilliefors Significance Correction

Table 9.1 Tests of normality for the critical thinking dispositions of the first and third year undergraduate nursing students

		Truth-seeking	Open-mindedness	Analyticity	Systematicity	Critical Thinking Self-Confidence	Inquisitiveness	Maturity of Judgment	Total CCTDI Score
N	Valid	452	452	452	452	452	452	452	452
	Missing	0	0	0	0	0	0	0	0
Mean		34.9760	41.3662	41.3053	37.1641	39.4739	44.8186	41.9093	281.0134
Std. Error of Mean		.30263	.25321	.26343	.33268	.34547	.33582	.33184	1.37853
Median		35.0000	41.6667	40.9091	37.2727	38.8889	46.0000	42.0000	279.6111
Mode		34.17[a]	43.33	38.18[a]	37.27	38.89	46.00	42.00	251.81[a]
Std. Deviation		6.43402	5.38323	5.60060	7.07289	7.34473	7.13958	7.05494	29.30796
Variance		41.397	28.979	31.367	50.026	53.945	50.974	49.772	858.957
Skewness		.107	-.216	.040	-.067	-.115	-.417	-.574	.113
Std. Error of Skewness		.115	.115	.115	.115	.115	.115	.115	.115
Kurtosis		.250	.280	′.356	.019	-.054	.315	.687	.592
Std. Error of Kurtosis		.229	.229	.229	.229	.229	.229	.229	.229
Range		44.17	33.33	33.64	44.55	44.44	44.00	45.00	192.92
Minimum		14.17	25.00	24.55	15.45	15.56	16.00	12.00	184.26
Maximum		58.33	58.33	58.18	60.00	60.00	60.00	57.00	377.18

a. Multiple modes exist. The smallest value is shown

Maximum disposition sub-scale score = 60. Recommended cut-off sub-scale score = 40. Maximum overall disposition score = 420.

Table 9.2 Statistics for all first and third year undergraduate nursing students for dispositions towards critical thinking

To test the third assumption of *homogeneity of variance,* Levene's test of equality of variance was used and results read accordingly; *'equal variance assumed'* or *'equal variance not assumed'*. The results of Levene's test are presented in Table 9.4 below and also explained in the next section. Based on the assessment of the assumptions of independence, normal distribution and equality of variance in the population, the assumptions which underpinned the independent samples t-test were accepted. In the next section, the results for Levene's test and the independent samples t-test for the hypothesis tested are presented.

9.3 Differences in critical thinking dispositions of undergraduate nursing students

In this section, results are presented which reveal differences in the critical thinking dispositions of the first and third year cohorts of undergraduate nursing students. The results address research question five which asked: *What is the difference in the critical thinking dispositions of the first and third year undergraduate general nursing students?*

9.3.1 Statement of hypothesis

To explore the research question stated above it was necessary to state an, *a-posteriori hypothesis*. The rationale for this hypothesis was to ascertain if there were significant differences in the critical thinking dispositions of the first and third year nursing students. The *hypothesis* was that, there was a difference in the average scores between the first and third year undergraduate nursing students for the critical thinking disposition subscales and overall critical thinking disposition. The *null hypothesis* was that, there was no difference in the average scores between the first and third year undergraduate nursing students for the critical thinking disposition subscales and overall critical thinking disposition. The assumptions of independence and normal distribution in the population were met as already explained above.

9.3.2 Differences in the average scores for critical thinking dispositions of the first and third year undergraduate nursing students

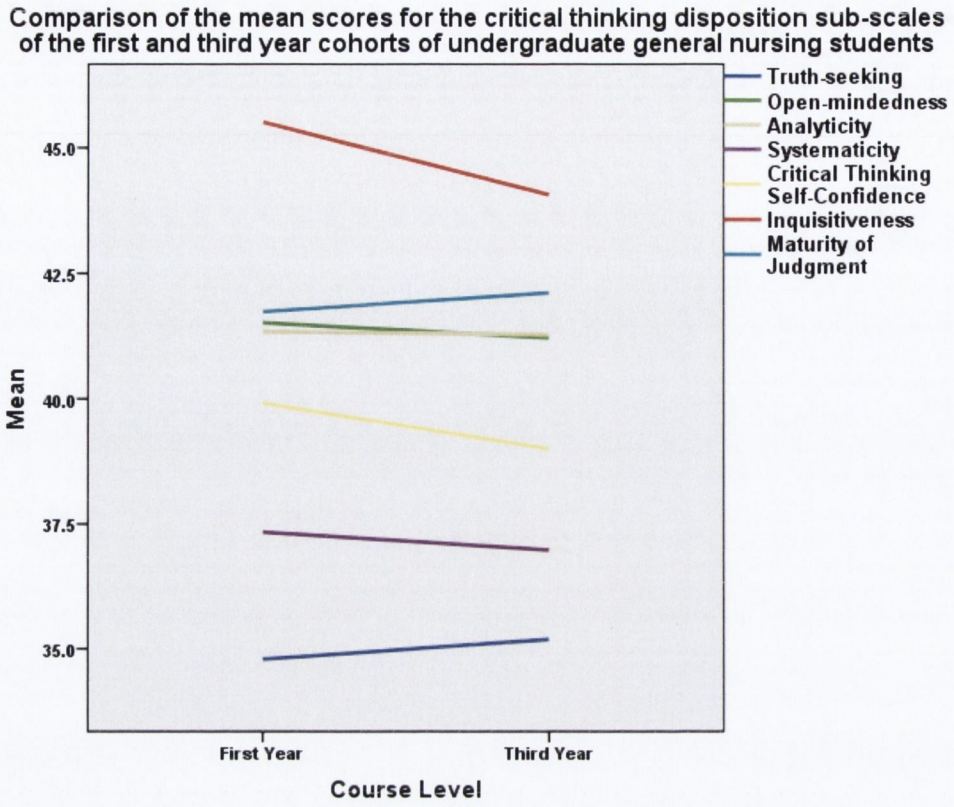
Table 9.3 shows the average scores for the first and third year undergraduate nursing students for the seven subscales and total disposition towards critical thinking, as measured using the CCTDI. In order to interpret the scores it is important to review the

categories and score ranges for the CCTDI as explained in Chapter 3, Section 3.8. An observation of the mean scores shows very little difference between the first and third year cohorts and only a very slight difference in relation to open-mindedness and analyticity. The differences in the mean scores are more visual in the line chart in Figure 9.1. An independent samples t-test was used to test the difference in the average scores.

	Course Level	N	Mean	Std. Deviation	Std. Error Mean
Truth-seeking	First Year	237	34.7855	6.66298	.43281
	Third Year	215	35.1860	6.18050	.42151
Open-mindedness	First Year	237	41.5084	5.45441	.35430
	Third Year	215	41.2093	5.31193	.36227
Analyticity	First Year	237	41.3310	5.62925	.36566
	Third Year	215	41.2770	5.58185	.38068
Systematicity	First Year	237	37.3341	7.02559	.45636
	Third Year	215	36.9767	7.13636	.48670
Critical Thinking Self-Confidence	First Year	237	39.9062	7.61956	.49494
	Third Year	215	38.9974	7.01617	.47850
Inquisitiveness	First Year	237	45.5063	7.07803	.45977
	Third Year	215	44.0605	7.14673	.48740
Maturity of Judgment	First Year	237	41.7300	7.10893	.46177
	Third Year	215	42.1070	7.00619	.47782
Total CCTDI Score	First Year	237	282.1016	29.35922	1.90709
	Third Year	215	279.8139	29.27280	1.99639

Maximum disposition sub-scale score = 60. Recommended cut-off sub-scale score = 40. Maximum overall disposition score = 420.

Table 9.3 Mean scores for the critical thinking dispositions of the first and third year undergraduate nursing students



Maximum disposition sub-scale score = 60. Recommended cut-off sub-scale score = 40.

Figure 9.1 Line chart showing the difference in the mean scores for critical thinking disposition between first and third year

9.3.3 Results of an independent samples t-test for the critical thinking dispositions of the first and third year cohort of undergraduate nursing students

Prior to interpreting the results of the independent samples t-test it was necessary to assess the *assumption of equal variance* in the population using Levene's test (Table 9.4). The result of Levene's test was not significant for any of the disposition subscales or the overall disposition to think critically. The assumption of equal variance was upheld and the results for *'equal variance assumed'* were interpreted (Table 9.4). The results for the independent samples t-test are also presented in Table 9.4. The independent samples t-test was statistically significant for the subscale of *inquisitiveness.* The first year nursing students had a higher mean score of 45.50 (SD 7.07) compared to the third years with a mean score of 44.06 (SD7.14), t (*df,* 450) = 2.159, p=.031, <.05. *The null hypothesis was rejected and the conclusion was that the*

first year nursing students had a statistically significantly higher average score than the third years for inquisitiveness disposition.

The results of the independent samples t-test were not significant for the remaining dispositions or for the overall disposition to think critically. There was no significant difference for the dispositions of; truth-seeking, open-mindedness, analyticity and systematicity. For *truth seeking,* the first year nursing students had a mean score of 34.78 (SD 6.66) and the mean for the third years was 35.18 (SD 6.18), t (*df,* 450) = -.661, p=.509, <.05. For *open-mindedness,* the first years had a mean score of 41.50 (SD 5.45) and the mean for the third years was 41.20 (SD 5.31), t (*df,* 450) =.590, p=.556, <.05. For *analyticity,* the first year nursing students had a mean score of 41.33 (SD5.62) and the third year had a mean score of 41.27 (SD 5.58), t (*df,* 450) =.102, p=.918, <.05. For *systematicity* the first year nursing students had a mean score of 37.33 (SD 7.02) and the third years had a mean score of 36.97 (SD 7.13), t (*df,* 450) =.563, p=.592, <.05.

The independent samples t-test was not significant for the dispositions of critical thinking self-confidence, maturity of judgment and for overall disposition towards critical thinking. For *critical thinking self-confidence,* the first years had a mean score of 39.90 (SD7.61), and the third year nursing students had a mean score of 38.99 (SD 7.01), t (*df,* 450) = 1.315, p=.189, <.05. For *maturity of judgment*, the first year nursing students had a mean score of 41.73 (SD 7.10) and the third years had a mean score of 42.10 (SD 7.00), t (*df,* 450) = -.567, p=.571, <.05. For the *overall disposition to think critically* the first years had a mean score of 282.10 (SD29.35) and the third years had a mean score of 279.81 (SD29.27), t (*df,* 450) =.828, p=.408, <.05. *The independent samples t-test was not significant for the critical thinking dispositions of truth-seeking, open-mindedness, analyticity, systematicity, critical thinking self-confidence, maturity of judgment or the overall disposition to think critically. The null hypothesis was not rejected and the conclusion was that, there was no significant difference between the first and third year undergraduate nursing students in relation to these dispositions for critical thinking.*

A comparison of the average scores for the critical thinking dispositions of the first and third year cohorts is shown in Table 9.3. When the average scores for both cohorts are

compared with the categories and score ranges for the dispositions towards critical thinking identified by Facione and Facione (2010) and explained in Section 3.8 of Chapter 3, results show that both first and third year nursing students were *ambivalent* for the dispositions of; truth-seeking, systematicity and critical thinking self-confidence and, therefore, considered weak in these dispositions. The first and third year cohorts were *positive* for the dispositions of, open-mindedness, analyticity, inquisitiveness and maturity of judgment and therefore they were disposed to these attributes in relation to critical thinking. While there was a statistically significant difference in the average scores for inquisitiveness, with the third year cohort showing a lower average score, both cohorts were in the *positive category* identified by Facione and Facione (2010). In relation to the total score on the CCTDI, or overall disposition to think critically, the first year cohort was *positive in overall disposition* while the third year nursing students were *ambivalent* and therefore slightly weaker, but this was not statistically significant. These results are discussed in detail later in Chapter 12. In the next section, results for differences in critical thinking skills of the first and third year cohorts of undergraduate nursing are presented.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Truth-seeking	Equal variances assumed	1.470	.226	-.661	450	.509	-.40053	.60636	-1.59218	.79111
	Equal variances not assumed			-.663	449.773	.508	-.40053	.60414	-1.58783	.78676
Open-mindedness	Equal variances assumed	.289	.591	.590	450	.556	.29914	.50738	-.69799	1.29626
	Equal variances not assumed			.590	447.729	.555	.29914	.50673	-.69672	1.29499
Analyticity	Equal variances assumed	.030	.863	.102	450	.918	.05408	.52807	-.98370	1.09186
	Equal variances not assumed			.102	446.445	.918	.05408	.52785	-.98330	1.09145
Systematicity	Equal variances assumed	.076	.783	.536	450	.592	.35736	.66668	-.95283	1.66754
	Equal variances not assumed			.536	444.298	.592	.35736	.66719	-.95388	1.66859
Critical Thinking Self-Confidence	Equal variances assumed	2.895	.090	1.315	450	.189	.90882	.69120	-.44955	2.26719
	Equal variances not assumed			1.320	449.897	.187	.90882	.68843	-.44411	2.26175
Inquisitiveness	Equal variances assumed	.344	.558	2.159	450	.031	1.44586	.66972	.12970	2.76203
	Equal variances not assumed			2.158	444.876	.031	1.44586	.67004	.12904	2.76269
Maturity of Judgment	Equal variances assumed	.200	.655	-.567	450	.571	-.37702	.66496	-1.68383	.92980
	Equal variances not assumed			-.567	446.912	.571	-.37702	.66449	-1.68293	.92889
Total CCTDI Score	Equal variances assumed	.835	.361	.828	450	.408	2.28770	2.76129	-3.13893	7.71433
	Equal variances not assumed			.829	445.997	.408	2.28770	2.76090	-3.13828	7.71368

Table 9.4 Independent samples t-test for the critical thinking dispositions for the first and third year undergraduate nursing students

9.4 Differences in critical thinking skills of undergraduate nursing students

In this section, results for the critical thinking skills of the first and third year cohorts of undergraduate nursing students are presented. Results address research question six which asked: *What is the difference in the critical thinking skills of the first and third year undergraduate nursing students?*

9.4.1 Statement of hypothesis

To explore this research question it was necessary to state an, *a-posteriori hypothesis.* The rationale for this hypothesis was to determine significant differences between the first and third year nursing students. The *hypothesis* was that, there was a difference in the average overall critical thinking skill as well as the critical thinking sub-skills for the first and third year cohorts of undergraduate nursing students as measured using the Health Sciences Reasoning Test (HSRT). The *null hypothesis* was that, there was no difference in the average overall critical thinking skill or in the critical thinking sub skills for the first and third year cohorts of undergraduate nursing students as measured by the Health Sciences Reasoning Test. An independent samples t-test was used to test this hypothesis.

9.4.2 Assessment of assumptions of the independent samples t-test

Prior to testing the hypothesis stated above it was necessary to test the assumptions of; *independence, normal distribution and equality of variance in the population.* In relation to the assumption of *independence* both groups were independent and each individual was in one cohort only, thus, the assumption of independence was met. To assess the assumption of *normal distribution* in the population the *Shapiro-wilk test* was used (Table 9.5). *The results of the Shapiro-Wilk test were significant for all five critical thinking subscales (p = 0.005) as well as for overall critical thinking skill (p = 0.024), and as such, the assumption of normality was questionable.* In this case, skewnwss and kurtosis was used. Table 9.6 shows the *skewness* and *kurtosis* values for the critical thinking skills for the undergraduate nursing students. As the values of skewness and kurtosis for the HSRT were within the range of -2 to +2 skewness was not in the extreme and the assumption of normality was accepted (Acton & Miller, 2009, p. 69). To test the *assumption of equal variance* in the population the results of Levene's test was used and the outcome is explained with the results of the independent samples t-test.

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Analysis and Interpretation	.168	293	.000	.940	293	.000
Inference	.195	293	.000	.927	293	.000
Evaluation & Explanation	.194	293	.000	.912	293	.000
Inductive Reasoning	.167	293	.000	.946	293	.000
Deductive Reasoning	.104	293	.000	.975	293	.000
Total HSRT Score	.075	293	.000	.989	293	.024

a. Lilliefors Significance Correction

Table 9.5 Tests of normality for the critical thinking skills of the first and third year cohorts of undergraduate nursing students

		Analysis and Interpretation	Inference	Evaluation & Explanation	Inductive Reasoning	Deductive Reasoning	Total HSRT Score
N	Valid	293	293	293	293	293	293
	Missing	0	0	0	0	0	0
Mean		3.55	2.87	4.32	6.88	4.80	18.04
Std. Error of Mean		.078	.064	.072	.098	.121	.241
Median		4.00	3.00	4.00	7.00	5.00	18.00
Mode		4	3	5	7	4	18
Std. Deviation		1.330	1.098	1.238	1.673	2.074	4.132
Variance		1.769	1.207	1.532	2.797	4.303	17.074
Skewness		-.213	.221	-.459	-.553	.053	-.280
Std. Error of Skewness		.142	.142	.142	.142	.142	.142
Kurtosis		-.567	.096	-.447	.029	-.484	.059
Std. Error of Kurtosis		.284	.284	.284	.284	.284	.284
Range		6	6	5	8	10	24
Minimum		0	0	1	2	0	4
Maximum		6	6	6	10	10	28

Analysis, Inference, Evaluation: Not Manifested 0 – 2, Moderate 3 – 4, Strong > 5. Inductive and Deductive Reasoning: Not Manifested 0 – 4, Moderate 5 – 7, Strong > 8. Total HSRT Score: Not Manifested 0 -14, Moderate15 – 20, Strong 21 - 25, Superior > 26.

Table 9.6 Statistics for the critical thinking skills of the first and third year cohorts of undergraduate nursing students

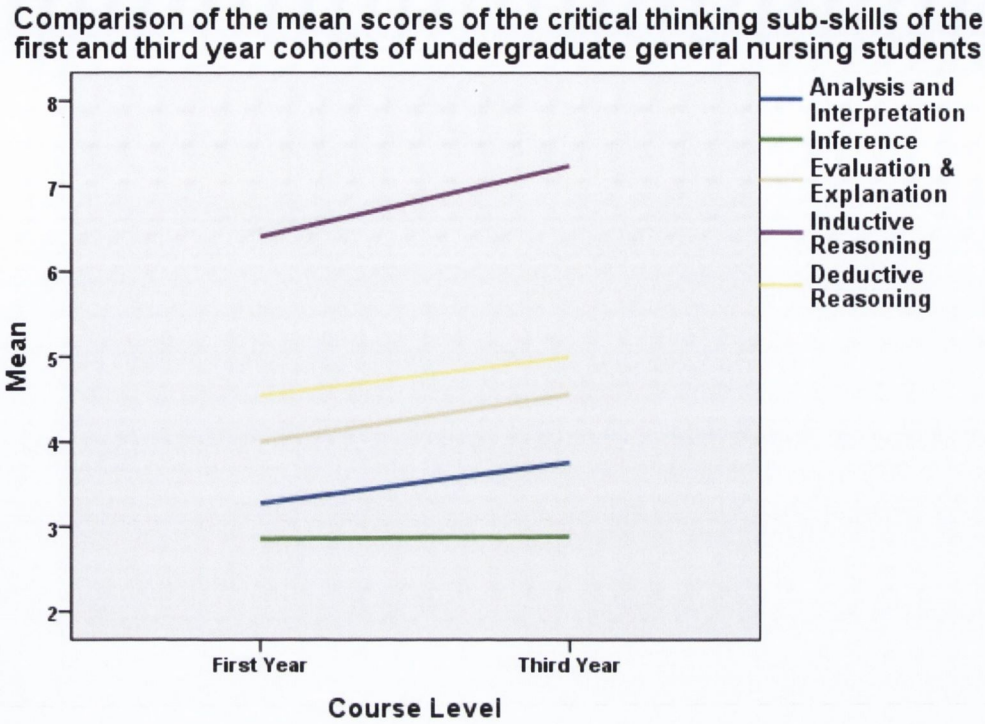
9.4.3 Differences in the average scores for critical thinking skills of the first and third year cohorts of undergraduate nursing students

Table 9.7 shows the mean scores for the first and third year undergraduate nursing students for each of the five critical thinking sub-scales and overall critical thinking skill. The differences are more visual in the line graph in Figure 9.2. The third year nursing students revealed a higher mean score (18.84, SD 3.54) compared to the first year mean score (16.99, SD 4.60) for *overall critical thinking skill*. The mean scores for the third years when compared to the first years show slight differences for the critical thinking skills of, *analysis, inference, and for evaluation.* For the critical thinking skills of; *inductive reasoning and deductive reasoning* the mean differences are somewhat higher for the third years and more so for inductive reasoning. An independent samples t-test was used to confirm if these differences in the average scores were significant (Table 9.8).

	Course Level	N	Mean	Std. Deviation	Std. Error Mean
Analysis and Interpretation	First Year	127	3.28	1.355	.120
	Third Year	166	3.76	1.275	.099
Inference	First Year	127	2.86	1.111	.099
	Third Year	166	2.89	1.092	.085
Evaluation & Explanation	First Year	127	4.00	1.357	.120
	Third Year	166	4.56	1.081	.084
Inductive Reasoning	First Year	127	6.41	1.883	.167
	Third Year	166	7.24	1.393	.108
Deductive Reasoning	First Year	127	4.54	2.148	.191
	Third Year	166	5.00	2.000	.155
Total HSRT Score	First Year	127	16.99	4.602	.408
	Third Year	166	18.84	3.542	.275

Analysis, Inference, Evaluation: Not Manifested 0 – 2, Moderate 3 – 4, Strong > 5. Inductive and Deductive Reasoning: Not Manifested 0 – 4, Moderate 5 – 7, Strong >8. Total HSRT Score: Not Manifested 0 -14, Moderate15 – 20, Strong 21 - 25, Superior > 26.

Table 9.7 Mean scores for the critical thinking skills of the first and third year cohorts of undergraduate nursing students



Analysis, Inference, Evaluation: Not Manifested 0 – 2, Moderate 3 – 4, Strong > 5. Inductive and Deductive Reasoning: Not Manifested 0 – 4, Moderate 5 – 7, Strong > 8.

Figure 9.2 Line graph showing the difference in the mean scores for critical thinking skills of the first and third year cohorts of undergraduate nursing students

9.4.4 Results of an independent samples t-test for critical thinking skills of the first and third year cohorts of undergraduate nursing students

Before examining the results of the independent samples t-test it was necessary to assess the assumption of equal variance in the population using Levene's test (Table 9.8). Levene's test for homogeneity of variance in the population was *not significant for, analysis, inference and deductive reasoning and in this case the results for 'equal variances assumed' were interpreted.* Levene's test *was significant for total critical thinking skill and for the critical thinking skills of evaluation and inductive reasoning* and as such equal variance in the population was questionable. In this case the results for *'equal variance not assumed'* were interpreted.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Analysis and Interpretation	Equal variances assumed	.684	.409	-3.129	291	.002	-.483	.154	-.787	-.179
	Equal variances not assumed			-3.104	262.561	.002	-.483	.156	-.790	-.177
Inference	Equal variances assumed	.165	.685	-.210	291	.834	-.027	.130	-.283	.228
	Equal variances not assumed			-.210	268.968	.834	-.027	.130	-.283	.229
Evaluation & Explanation	Equal variances assumed	5.477	.020	-3.933	291	.000	-.560	.142	-.841	-.280
	Equal variances not assumed			-3.817	235.676	.000	-.560	.147	-.849	-.271
Inductive Reasoning	Equal variances assumed	17.081	.000	-4.344	291	.000	-.832	.191	-1.208	-.455
	Equal variances not assumed			-4.178	223.713	.000	-.832	.199	-1.224	-.439
Deductive Reasoning	Equal variances assumed	1.484	.224	-1.876	291	.062	-.457	.244	-.936	.023
	Equal variances not assumed			-1.858	260.898	.064	-.457	.246	-.941	.027
Total HSRT Score	Equal variances assumed	9.174	.003	-3.891	291	.000	-1.851	.476	-2.788	-.915
	Equal variances not assumed			-3.760	229.991	.000	-1.851	.492	-2.821	-.881

Table 9.8 Independent samples t-test for critical thinking skills of the first and third year cohorts of undergraduate nursing students

The independent samples t-test was significant for *overall critical thinking skill* as well as for the critical thinking sub skills of, *analysis, evaluation and inductive reasoning* with the third year undergraduate nursing students revealing higher mean scores (Tables 9.7 & 9.8). For *overall critical thinking skill,* the third year nursing students revealed a statistically significantly higher mean score of 18.84 (SD 3.54) compared to the first year students mean score of 16.99 (SD 4.60), t (*df,* 229.991) = -3.760, p=.0001, <.05. For the sub-skill of *analysis* the third year nursing student had a statistically significantly higher mean score of 3.76 (SD 1.27) compared to the first year mean score of 3.28 (SD 1.35), t (*df,* 291) = -3.129, p=.002, <.05. For the sub skill of *evaluation* the third year nursing students had a statistically significantly higher mean score of 4.56 (SD 1.08) compared to the first years mean score of 4.00 (SD 1.35), t (*df,* 235.676) = -3.817, p=.0005, <.05. For *inductive reasoning* the third year nursing students had a statistically significantly higher mean score of 7.24 (SD 1.39) compared to the first years mean score of 6.41 (SD 1.88), t (*df,* 223.713) = -4.178, p=.0005, <.05. *The null hypothesis was rejected in each case and the research hypothesis was supported. The conclusion was that, the third year undergraduate nursing students had a statistically significantly higher average score for overall critical thinking skill. They also had statistically significantly higher average scores, although only slightly so, for the critical thinking skills of analysis and evaluation.* The greatest difference between the groups was for the critical thinking skill of *inductive reasoning with the third years revealing a statistically significantly higher mean score than the first year cohort.*

There was no significant difference between the groups for the critical thinking skills of, *inference and deductive reasoning.* For *inference,* the third years had a mean score of 2.89 (SD 1.09) and the first year group had a mean score of 2.86 (SD 1.11), t (*df,* 291) =-.210, p=.834, <.05. For *deductive reasoning,* the third years had a mean score of 5.00 (SD 2.00) compared to the first year mean score of 4.54 (SD 2.14), t (*df,* 291) = -1.876, p=.062, <.05. *The null hypothesis was not rejected in each case, thus, the research hypothesis was not supported. The conclusion was that there was no significant difference between the first and third years for the critical thinking skills of inference and deductive reasoning.* These findings are discussed later in Chapter 12.

In summary, results for a comparison of the average critical thinking skills scores of the first and third year cohorts of undergraduate nursing students revealed a statistically

significant difference for the skills of analysis and evaluation. The differences between the average scores were slightly different and when compared to the categories and score range recommended by Facione & Facione (2012) both cohorts were *moderate in strength* for the skills of analysis and evaluation (Tables 9.7 & 3.3).

There was no significant difference in the average scores for the critical thinking skill of *inference* and when compared to the category and score range identified by (Facione & Facione, 2012) this skill was *not manifested* in either of the cohorts but close to *moderate strength*. In relation to *inductive reasoning* there was a statistically significant difference between the cohorts with the third year cohort showing greater ability in this skill. When compared to the categories and scores identified by Facione and Facione (2012) *both first and third years were moderate in strength for inductive reasoning*. For the skill of *deductive reasoning* the third year cohort were just in the category of *moderate strength* while this skill was *'not manifested'* in the first year cohort is was close to *moderate strength*. However, the difference in the average scores for deductive reasoning between the first and third year cohorts was not significant. For *overall skill in critical thinking* there was a statistically significant difference between the cohorts with the third year nursing students revealing a statistically significantly higher average score (Tables 9.7 & 9.8). However, when compared to the categories and scores identified by Facione and Facione (2012) *both cohorts were moderate in strength* (Tables 9.7, 3.2 & 3.3). These findings are discussed in detail later in Chapter 12.

9.5 Summary of the main findings for differences in critical thinking of undergraduate nursing students

The main findings for differences in critical thinking of the first and third year cohorts of undergraduate nursing students are summarised here. An independent samples t-test was used to test *two a-posteriori hypotheses*. The assumptions of independence, normal distribution and equality of variance in the population were met and this was to ensure that the results of the independent samples t-test were meaningful and accurate. These assumptions were described in detail earlier in this chapter for each hypothesis tested. The main findings for the critical thinking dispositions are presented next, followed by the main findings for the critical thinking skills.

9.5.1 Main findings for the difference in critical thinking dispositions

To explore differences in the critical thinking dispositions of the first and third year nursing students an, a-posteriori hypothesis was tested using an independent samples t-test. The hypothesis stated earlier in this chapter and the results of the independent samples t-test are presented in Table 9.4. There were *three main findings* for the differences in critical thinking dispositions. *The first main finding was that, there was a statistically significant difference between the first and third year cohorts for disposition towards inquisitiveness. The first year nursing students had a statistically significantly higher mean score compared to the third year nursing students.* Although the difference was statistically significant both cohorts were in the *positive category* when compared to the category scores identified by Facione and Facione (2012),(Tables 3.1 & 9.3).

A second main finding was that, there was no significant difference in the average scores between the first and third year nursing students for the critical thinking dispositions of, truth-seeking, open-mindedness, analyticity, systematicity, critical thinking self- confidence, and maturity of judgment. When the average scores were compared with the categories and score ranges identified by Facione and Facione (2012) *the results revealed that both first and third year nursing students were ambivalent for the dispositions, truth-seeking, systematicity and critical thinking self-confidence* (Tables 3.1 & 9.3). The first and third year cohorts were *positive* for the dispositions of; open-mindedness, analyticity and maturity of judgment. *A third main*

finding in relation to the total score on the CCTDI, or overall disposition towards critical thinking, revealed that there was no significant difference between the two cohorts. The first year cohort was positive in strength while the third year cohort was ambivalent, although bordering very close to positive strength. These findings are discussed in detail later in Chapter 12.

9.6 Main findings for the difference in critical thinking skills

To explore differences in the critical thinking skills of the first and third year nursing students an, *a-posteriori hypothesis* was tested using an independent samples t-test. The hypothesis was stated earlier in this chapter and the results of the independent samples t-test are shown in Table 9.8. *Five main findings* were revealed for critical thinking skills as an outcome of the undergraduate nursing curriculum.

The first main finding was a statistically significantly higher average score for the third year cohort compared to the first year cohort of nursing students for the critical thinking skills of analysis and evaluation. Although the differences were significant, when compared to the categories and score ranges identified by Facione and Facione (2012), *both cohorts were moderate in strength* (Tables 3.3 & 9.7).

The second main finding was that, there was no significant difference in the average scores for the critical thinking skill of inference. When compared to the category and score range identified by Facione and Facione (2012) *this skill was not manifested in either of the cohorts but close to moderate strength. A third main finding related to reasoning skills of induction and deduction. In relation to inductive reasoning there was a statistically significant difference between the cohorts with the third year cohort revealing a higher average score and therefor greater ability for this skill.* When compared to the categories and scores identified by Facione and Facione (2012) *both first and third years were moderate in strength for inductive reasoning. The fourth main finding was no significant difference in the average scores of the first and third year cohorts for deductive reasoning.* When the average scores for both disciplines were compared to the categories and score ranges identified by Facione and Facione (2012), the third year cohort were just in the category of *moderate strength* while this skill was *not manifested* in the first year cohort. However, they were close to being moderate in strength (Tables 9.7 & 3.3).

A fifth main finding was for overall skill in critical thinking. There was a statistically significant difference between the first and third year cohorts for overall critical thinking skill. The third year nursing students revealed a statistically significantly higher mean score compared to the first year students. However, when compared to the categories and scores identified by Facione and Facione (2012) *both cohorts were moderate in strength* (Tables 3.2 & 9.7). These findings are discussed in detail in Chapter 12.

9.7 Conclusion

This chapter presented the results for the differences in critical thinking of the first and third year undergraduate general nursing students. Differences in critical thinking dispositions were presented in the first section. The disposition of inquisitiveness was statistically significantly higher for the first year nursing students compared to the third years, however, both cohorts were positive in disposition. There was no significant difference for any of the other dispositions. Both groups were positive for open-mindedness, analyticity and maturity of judgment. They were ambivalent or weaker for truth-seeking, systematicity and self-confidence. In the second section of the chapter results for the differences between the first and third year cohorts for critical thinking skills were presented. While third year nursing students revealed higher average scores for the skills of analysis and evaluation they were moderate in strength similar to the first year students. The skill of inference was not manifested for either of the cohorts and this appeared to indicate poor ability to effectively interpret situations. This raises a concern, especially so in relation to the third year nursing students, as weak ability to interpret situations has consequences for both the standard and outcomes of care which patients receive. Both cohorts were moderate in strength for inductive reasoning. For deductive reasoning, third year nursing student were moderate in strength while this skill was not manifested for the first year students. Both cohorts were moderate in strength for overall critical thinking skill, however, as was explained above they had strengths and weaknesses in the various sub-skills. In the following chapters, the main findings for the critical thinking dispositions and skills are discussed in detail. Quantitative findings are discussed and the less-dominant qualitative findings are integrated to add further insights about the critical thinking of the undergraduate nursing students in this study. Prior to progressing with the discussion of findings an introduction to provide an overview of the discussion chapters is provided.

Introduction to findings' discussion

In the following chapters the main findings from the results of the quantitative data analysis presented in chapters five through to nine are discussed. The findings from the qualitative data analysis are integrated and expand this study by providing additional insights about critical thinking of undergraduate nursing students. They also provide insights of nurse lecturers about critical thinking in the undergraduate nursing curriculum. **Chapter 10** discusses the findings for the critical thinking dispositions and skills of the first year undergraduate nursing students. **Chapter 11** discusses the findings for the critical thinking dispositions and skills of the third year undergraduate nursing students. **Chapter 12** discusses the findings about the differences in the critical thinking dispositions and skills of the first and third year nursing students and includes a discussion of critical thinking in the undergraduate nursing curriculum.

To interpret the findings for critical thinking dispositions the categories and score ranges identified by Facione and Facione (2010, p. 19) are used. In relation to *overall disposition* towards critical thinking, a score of 280 represents, *'generalized strength in critical thinking disposition'* and they also state that, *'low overall scores below 210 and high overall scores above 350 are relatively rare in the undergraduate university population'*. To interpret the findings of the disposition sub-scales, findings are discussed in terms of being, *'low or negative', 'ambivalent', 'positive', and 'high'* (Facione & Facione, 2010, p. 20). Scores in the low category (10 - 29) are, 'indicative of a lack of valuation, aversion to, or even hostility to the attitude or attribute being measured'. Low scores in this range indicate that the attribute or attitude is a *negative habit of mind* likely to affect thinking in most situations'. Scores in the *'ambivalent'* category (30 - 40) are 'indicative of ambivalent or inconsistent endorsement of the attitude or attribute being measured'. Scores in the *positive category* (40 - 50), 'indicate consistent endorsement and valuation of the attitude or attribute being measured'. Scores in the *range of 50 - 60 indicate strength* in the attribute being measured. Each of the seven disposition sub-scales are discussed in context of these categories and score ranges.

To interpret the findings for the critical thinking skills the score ranges and categories identified by Facione and Facione (2012, pp. 25-26) are shown in Tables 3.2 and 3.3 in Chapter 3. For *total critical thinking skill* a score in the range 0 -14 is considered *weak*

and overall critical thinking skill is 'not manifested', a score in the range of 15-20 is *'moderate strength',* a score in the range of 21-25 is *'strong'* and a score of 26 or higher is considered *'superior'.* For the critical thinking subscales of analysis, inference, and evaluation a score in the range of 0-2 is weak and *'not manifested'*, a score in the range 3-4 is *'moderate'* strength and a score of 5 or more is *'strong'.* For the skills of inductive reasoning and deductive reasoning a score of 0-4 *is weak and 'not manifested',* a score of 5-7 is *'moderate'* strength and a score of 8 or more is *'strong'.* The categories and range of score identified above together with the Delphi conceptualisation and meaning of the constructs explained in the theoretical framework in Chapter 4 provide meaningful interpretation and discussion of the findings of this study.

Chapter 10 Discussion of Findings for the Critical Thinking Dispositions and Skills of the First Year Nursing Students

10.1 Introduction

This chapter discusses the *main findings* for the critical thinking dispositions and skills of the first year undergraduate general nursing students. Prior to the discussion and to the discussion of findings in Chapters 11 and 12 it is important to explain the rationale and justification for the scope of the integration of quantitative and qualitative findings. This study incorporated mixed methods and was quantitative dominant with a less-dominant qualitative component and denoted by the following mixed methods notation, QUAN-qual). A complimentarity model of data triangulation was used to integrate the data. In this model, findings supplement each other and provide perspectives of a broader and deeper nature about a phenomenon (Erzberger & Kelle, 2003, p. 469). The Delphi conceptualisation of critical thinking dispositions and skills as a theoretical framework also determined the integration of qualitative findings into the discussion chapters. Analysis of the qualitative data revealed *twelve themes* for the first year nursing students, *eight themes* for the third year nursing students and *nine themes* for the lectures around critical thinking (Appendices 6, 29, 31 and 32). All of the themes were not discussed for two main reasons. One, the less-dominant nature of the qualitative component meant that findings were integrated guided by the Delphi conceptualisation and derived constructs of dispositions and skills. Two, the volume of findings across all of the themes was beyond the scope of reporting in this thesis. The Delphi conceptualisation and derived constructs as a framework for the integration of the findings has strengths and weaknesses. The strengths and weaknesses, explained next, provide a justification for the integration of qualitative findings in this investigation of critical thinking.

The Delphi conceptualisation and derived constructs of dispositions and skills had strength in that it provided both a practical framework and a theoretical function for the integration of qualitative findings. As a practical framework it guided data integration around the constructs. The theoretical function, underpinned by the meanings of the Delphi constructs and their attributes, informed the integration of data through a comparison of informants' perspectives with the meanings of the constructs identified by (Facione & Facione, 2014; Facione et al., 2014; Facione, 1990). Another strength was that it served to supplement the quantitative findings and it provide broader scope

as well as deeper insight about critical thinking of the undergraduate nursing students. The Delphi conceptualisation and the derived constructs of dispositions and skills determined the scope of the qualitative findings to integrate from the emergent themes. Another strength was that it facilitated consistency in the integration by ensuring qualitative findings consistent with quantitative findings were integrated.

The Delphi framework in determining data integration had weakness in that, not all themes could be fully integrated and only findings to supplement the quantitative findings were integrated. If the Delphi constructs had been used as a framework to guide the qualitative interviews, then the focus of the interviews would have been pre-determined in that direction. Such an approach is likely to have provided different perspectives than was obtained in this study without a pre-determined approach to the qualitative interviews. On the other hand, if the focus had been to investigate the Delphi constructs in the qualitative component then the constructs would have served that purpose. In this study the interviews were determined by broad topics around critical thinking to avoid the imposition or distortion of informants' perspectives on my part as the researcher. This resulted in themes emerging from the qualitative data about what the students in this study perceived as critical thinking. Only themes and qualitative findings which integrated with the findings of Delphi constructs of dispositions and skills are reported. To report all themes would incorporate additional themes with different perspectives of critical thinking outside of the scope of the research questions. Also, the dominant quantitative less-dominant quantitative components of this study justified the integration of qualitative findings to achieve complimentarity to the quantitative findings.

Given the strengths and the weakness of the Delphi conceptualisation identified above its strengths provided for the integration of the less-dominant qualitative findings. Its use was beneficial both practically and theoretically and justified the scope of the qualitative findings to compliment the quantitative data, thus expanding this study. In this chapter, qualitative findings for the first year nursing students are integrated with the quantitative findings and add deeper insights about their critical thinking. In Chapter 11, qualitative findings are integrated to provide deeper insights about critical thinking in the third year cohort of nursing students. In Chapter 12, qualitative findings of nurse lecturers about critical thinking in the nursing curriculum are integrated and

add further important insights about critical thinking in the undergraduate nursing curriculum.

Findings for two quantitative research questions, questions one and three are discussed in this chapter. The less-dominant qualitative findings are integrated with the dominant quantitative findings to address question seven, a qualitative research question which asked: *What are first year undergraduate general nursing students' perceptions of critical thinking in the nursing curriculum?* Findings are interpreted and discussed in the context of findings reported in published literature on critical thinking dispositions and skills. The Delphi constructs as components of the theoretical framework provided theoretical explanations for the critical thinking dispositions and skills (Facione & Facione, 2014; Facione, 1990). The Delphi constructs also provided a framework which facilitated the integration of the quantitative and qualitative findings. Section one discusses the findings for the critical thinking dispositions. In section two, the findings for the critical thinking skills are discussed. A summary of the discussion is included at the end of the chapter.

10.2 Critical thinking dispositions of the first year nursing students

The *main findings* for the critical thinking dispositions of the first year cohort of undergraduate nursing students are discussed in this section to address the first research question: *What are the critical thinking dispositions of first year undergraduate general nursing students as measured by the California Critical Thinking Disposition Inventory (CCTDI)?* Overall critical thinking disposition as well as the dispositions of: truth-seeking, open-minded, analyticity, systematicity, critical thinking self-confidence, inquisitiveness, and maturity of judgment are discussed.

10.2.1 Overall disposition towards critical thinking for the first year nursing students

Overall disposition towards critical thinking was measured for the first year cohort of undergraduate nursing students. The first year cohort of nursing students (N=237) revealed an average score of 282.10 (SD 29.35). This score was just above the cut-off score of 280.00 and they were *positive* in overall disposition towards critical thinking, thus, they demonstrated generalized strength in overall critical thinking disposition. This finding was similar to the positive scores reported in junior and in first year nursing

students in Canada (Profetto-McGrath, 2003), in the USA (Colucciello, 1997), Korea (Shin et al., 2006b) and in the Middle East (Suliman & Halabi, 2007) (Table 2.4). In contrast are studies which report scores below 280.00 indicating weakness in overall critical thinking disposition in first year baccalaureate nursing students, in China (Ip et al., 2000), Japan (Kawashima & Petrini, 2004) and in the Middle East (Suliman, 2006). Ip et al. (2000) attributed the low overall disposition score to Chinese students' lack of confidence in their ability to solve problems, adapting to nursing education after tertiary education, an authoritarian education system, and the influence of Confucian philosophy. It appears that cultural values and what is valued in eastern, versus western culture, impacts the curriculum and consequently on overall disposition towards critical thinking. While the total score on the CCTDI provides an overall indication of the first year nursing students disposition towards critical thinking the seven sub-scales are more informative. According to Facione and Facione (2010, p. 20), 'each of the seven dispositional constructs is important individually, and these seven constructs are far more informative than the overall score'. Each of the seven disposition sub-scales are subsequently discussed and provide further knowledge of the strengths and weaknesses of the first year nursing students disposition to think critically.

10.2.2 Truth-seeking in the first year nursing students

The average score for *truth-seeking* for the first year nursing students in this study was below the cut-off score of 40.00 and indicated *ambivalence or weakness* towards this disposition. An ambivalent attitude towards truth-seeking was reported in sophomore students in the USA (Colucciello, 1997) and in first year nursing students in China (Ip et al., 2000) and the scores were lower than the first years in this study (Table 2.4). In contrast, a positive disposition was reported in first year nursing students in Korea (Shin et al., 2006b) and in the Middle East (Suliman & Halabi, 2007). According to Facione and Facione (2014, p. 18), truth-seeking is the habit of always desiring the best possible understanding of a situation and it involves the use of reason, evidence, questioning and attention to detail. Truth seekers strive not to let bias or preconception colour their search for knowledge and truth. The opposite of truth seeking is bias which ignores good reasons and relevant evidence in order not to have to face difficult ideas. Over half of the first year cohort (57%, N=135) in this study were ambivalent in truth-seeking and as such they were inconsistent in the use of reason, in questioning their beliefs and not fully adept at casting aside their biases and preconceptions in the

search for knowledge and truth. A reasonable expectation is that further progression through second, third and into fourth year of the course would lead to a larger proportion of the cohort moving from a negative and ambivalent disposition towards being positive for truth seeking.

Qualitative data revealed evidence of truth-seeking which was prevalent in the descriptions of the students in relation to the use of reason, questioning and a desire for honesty. The following descriptions are evidence of this. A student described reason in making decisions and reasoning being evident in other nursing students:

> Every decision you make you'd really think about it like and you'd have to have a reason behind everything you do... maybe, I suppose some people in nursing in my year or whatever wouldn't do anything without reasoning... they'd have to have a reason for everything you do like and they wouldn't just do something for no reason... they'd always have to have some kind of thinking behind it ...you'd notice it... I don't know how you'd know but you'd just know by them like they ...everything they do is thought about. (Y1Q4S7)

Reasoning was perceived as very significant in clinical practice:

> In the clinical area...you'd really have to think about things... maybe in certain situations you have to apply critical thinking...when you're in certain situations in the hospital you have to think... not improperly ... but you have to... you have to think more and have a reason behind what you're doing. (Y1Q1S7)

These findings indicate that reason as an attribute of truth-seeking was used by the first year nursing students in various situations in nursing practice. Truth-seeking as a disposition towards critical thinking was also described in relation to the use of questioning and is evident in the following student's description:

> Asking questions of students, I think, is a better way of getting critical thinking. Some lectures do it... I guess they have, sometimes ...five questions on the board and they say... now this is a free question part for you and it's usually the shortest part of the lecture. (Y1Q8 S1)

Evidence of truth-seeking as honesty was also evident in the student's desire for honesty and in making the right decision:

> You kind of expect to get to the root or the honesty of something ...you find maybe the truth of something. (Y1Q10AS2)

> It's just important to make the right decision because if there is something you're thinking about and you put effort to look into and focus into...you're going in the right direction, making the right decision in the end. (Y1Q3S5)

These qualitative findings provide evidence that attributes of truth-seeking such as reason, questioning and seeking honesty influences clinical practice for first year nursing students. Clinical practice situations and questioning appear as stimuli to the development of truth-seeking. It may be suggested, that if methods and approaches to enhance the processes of reasoning, use of questioning and the facilitation of decision-making are further emphasised in the nursing curriculum and teaching pedagogies, then it is likely to lead to a more positive disposition towards truth-seeking. Questioning and decision-making are essential to seeking and influencing truth, and it may be suggested that at first year level nursing students are cautious about questioning what appear as accepted truths. Approaches which challenge students' misconceptions, biases and encourage questioning is likely to enhance truth-seeking disposition. Also, first year nursing students are not engaging fully in decision-making in first year and their supernumerary status of observing, as opposed to doing, may also have a role to play in determining a positive disposition towards truth seeking.

10.2.3 Open-mindedness in the first year nursing students

The first year cohort of nursing students was *positive* in open-mindedness disposition. This finding compares with the positive scores of first year nursing students in the USA (Colucciello, 1997), Korea (Shin et al., 2006b) and in the Middle East (Suliman & Halabi, 2007) and contrasts with the weaker scores of first year nursing students in China with a score in the ambivalent category (Ip et al., 2000) (Table 2.4). According to Facione and Facione (2014, p. 18), open-mindedness is tolerant to the views and opinions of others and involves seeing things from different perspectives. Almost two thirds of the first year students (65%, N= 156) in this study were positive and highly positive in disposition towards open-mindedness. They were tolerant of the views and opinions of others and were capable of working in harmony in a complex environment.

They were also capable of approaching complex issues such as those encountered in a health service environment from different perspectives.

Open-mindedness as tolerance of others and being non-judgmental was evident in the following students' description:

> We are told to not be judgemental and stuff like that and just to have an open mind about things and not to have too much of an opinion... I think, just to be open to, kind of to everybody...everyone has different circumstances not everyone is...you know... the same, just to be open and embrace everyone kind of... and not to be kind of, judgemental or prejudiced. (Y1Q10AS3)

An open-minded disposition is important for nursing students given the nature of their work and the diversity of patients and health care situations they encounter in clinical practice. The positive disposition towards open-mindedness and the above description of a first year nursing student is evidence that the nursing curriculum from an academic and clinical perspective encourages and plays an important part in enhancing an open-minded disposition. An further analysis of the students description above acknowledges the impact of the curriculum on an open-minded disposition and that the perception *'we are told'*, appears to suggest that teaching contributes to this as it places emphasis on a non-judgmental attitude and the need to keep an open mind.

10.2.4 Analyticity in the first year nursing students

Analyticity as a disposition was in the *positive* category for the first year nursing students. A similar positive score was reported for first year nursing students in China (Ip et al., 2000). Studies in the USA (Colucciello, 1997), the Middle East (Suliman & Halabi, 2007) and in Korea (Shin et al., 2006b) also reported a positive disposition towards analyticity (Table 2.4). The scores in these studies were higher than the scores of the Chinese nursing students in Ip et al's (2000) study and in this study. According to Facione and Facione (2014, p. 18) analyticity is the tendency to be alert to what happens next and anticipation of both the good and the bad potential consequences or outcomes of situations, choices, proposals, and plans. Close to two thirds (63%, N=148) of the first years in this study were positive and highly positive and as such they were disposed to the attributes of analyticity.

Evidence of analyticity as a disposition in students' perceptions of critical thinking was described as thinking ahead and anticipation of consequences:

> Sometimes it (critical thinking) can be a negative thing and sometimes it can be a positive thing...you know...it can work well in certain situations...like...for a suggestion for something, if people want... as a group of people... where will we go.... will we go to the shop ....will we go to a bar... that kind of thing... I guess it's a kind of a thing of thinking before...it helps me think ahead of the situation... I guess. (Y1Q4S1)

In relation to the anticipation of consequences a first year nursing student stated:

> Certain subjects in nursing get you thinking .... there was one this year on medication safety ... to know what you are giving and know how much and be double checking and all of that ...they were getting us to think and not be ... not that people intentionally give out wrong medications but just to be aware of what we are doing like ... some of the subjects like that... I think...maybe get you to think properly...they showed us videos of how easy mistakes can happen... maybe just to get us thinking or even to show us how mistakes can happen and to think properly like before you do things. (Y1Q10BS7)

The finding that almost two thirds of the first year cohort were positive indicates that this cohort were capable of thinking ahead and anticipating the consequences of their actions in the delivery of nursing care. The high prevalence of a positive disposition towards analyticity across studies in different cultures reported earlier in this study may be attributed to the nature of the nursing practice environment. The nursing practice environment demands alertness to situations and the need to think ahead in situations, to avoid inadvertent consequences as describe by the nursing student in the above description in relation to medication administration. It may be suggested that the anticipation of consequences is tied with nursing students novice stage in the nursing profession and that these nursing student were over cautious about the good and bad consequences of their actions on patient care.

10.2.5 Systematicity in the first year nursing students

The systematicity disposition was in the *ambivalent* category which meant the first year students were somewhat weak and inconsistent in this critical thinking disposition. A

similar ambivalent finding was also reported for systematicity in first year nursing students in the USA (Colucciello, 1997), China (Ip et al., 2000) and in Korea (Shin et al., 2006b) (Table 2.4). In contrast, a positive disposition towards systematicity was reported for first year nursing students in the Middle East (Suliman & Halabi, 2007). According to Facione and Facione (2014, p. 18) systematicity is the tendency or habit of striving to approach problems in a disciplined, orderly and systematic way. While a plan or strategy may or may not be known or used there is a mental desire to approach issues in an organised way. Almost half (49%, N=117) of the first year cohort in this study were ambivalent in systematicity disposition and as such were inconsistent in their approach to situations. They were not as disciplined, orderly or systematic and they appeared to lack the mental desire to approach issues in an organised way. Although the highest percentage proportion of the first year nursing students revealed an ambivalent or inconsistent systematicity disposition just over a third (34%, N=80) were positive. and there was evidence of attributes of systematicity in the student's descriptions in relation to being organised an in planning care:

> I've become more... much more logical in my way thinking and much more organised... definitely...I would have some of it but I have more this year ...I think better, just the way I probably handle a situation... probably last year... I probably would have went...what do I do?... I don't know what to do kind of thing...whereas this year I'm more like hang on, think about it for a minute and then see what you know or come up with. (Y1Q8 S3)

Systematicity was evident in the planning and organising of nursing care:

> Where it's most evident is when you are doing some procedure....you know... even something simple like your changing a dressing ...like... you have to think....like... ok ...this is this patient...they have this wound ..I'm going to need...like...these dressings, I need this equipment ...I need these gloves... like your bringing everything together ...like... your thinking through each step...what do I have to do now like and all the time... like... your trying to maintain sterility ...like... avoid infection so you're thinking the whole time and thinking about the patient and their comfort like you know there's a lot of things you have to take into account. (Y1Q14 S9)

The ability to organise, plan and prioritise nursing care are competencies which are valued by the nursing profession and are identified in context of the five broad domains

of competence at a national level (An Bord Altranais, 2000, p. 14). The ability to organise plan and prioritise care is addressed in the undergraduate nursing curriculum using the nursing process which focuses on the planning and prioritisation of care in all nursing situations. The first year nursing students in this study and in studies reported above were weak in these skills. An ambivalent systematicity disposition may be somewhat acceptable at this early stage as first year nursing students are developing competence in these skills.

10.2.6 Critical thinking self-confidence in the first year nursing students

The importance of self-confidence is a recognised disposition for critical thinking and the first year nursing students revealed an average score in the *ambivalent* category indicating weakness and an inconsistent self-confidence disposition. This finding was similar to first year nursing students in China (Ip et al., 2000), Korea (Shin et al., 2006b) and in the Middle East (Suliman & Halabi, 2007) who also scored in the ambivalent category. In contrast, first year nursing students in the USA reported a positive disposition for critical thinking self-confidence (Colucciello, 1997). According to Facione and Facione (2014, p. 18) critical thinking self-confidence is the tendency to trust the use of reason and reflective thinking to solve problems and reach goals. The opposite is the tendency to be mistrustful of reason, to consistently devalue or be hostile to the use of careful reason, and reflection as a means to solving problems or discovering what to do or what to believe. Close to half (42%, N=99) of the first year nursing students in this study were ambivalent in critical thinking self-confidence. They were inconsistent in that they were not yet confident in the product of their reasoning and thinking to solve problems and reach goals. Scoring in the ambivalent category also meant that they did not ignore the value of their reasoning and reflective thinking.

Critical thinking self-confidence was evident in the description of a first year nursing student in relation to the greater use of thought when an issue was important, as well as trust in their reason, and the use of reflection when an issue was deemed important:

> The times that I am (thinking critically) I guess...the thing is really ...really important to me and I need to give it loads more thought and that... the times I'm not ...I just go with the flow and once I've decided about it that's what I'm going to do. (Y1Q4S5)

The same student also described trust in their reasoning and judgment in a clinical situation:

> I suppose it's different...it depends on where you are...what you are doing. If I was working maybe it'd be like...whether you think someone is in need of a doctor or not... like... just looking at them, sometimes you could be completely wrong and say... oh... I'm completely blowing this out of proportion but you have to make that decision and you have to think about it and decide yourself and that would be it. (Y1Q4S6)

Being confident was described as influential in critical thinking:

> I think you do need a certain element of confidence to know what you are talking about and understand what you are doing. Some people might not be confident but they are confident when they are doing things that they know they can do or they know they are good at... they might not have a general confidence but they could have confidence in that area like and that helps them be critical thinkers. (Y1Q5S6)

An ambivalent attitude towards critical thinking self-confidence in the first year nursing students in this study and it's prevalence in nursing students in the international studies reported earlier may be partly due to being a first year and their lower status in the practice setting. The qualitative findings indicate that critical thinking self-confidence is necessary for safe patient care even at a very junior level in clinical practice. The first year nursing students in this study, although ambivalent, scored higher than the nursing students reported in China, Korea and in the Middle East but not as high as the nursing students in the USA who were positive in the disposition. It is possible that cultural influences play a part in determining a self-confidence disposition, Eastern cultures influenced by Confucian philosophy compared to western culture such as North America is quite different. The differences may also be considered to be related to the level and timing of exposure to the clinical practice setting as this would have a bearing on nursing students' self-confidence disposition. It is acknowledged that the first year nursing students in this study were very close to the positive category and that 39% (N=93) were positive for this disposition.

10.2.7 Inquisitiveness in the first year nursing students

An enquiring mind is important for the discovery of knowledge and the first year nursing students in this study were *positive* for inquisitive disposition. This finding is similar to the positive scores for inquisitiveness in sophomore students in the USA (Colucciello,

1997), and first year nursing students in China (Ip et al., 2000), Korea (Shin et al., 2006b) and in the Middle East (Suliman & Halabi, 2007). According to Facione and Facione (2014, p. 18), inquisitiveness is the tendency to want to know things, even if they are not immediately or obviously useful at the moment. It is being curious and eager to acquire new knowledge and to learn the explanations for things even when the applications of that new learning are not immediately apparent. Well over three quarters (79%, N=187) of the first year cohort in this study were positive and highly positive for an inquisitiveness disposition towards critical thinking. They were curious and eager to acquire new knowledge and explanations.

Inquisitiveness was not prevalent in the discussions with the first year nursing students in relation to critical thinking. One first year nursing student described a critical thinker as more dedicated to 'finding out' and being inquisitive:

> Some people you can tell would be naturally more inquisitive ... I think that people who are inclined to be critical thinkers.... I think are...maybe a bit more dedicated ...possibly... to the care of the patient and finding out the kind of ... the cause of things rather than just the cure. (Y1Q4 S2)

The same student described the tendency for critical thinkers to be inquisitive and curious:

> I think there's also some kind of natural tendencies that people just have to be inquisitive and be curious about things. (Y1Q5 S2)

Inquisitiveness was a disposition which was positive and the strongest disposition for the first year nursing students in this study. It was also positively scored for students at the same level in the international studies reported above. The strong positive scores for inquisitiveness indicate that nursing students, in their first year, are curious, eager for knowledge and desire explanations. Such a positive attitude is likely to be influenced by nursing as their career choice and ambition. Their desire to practice a safe standard of nursing care of a high standard is contingent upon their knowledge base. While the first year nursing students in this study were positive for the inquisitiveness disposition, it's lack of prevalence in the discussion in interviews may be due to their lack of perception of inquisitiveness as a component of critical thinking. An

inquisitive disposition and a sense of curiosity is essential for nursing students not only to seek out knowledge but also to have this curiosity about wider issues related to patient care.

10.2.8 Maturity of judgment in the first year nursing students

The nursing practice environment requires that nursing students make judgments about patient care. The ability to make judgments is dependent upon the appropriate attitude or disposition to do so. The first year nursing students in this study revealed a *positive* disposition *for maturity of judgment*. This finding was similar to a positive finding reported for sophomore nursing students in the USA (Colucciello, 1997). A comparison with first year nursing students in China (Ip et al., 2000), Korea (Shin et al., 2006b) and in the Middle East (Suliman & Halabi, 2007) revealed the nursing students in this study were stronger than these students who scored lower, in the ambivalent category, and as such were weaker for maturity of judgment disposition. According to Facione and Facione (2014, p. 18) maturity of judgment is the tendency to see problems as complex, rather than black and white. There is a tendency to make judgments in a timely way, not premature and not without delay. There is a tendency towards being firm in one's judgments based on reason and capable of changing one's mind when appropriate to do so. There is a tendency to be prudent in making judgments, aware that multiple solutions may be acceptable and appreciative of the need to accept closure in certain circumstances even in the absence of complete knowledge.

The first year nursing students' descriptions revealed evidence of the attributes of maturity of judgment. The nursing course had an influence on this disposition through situations the students encountered and which challenged their ability in making judgments. This was evident in the following description by a first year nursing student who indicated that critical thinking challenged her judgment:

> It does ....you know .... certainly when your put in situations where you don't know what's best to do and you just think ...should you do this or will I do A or will I do B. (Y1Q18S4)

Maturity of judgment was evident in the following student's description of a change in the form of their thinking from black and white to considering different perspectives in relation to patient care and influenced by the activities of daily living (ADL's) component of the Roper, Logan and Tierney model of nursing (Holland, Jenkins, Solomon, & Whittman, 2012):

> Because we have learned about the whole ADL's ...like ....you kind of don't think about it ... before that. I guess you would have seen things as black and white...sick or healthy... you know that kind of thing...now you're kind of thinking ... socially... physically... emotionally... every kind a thing but you might not... you might miss one or two... you know... but if you get... hell it's better than getting just the two... black and white. (Y1Q10B S1)

The same nursing student identified development of maturity in thinking in relation to the tendency to make a judgment influenced by thinking more broadly as opposed to just focusing on one aspect of a situation:

> I guess sometimes it could be just things like ... thinking rather than just focusing ... sometimes just looking around the patient ... for example ... say the patient is getting a dressing or whatever ... you might notice something ... like ... a wire...coming out or loose or it may be tightening around someone's leg and you kind of say... oh ....that actually... you might not be able to name the thing but just making sure that that person...kind of...not focusing on the one thing ... you know... I guess seeing if the patient is ok, asking if they are in pain... I guess...rather than looking at the one thing. (Y1Q4S1)

Almost two thirds (64%, N=151) of the first year cohort were *positive and highly positive for the* maturity of judgment disposition. This was also evident as a qualitative finding in the above descriptions and the move form black and white thinking to thinking more broadly as influenced by clinical practice. It is interesting to note that the first year nursing students in this study were positive in disposition and similar to nursing students in the North American study compared to the prevalence of an ambivalent and weaker disposition in the nursing students, at the same level, in the three Eastern studies reported above. This raises the issue of students in western culture being positive in the attributes of maturity versus eastern students who were ambivalent or weaker. It is likely that differences in western compared to eastern education and

cultural factors may be influential. The qualitative findings reported above indicate the potential of perplexing and challenging situations to enhance maturity of judgment. The identification of the activities of daily living (ADL's) component of the Roper Logan and Tierney model of nursing (Holland et al., 2012) mentioned in the qualitative description above also indicates that curriculum instruction, in this component of the model of nursing, contributed to thinking more broadly and this was perceived by a first year nursing student to enable a move beyond black and white thinking.

To this point, the discussion has focused on the main findings for the critical thinking dispositions of the first year undergraduate nursing students. The integration of the qualitative findings added further insights about critical thinking dispositions in these nursing students. Results revealed both positive and ambivalent or weak scores across the seven disposition sub-scales and in doing so provided further knowledge about the first year nursing students for the specific critical thinking dispositions. While the first years nursing students revealed an overall positive critical thinking disposition at this early stage in the nursing degree course the category scores provided knowledge which is reassuring for the positive dispositions and raises concern for ambivalent dispositions. This knowledge is useful as it identifies areas for enhancement in both the clinical and theoretical components of the undergraduate nursing curriculum. This new knowledge about the first year nursing students in this study has the potential to further enhance positive and ambivalent critical thinking dispositions. While positive dispositions are important, critical thinking skills are also an important component of critical thinking. In the next section, critical thinking skills of the first year nursing students are discussed and add further knowledge about critical thinking of first year nursing students in this study.

10.3 Critical thinking skills in the first year undergraduate nursing students

In this section, the main findings for the critical thinking skills of the first year cohort of undergraduate nursing students are discussed. Findings are discussed to address research question three which asked: *what critical thinking skills do undergraduate general nursing students have in the first year of the nursing degree course as measured by the Health Sciences Reasoning Test?* Findings in relation to overall critical thinking skill as well as the sub-skills: *analysis, inference, evaluation, inductive reasoning and deductive reasoning are discussed.* Qualitative findings are integrated

and provide further insights about the critical thinking skills as perceived by the first year nursing students. The first year nursing students also describe their lack of awareness of critical thinking and what they perceived as critical thinking skills.

10.3.1 Overall critical thinking skill for the first year nursing students

In the review of the literature critical thinking skills as a component of critical thinking was identified (Beyer, 1987; Ennis, 1985; Facione & Facione, 2012). The first year nursing students in this study scored *moderate in strength for overall critical thinking skill.* A comparison with first year undergraduate nursing students in the USA (Beckie et al., 2001; Mc Carthy et al., 1999) and in Canada (Profetto-McGrath, 2003) also revealed scores of moderate strength. In contrast, a weak score was reported, for first year nursing students in another study in the USA (Colucciello, 1997). A comparison of the overall average score of 16.99 (SD 4.60), and rounded to 17.00, with norm values for the HSRT revealed that the first year nursing students in this study were in the 29th percentile compared to US undergraduate nursing students and in the 27th percentile compared to US undergraduate health science students (California Academic Press, 2012). The first year nursing students in this study, compared well with US undergraduate nursing student norms for 2012. They were *moderate in strength* for overall critical thinking skill with 'potential for skills related challenges when engaged in the reflective problem-solving and reflective decision-making associated with learning or employee development' (Facione & Facione, 2012, p. 24) (Appendix 8).

According to Facione and Facione (2012, p. 12), the total critical thinking skill score is a measure of overall strength in the use of reason based on reflective judgment about what to believe or do. To score well one must excel, 'in the sustained, focused, and integrated application of core reasoning skills including analysis, interpretation, inference, evaluation, explanation, induction, and deduction'. Less than half of the first year nursing student scored moderate in strength (43%, N=55) and less than a quarter scored in the strong category (23%, N=29) for overall critical thinking skill and as such they had the ability to use reason and make judgments based on reflective thought. However, they were just in the category of moderate strength and stood to excel in this as they progressed through the course to more senior years. Findings for the critical thinking sub-skills provide further insight about their ability in analysis, inference, evaluation and reasoning in skills.

10.3.2 Analysis as a critical thinking skill in the first year nursing students

To think critically, the ability to analyse, break things down, and have strength in this skill is both necessary and important to facilitate the interpretation of both knowledge and situations. The first year nursing students were *'moderate'* in strength for the skill of analysis. A study in the USA by (Colucciello, 1997) reported moderate strength for analysis in sophomore students. A later study by Beckie et al. (2001), also in the USA, among three cohorts of nursing students at entry to a baccalaureate nursing degree course reported scores of moderate strength for analysis. A curriculum revision to incorporate critical thinking improved the students' strength in the skill of analysis, but none of the cohorts reached the *strong* category. According to Facione and Facione (2014, p. 21), analytical reasoning skills enable people to identify assumptions, reasons and claims and how these interact in the formation of arguments. Strong analytical skill reflects the ability to attend to patterns and detail in issues. Close to three quarters of the first year nursing students (71%, N=90) scored *moderate* and *strong* for the skill of analysis. They had potential to challenge assumptions, reasons and claims and build arguments in relation to situations encountered. Analysis as a skill for critical thinking developed for one nursing student and was evident in her description:

> I think before I came into nursing I never probably thought too much about things...I never analysed things much... then, I suppose when you start nursing you kind of have to...not have to...but in certain situations you really do like, even unknown to yourself you do. (Y1Q8S7)

For this student, a greater awareness of thinking and the ability to use the skill of analysis developed. This was influenced, not only by the need for thinking and the use of the skill of analysis, but it was integral to the situations encountered by the student. This nursing student was only in the first year of her course and based on Benner's model of skill acquisition was at the *'novice'* level. She lacked the clinical experience of an *'expert'* nurse and it appeared that need for analysis was stimulated, without conscious awareness at the time, and this is reflected in the phrase, *'but in certain situations you really do like, even unknown to yourself you do'.* It appears that in a challenging situation analysis comes to the fore as a skill and it appeared to happen in an almost intuitive or tacit form for this student. Another first year nursing student reported that there is an expectation to draw on theoretical knowledge across modules and apply it to analyse situations:

> As a student nurse you're supposed to be able to draw upon... you know... if you're doing one module you need to be able to draw upon other modules to analyse a situation and come to a conclusion or something like that. (Y1Q1S10)

Here, there is evidence of use of analysis to '*come to a conclusion'* and this is reflective of critical thinking as, 'a judgment process' (Facione & Facione, 2008) and 'deciding what to believe or do' (Ennis, 1985). The first year nursing students in this study were moderate in strength for analysis and as such they were similar to first year nursing students in the North American studies reported above. The qualitative findings revealed that the perception of the two first year nursing students in this study was that analysis was brought to the fore by the nature of the situations they encounter in the clinical practice setting. Analysis was not a choice, but integral to nursing situations, an essential skill and was influenced, to an extent, by the nursing curriculum. The ability to use the skill of analysis is required in nursing practice in order to be able to interpret and understand situations and to form the basis to build strong arguments. Such attributes are essential to ensure effective patient care in continuously changing, complex and demanding health care environment.

10.3.3 Inference as a skill for critical thinking in the first year nursing students

In all professions knowledge, information, facts, issues and situations present themselves in various forms and this is certainly true in the practice of nursing. When one is confronted with information and situations which are novel and challenging they are interpreted to gain an understanding and establish meaning. The skill of inference and the ability to have strength in this skill is required to think critically. First year nursing students in this study did *not manifest* this skill but were very close to *moderate strength.* A comparison with studies reported in the literature found higher scores for inference in junior nursing students in the USA who scored in the moderate category (Beckie et al., 2001) and in the strong category (Colucciello, 1997). According to Facione and Facione (2014, p. 21), we use inductive reasoning skills when we draw inference about what we think must probably be true in light of the possibility that our conclusions might be false. While half of the first year cohort (58%, N= 74) were *moderate in strength for inference* the average score was just short of the category of moderate strength. Inference as a skill for critical thinking was not strongly prevalent in

the qualitative findings. However, a first year nursing student drew attention to the use of inference in clinical practice in relation to the interpretation of laboratory results:

> Say you got results back from... blood results or something...instead of looking at what the results mean or relating them to a chart maybe looking underneath... kind off... to see... also including maybe somebody's family history or something and maybe... kind off... coming to the conclusion that it could be something else. (Y1S2Q2)

This statement captures the use of inference for a first year nursing student where facts were not taken at face value, but interpreted in context of other facts, and thus also demonstrating the use of inductive and deductive reason to draw inference before arriving at a conclusion and not just relying on one source of information. This also indicates the importance of inference as a critical thinking skill and the benefit of strong inference skills from an early stage for undergraduate nursing students. The first year nursing students, as a cohort, were notably close to moderate strength and it is likely that progression through the course would further develop strength in this critical thinking skill. Further strength is also likely to be gained if teaching pedagogies encourage thinking beyond facts presented in a situation.

10.3.4 Evaluation as a skill for critical thinking in first year nursing students

Evaluation is a skill required in critical thinking and it is also a highly recognised and valued skill in nursing. It is one of the main components of the nursing process and is strongly emphasised and utilised in both nursing theory and in clinical practice. The first year nursing students revealed evidence of this skill and had an average score in the category of *moderate strength*. A comparison with studies in the USA also revealed moderate strength for the skill of evaluation (Beckie et al., 2001; Colucciello, 1997). According to Facione and Facione (2012, p. 12) evaluation involves the ability to assess the credibility of sources of information and their claims. Considered together, over four fifths (84%, N=106) of the first year nursing students scored in the moderate and strong category (65%, N=83) for the skill of evaluation, and as such they demonstrated ability to assess the credibility of information.

Evaluation was not discussed in the interviews about critical thinking with the first year nursing students. This appears to suggest their lack of awareness of evaluation as a critical thinking skill, although they are engaged in evaluation through the nursing process. Awareness of evaluation as a critical thinking skill was described by a first year nursing student in the context of nursing care plans:

> For me it (critical thinking) would be mostly with the care plans just because of the level I am in nursing... this is where it see it (critical thinking) most... you see it mainly as an example like a patient in pain... this patient has such and such a pain and she's going to need this intervention... these pain killers... then you come back and you re-evaluate what has happened... is the patient any better... it's like the critical thinking... you know you are very conscious of what you are doing... of how you are thinking and solving problems. (Y1S9Q2)

For this student, evaluation was a skill used in the context of patient care. The first year nursing students revealed moderate strength for evaluation but this was not strongly evident in the qualitative findings. It is likely they perceive evaluation as a different entity tied to the nursing process and care plans and not as a critical thinking skill. Evaluation is a major component of the nursing process taught in the first year of the undergraduate nursing curriculum and encountered in their first practice placement. Their familiarity with the term and use in the practice setting is likely to have enhanced this skill as they scored in the upper end of moderate strength. This would suggest that the nursing curriculum experiences, through the teaching of this skill and its application in the clinical practice setting through the use of the nursing process, had a strong influence on the strength of this critical thinking skill. This also identifies the value of the nursing process in stimulating and developing evaluation as a skill for critical thinking.

10.3.5 Inductive reasoning in the first year nursing students

Inductive reasoning is a process of reasoning from facts and observations to reach a conclusion (Sternberg & Sternberg, 2012). Inductive reasoning is necessary for nurses in clinical practice as they are continuously confronted with what are quite often critical situations and they are required to reason based on the facts of the events as they arise. The first year nursing students in this study were *moderate in strength* for this critical thinking skill. A comparison with studies reported in the literature also indicate that junior nursing students in the USA reported moderate strength for inductive

reasoning (Beckie et al., 2001; Colucciello, 1997). According to Facione and Facione (2012, p. 12) we use inductive reasoning skills when we draw inference about what we think must probably be true in light of the possibility that our conclusions might be false. Collectively, over 82% (N=104) of the first year nursing students scored in the moderate and strong categories for inductive reasoning. They were capable of gathering information about issues and situations. However, it appears that drawing conclusions from this form of reasoning, while with the possibility of being false, may be somewhat incomplete and not fully accurate as these first year nursing students, as was discussed above, did not manifest strength inference skills. It appears they have ability to gather information but lack strong ability to correctly and accurately interpret information to arrive at accurate outcomes. However, the ability to reach accurate and truthful conclusions may be inhibited somewhat by their limited professional knowledge in the first year of nursing and lack of clinical experience as they are at the novice stage.

The specific process of inductive reasoning was not overtly evident in the qualitative findings and this may be partly due to not knowing the meaning and process of inductive reasoning. The first year nursing students did not describe inductive reasoning when asked about what they perceived as the skills of critical thinking and this is more evident in the later section which discusses the findings in relation to what the first year nursing students perceived as the skills of critical thinking. Reasoning was a term used by the first year nursing students in relation to critical thinking but they did not differentiate between inductive and deductive reasoning. Descriptions in relation to reasoning were rather general and for that reason descriptions by the students are discussed after the discussion of deductive reasoning which is addressed next.

10.3.6 Deductive reasoning in the first year nursing students

Deductive reasoning is a process of reasoning from one or more general statements about what is known to the application of the general statement (Sternberg & Sternberg, 2012). Nursing students are required to use deductive reasoning as they apply knowledge to practice and it is a necessary critical thinking skill. Findings for the first year nursing students revealed their average score was in the category of *'not manifested'*, in relation to deductive reasoning and this was evident in over half of the first year cohort of nursing students (53%, N=57). A comparison with studies reported

in the literature revealed that sophomore nursing students, in the USA, early in their course, were moderate in strength for deductive reasoning (Colucciello, 1997). In another North American study, Beckie et al. (2001) reported scores for three different cohorts in the moderate and strong categories. According to Facione and Facione (2014, p. 21) deductive reasoning is precise and the assumed truth of a set of beliefs necessitates a conclusion that cannot be false if those beliefs are true. The findings from studies reported above revealed scores for deductive reasoning in the moderate and strong categories for junior nursing students in the USA. The majority of first year nursing students in this study entered nursing directly after their Leaving Certificate examination and it is likely that this format of education may have had an influence on their ability to reason deductively. This is likely, as the Leaving Certificate, as was described by Hyland (1999b, pp. 5-6) in the introductory chapter, *'teaches-to-the-test'*. Such an approach places emphasis on recall and recognition of facts without consideration of reason. In the first year of the undergraduate nursing degree course these nursing students were becoming familiar with different kinds of knowledge and methods of challenging their knowledge, values and beliefs. All of this would appear to have potential to develop deductive reasoning. The qualitative findings revealed that the first year nursing students were aware of reason in relation to critical thinking. For one student, critical thinking was characterised by the use of reason:

> A person who is willing to kind of explore… reason. (Y1S1Q9)

Reasoning was identified as being overtly evident in some nursing students:

> I suppose some people in nursing in my year… they wouldn't do anything without reasoning… they'd have to have a reason for everything… you do like… and they'd be very… you know like they wouldn't just do something for no reason they'd always have to have some kind of thinking behind it. (Y1S7Q4)

Reason was identified as a necessary determinant behind one's actions and considered a 'proper critical thinking skill':

> Whatever you do there should be a reason behind it like…you have to think… have proper critical thinking skills… you have to have a reason behind what you are doing. (Y1S7Q10)

Reason was also perceived in the context of decision-making and its significance in decision-making was also evident in the following student's statement:

> Every decision you make you'd really have to have a reason behind everything you'd do. (Y1S7Q4)

In another description, reason was evident in relation to suspending judgment to consider the right decision in recognition of the *'many reasons'* to arrive at a conclusion:

> With critical thinking the person wouldn't rush to a conclusion... they would kind of, maybe... take a minute or two... or maybe... if they are explaining their reasons behind making a decision... they would have many reasons. (Y1S10Q4)

The qualitative findings above reveal evidence that students recognise reasoning as a critical thinking skill and its significance in relation to decision-making in nursing. Decision-making grounded in sound reasoning was identified as a *'proper critical thinking skill'*. This is somewhat consistent with critical thinking as, *'deciding what to believe or do'* (Ennis, 1985; Facione & Facione, 2008). The first year nursing students were moderate in strength for inductive reasoning while their average score was in the *not manifested* category for deductive reasoning. This study provides evidence of first year nursing students' ability to reason and the expectation is that these nursing students will gain further strength in reasoning skills as they progress through the nursing degree course. To this point, the discussion has focused on critical thinking disposition and skills of the first year nursing students. In the following section their perceptions of what they perceive constitutes critical thinking skills is discussed and adds additional insights about their understanding of critical thinking.

10.4 First year nursing students' perceptions of critical thinking skills

While the quantitative findings revealed the critical thinking dispositions and skills of the first year cohort of undergraduate nursing students there was very little evidence as

part of students' interviews about these critical thinking skills apart from the skill of *'analysis'.* The first year nursing students acknowledged their lack of awareness of critical thinking skills and identified what they perceived as skills of critical thinking. A theme which emerged from the qualitative data was *'critical thinking skills'* with two sub-themes which centred around *'lack of awareness of the skills of critical thinking'* and *'cognitive skills.'* The first sub-theme 'lack of awareness of the skills of critical thinking' was evident in the following students' descriptions:

> I don't know honestly...I don't know... I'm just trying to think of some. (Y1Q5S4)

> I wouldn't even know if I have skills myself, but I'd believe since you told me that there might be... there might be some skills in critical thinking if I have that I would be greater inclined towards critical thinking. (Y1 Q6 S5)

> I'd say there is ... I just think if you're a critical thinker you're very aware... conscious of what you're doing so there is certain skills you'd probably have ... maybe. (Y1Q5S7)

These qualitative findings provide evidence of the lack of awareness of critical thinking skills on the part of the first year nursing students. This appears to indicate the need for greater awareness of the skill for critical thinking in the undergraduate nursing curriculum.

The second sub-theme described cognitive skills such as, *memory, reading* and *writing,* perceived by the first year nursing students as the skills needed for critical thinking. Knowledge, in order to be able to assess situations, as well as communication skills was described. Memory and recall from past experience, being creative and imaginative were considered skills for critical thinking:

> Cognitive, like... thinking, using memory...remembering ...from past experience. I guess imagination ... think around things... like... being more creative with your imagination I guess thinking ... what will it look like afterwards ... sort of thing. (Yr1Q5 S1)

Being logical and organised in thought were considered as skills for critical thinking. According to this student critical thinking required practice and was not something that was automatic:

> I think you need to be quite a logical person to be able to critically think and you need to be able to organise your thoughts in a way so they're not all over your head kind of... have an organised approach... when your critically thinking ... I think it takes practice as well to be able to critically think...I don't think you could just say to a person ...you know... just critically think all of a sudden....I think you need to get used to doing it ...kind of a thing you can't just automatically turn on a switch and be like.... critically think right there kind of thing...I need to have a clear head... I need to be calm... I need to focus on what I'm doing... I have to be organised in the way that I think. (Y1Q5 S3)

Having knowledge to be able to assess a situation was considered a skill for critical thinking:

> I just think if you're a critical thinker your're aware...conscious of what you're doing so there is certain skills you'd probably have ... maybe if they have a lot of knowledge about something ...maybe they can assess the situation and then think about something ... they probably assess the situation they're in and assess what's going on around them and then make a decision. (Y1Q5 S7)

Being able to read and write and use communication skills were considered as skills for critical thinking:

> Well reading and writing and... for critical thinking... communication skills ... just taking everything in ....the knowledge of others ... I suppose that's communications. (Y1Q5S8)

The descriptions above identify what the first year nursing students perceived as skills for critical thinking. The Health Sciences Reasoning Test (HSRT) measured the skills of analysis, inference, evaluation, as well as reasoning skills and revealed different strengths for these skills. However, the first year nursing students did not appear to be aware of these as skills for critical thinking. When asked about the skills for critical thinking, literary skills and communications came to mind. These skills are strongly emphasised in the undergraduate nursing degree with the aim of enhancing critical thinking development. While important and necessary the approach in the nursing curriculum falls short in developing the skills of critical thinking identified by Facione

and Facione (2012), thus indicating the need for more considered approaches in the nursing curriculum to enhance the skills of critical thinking. Having discussed the main findings for the critical thinking dispositions and skills of the first year nursing students it is evident they have strengths and weakness in relation to critical thinking. To conclude this discussion a summary of the main findings is presented in the following section.

10.5 Summary of the main findings for the critical thinking dispositions and skills of the first year nursing students

The findings discussed to this point addressed research questions one and three which investigated critical thinking dispositions and skills of the first year undergraduate general nursing students, respectively. The integration of the qualitative findings, which addressed research question seven, provided further insights about the first year nursing students' perceptions in relation to critical thinking. Key findings are now summarised.

The first year undergraduate nursing students were *positive for overall critical thinking disposition* and according to Facione and Facione (2010, p. 19) they had 'generalized strength in critical thinking disposition'. *They were positive for four of the disposition sub-scales in the order of, inquisitiveness, maturity of judgment, open-mindedness and analyticity.* There was very little observable difference in the scores of the latter three dispositions and the average scores were at the lower end of the positive category. Inquisitiveness had the highest score, with well over three quarters of the cohort positive for this disposition, which indicated these first year students were curious and eager for knowledge and explanations. In relation to the percentage proportions, and when the positive and highly positive percentage proportions were combined, approximately two thirds were positive for the disposition of open-mindedness (66%), maturity of judgment (64%) and analyticity (63%) (Figures, 5.3, 5.4, 5.8, & Appendix 33). The first year nursing students revealed maturity of judgment in the context of clinical situations which influenced their thinking and they noted their pattern of thinking was no longer black-and-white thinking. Open-mindedness was described as being tolerant of others and being open-minded in approaching situations in clinical practice. Analyticity was described as, thinking ahead and anticipating consequences. Findings revealed that the first year students scored in the *ambivalent category* and as such

they were considered weak for the following dispositions in the order: critical thinking self-confidence, systematicity and truth-seeking. In relation to the percentage proportions for these dispositions less than half (42%) of the first year nursing students were *ambivalent* for critical thinking self-confidence, almost half (49%) were *ambivalent* for systematicity, and well over half (57%) were *ambivalent* for truth-seeking. Critical thinking self-confidence was described as, trusting their reason and decisions in a clinical situation. Systematicity was described as an ability to organise, prioritise and plan care. Aspects of truth-seeking were described as reasoning, questioning and seeking out honesty in decision making. Truth-seeking was the weakest of all seven dispositions for the first year nursing students. The disposition of truth-seeking was also reported as the weakest disposition in nursing students in the USA (Colucciello, 1997) and in Canada (Profetto-McGrath, 2003).

For the first year nursing students, a *positive* disposition towards inquisitiveness meant they were curious and eager for knowledge and explanations. A positive disposition towards maturity of judgment meant a move form black and white thinking to thinking more broadly in practice. Being positive in disposition towards analyticity meant they were disposed to thinking ahead and anticipating the consequences of their actions. Being open-minded they were positively disposed to the opinions and views of others, and seeing different perspectives. A positive attitude towards these dispositions is considered necessary if nursing students are to develop critical thinking. The first year nursing students were *ambivalent* in disposition towards critical thinking self-confidence and were not yet confident in the product of their reasons and thinking to solve problems and reach their goals, yet, at the same time they did not ignore the value of their reason and reflective thinking. Ambivalence towards systematicity meant they were inconsistent in their approach to situations. Ambivalence towards truth-seeking meant they were inconsistent in the use of reason, in questioning their beliefs and were influenced to an extent by their biases and preconceptions in the search for knowledge and truth. The development of these dispositions is necessary to ensure and overall positive disposition towards critical thinking. It is to be expected that the curriculum experiences would enhance these dispositions so that the first years would become more confident, develop a more systematic approach and develop an attitude of trust in their own reasoning and knowledge for practice. Approaches such as confidence in questioning their knowledge and practice as well as the development of positive

attitudes in clinical practice through support from clinical support staff involved in nurse education is likely to enhance more positive critical thinking dispositions.

The first year nursing students were *moderate in strength for overall skill in critical thinking.* For the critical thinking sub-skills, they demonstrated *moderate strength* in analysis and evaluation. The critical thinking skill of inference was *not manifested* although they were bordering on moderate strength. In relation to reasoning skills, inductive reasoning was *moderate in strength* while deductive reasoning was *not manifested* although close to moderate strength. In terms of the qualitative findings, analysis was the only critical thinking skill which was evident in the students' descriptions of critical thinking and in which the ability to analyse was described in the interviews. The first year nursing students described what they perceived as the skills of critical thinking which included: *knowledge, communication skills, memory, recall, creativity and imagination.* These skills directly reflect curriculum components which are strongly emphasised in the undergraduate nursing degree course.

10.6 Conclusion

This chapter discussed the critical thinking dispositions and skills of the first year undergraduate general nursing students. These students were positive in overall critical thinking disposition and for the dispositions open-mindedness, analyticity, systematicity, inquisitiveness and maturity of judgment. A positive overall disposition and for the five sub-scales is promising for these first year nursing students at an early stage in their degree course. They were weak for the dispositions of truth-seeking, systematicity and critical thinking self-confidence. The attributes of these dispositions were evidently lacking and reflect the need to address these in the nursing curriculum. The first year nursing students were moderate in overall strength for critical thinking skill as well as for analysis and evaluation. Moderate strength in these skills highlights their ability in these aspects of critical thinking which are necessary to function effectively both academically and in clinical practice. A reasonable expectation is that progression through second and third year of the undergraduate nursing degree programme would enhance their strength in both the dispositions and skills for critical thinking. This new knowledge of the critical thinking dispositions and skills has potential to guide curriculum development and assist nurse educators in enhancing critical

thinking for undergraduate nursing students. In the next chapter, the critical thinking dispositions and skills of the third year undergraduate nursing students are discussed.

Chapter 11 Discussion of Findings for the Critical Thinking Dispositions and Skills of the Third Year Nursing Students

11.1 Introduction

This chapter discusses the main findings for the critical thinking dispositions and skills of the third year undergraduate general nursing students, the results of which were presented in Chapters 7 and 8, respectively. Two quantitative research questions, questions two and four, are addressed in two main sections in this chapter. The less-dominant qualitative findings are integrated with the dominant quantitative findings to address question eight, a qualitative question which asked: *What are third year undergraduate general nursing student's perceptions of critical thinking in the nursing curriculum?* Findings are interpreted and discussed in the context of findings reported in published literature on critical thinking dispositions and skills. The Delphi constructs also provide theoretical meaning for the critical thinking dispositions and skills (Facione et al., 2014; Facione, 1990). The Delphi constructs also provided a framework which facilitated the integration of the quantitative and qualitative findings. Section one discusses the findings for the critical thinking dispositions and in section two the findings for the critical thinking skills are discussed. A summary of the discussion is included in the final section of this chapter.

11.2 Critical thinking dispositions of the third year nursing students

The main findings for the critical thinking dispositions of the third year cohort of undergraduate general nursing students are discussed in this section to address the second research question which asked: *What are the critical thinking dispositions of the third year undergraduate nursing students as measured by the California Critical Thinking Disposition Inventory (CCTDI)? Overall critical thinking disposition* as well as the dispositions of: *truth-seeking, open-minded, analyticity, systematicity, critical thinking self-confidence, inquisitiveness, and maturity of judgment* are discussed.

11.2.1 Overall critical thinking disposition for the third year nursing students

Overall critical thinking disposition was measured for the third year cohort of undergraduate general nursing students. This score was below the cut-off score of 280 and indicated *an ambivalent attitude or disposition towards overall critical thinking* and

as such they were considered weak. According to Facione and Facione (2010, p. 20) a score below 280 is indicative of ambivalent or inconsistent endorsement of the attribute being measured. A similar ambivalent overall disposition score was reported for third year Chinese (Ip et al., 2000) and Japanese nursing students (Kawashima & Petrini, 2004). Chinese nursing students scored much lower than the nursing students in this study and as such were much weaker in overall disposition towards critical thinking (Table 2.4). While the researchers considered low scores to be attributed to lack of confidence in solving problems, an authoritarian education system, pressure of conformity they also considered the lower scores in third year likely to be attributed to confounding variables such as personal, social and family circumstances In contrast, third year nursing students in Korea (Shin et al., 2006b) and nursing students in a Canadian study (Profetto-McGrath, 2003) scored in the positive category for overall disposition towards critical thinking. A positive disposition score was also reported in senior nursing student in the USA (Colucciello, 1997) (Table 2.4).

Findings for the percentage proportion of the third year cohort of nursing students revealed that half of the students (50%, N=108) who had completed three years of the undergraduate nursing degree course were overall weak in disposition towards critical thinking (Figure 7.9). This finding, for half of the third year cohort, is somewhat disappointing in light of the expected outcome that the nursing degree course would lead to critical thinking. The finding of an overall weak score for the third year nursing student in this study highlights the need for further emphasis in the nursing curriculum to enhance a positive disposition towards critical thinking. While the total score on the CCTDI provides an indication of the overall disposition towards critical thinking the seven sub-scales are more informative in relation to specific dispositions. According to Facione and Facione (2010, p. 20), 'each of the seven dispositional constructs is important individually, and these seven constructs are far more informative than the overall score'. Each of the seven dispositional sub-scales are subsequently discussed.

11.2.2 Truth-seeking in the third year nursing students

An *ambivalent truth-seeking disposition* was a main finding for the third year nursing students and as such they were considered weak and inconsistent in relation to this critical thinking disposition. A comparison with studies in the literature also revealed an ambivalent disposition towards truth-seeking in third year nursing students in China (Ip

et al., 2000). An ambivalent attitude was also reported in senior nursing students in the USA (Colucciello, 1997) and in the Middle East (Suliman, 2006). In contrast, are studies which report a positive disposition towards truth-seeking in third year nursing students in Korea (Shin et al., 2006b). Fourth year graduating nursing students in the Middle East also reported a positive disposition for truth-seeking (Suliman & Halabi, 2007) (Table 2.4). According to Facione and Facione (2014, p. 18) truth-seeking is the habit of always desiring the best possible understanding of a situation, it involves the use of reason and evidence. It also involves questioning as well as attention to detail. Truth seekers strive not to let bias or preconception colour their search for knowledge and truth. The opposite of truth seeking is bias which ignores good reasons and relevant evidence in order not to have to face difficult ideas. In consideration of the findings in this study and the international studies reported above, nursing curricula in different cultural backgrounds may influence the disposition towards truth-seeking. While the cultural background of a nursing curriculum may be considered an influence on truth-seeking it is likely that other factors such as one's biases and pre-conceptions as well as one's lack of ability to question may be influential factors. It is also likely that maturity may be a factor and that over time a combination of factors shape the truth-seeking disposition rather than the curriculum experiences on their own.

Close to two thirds of the third year nursing students (62%, N=134) were ambivalent in attitude for the truth-seeking disposition and this was the weakest of the seven dispositions (Figure 7.2). Based on the Delphi construct the third year nursing students were somewhat weak in desiring the best understanding of a situation, use of reason, use of evidence and questioning. Absence of these attributes and the inability to cast aside biases and preconceptions is likely to prevent a positive truth-seeking disposition. The implementation of high quality nursing care is contingent, in part, upon good understanding of situations, application of knowledge, use of evidence and questioning in context of the attributes of truth-seeking. These are the attributes that nursing students should have gained strength in by the third year of the nursing degree course. It may be suggested, that for the students in this study, the ambivalent attitude, for almost two thirds of the cohort, towards truth-seeking may be influenced by their limited clinical experience and as such the lack of opportunity to develop the attributes of truth-seeking. It may well be that to develop the attributes and gain strength in truth-seeking by third year requires responsibility at an earlier stage in the course.

There was evidence of truth-seeking as a disposition in the descriptions of the third year nursing students. Truth-seeking, as was described above , involves desiring the best possible understanding of a situation, using reason and questioning. The use of reason to ensure patient safety in relation to medication administration was deemed critical thinking and of greater importance and necessity. This was described by a third year nursing student:

> Critical thinking has more emphasis on it...you need to do this now ... there has to be a reason why I'm thinking this way or it's best... like... say giving medication to a patient... you have to make sure you think about it... giving them at the right time making sure ... it (critical thinking) has a set out goal more than normal thinking... much different... much more important ...much more necessary depending on what you're doing and... I would put more of an emphasis on critical thinking, saying it is more important...more necessary than normal thinking. (Y3Q2S3)

Truth-seeking was evident in the use of questioning, reason and reflection on experience to determine a different course of action in a subsequent occasion and this was evident in the following description of a third year nursing student:

> Critical thinking is looking back and saying...Why am I thinking that way?... that makes you question why you did something... the reasons you're doing... thinking that way and you can change your behaviour if you're going to do it next time...will you do it differently and it's reflection. (Y3Q2S9)

The third year nursing students revealed an ambivalent disposition towards truth-seeking and as such they were considered weak. Weakness was also reported in international studies among Chinese, Middle Eastern and North American nursing students while a positive disposition was reported in Japanese third year nursing students. The likely reasons given for the weakness in the Chinese nursing students was an authoritarian and conformist educational system, while Colucciello (1997) recommends that nursing students continually re-evaluate new information and evidence and be attuned to counter evidence. The qualitative findings provided evidence of some of the attributes of truth-seeking which indicates the relevance of this disposition for critical thinking in nursing practice. There is potential in the undergraduate nursing curriculum to develop a positive attitude towards truth-seeking as a disposition towards critical thinking. To do this there is need to ensure that the

attributes of truth-seeking such as, reasoning, questioning, continually evaluating and re-evaluating new information to gain greater understanding is encouraged in the theoretical and clinical components of the nursing curriculum. This will also assist them to challenge their biases and preconceptions as barriers to the development of the truth-seeking disposition.

11.2.3 Open-mindedness in the third year nursing students

In everyday nursing practice, nursing students care for people from different backgrounds, with different health needs and with different values and beliefs about their health. This requires a non-judgmental, open-minded and a positive attitude. The third year cohort of nursing students revealed *a positive disposition for open-mindedness*. A comparison with studies in the literature also revealed a positive disposition towards open-mindedness for third year nursing students in Korea (Shin et al., 2006b). A positive disposition was reported in senior students in the USA (Colucciello, 1997) and in graduating fourth year nursing students in the Middle East (Suliman & Halabi, 2007) (Table 2.4). In contrast, third year nursing students in China revealed an ambivalent disposition towards open-mindedness (Ip et al., 2000). According to Facione and Facione (2014, p. 18) open-mindedness is tolerant to the views and opinions of others and involves seeing things from others' perspectives. Almost two thirds of the third year cohort (61%, N=132) were positive towards an open-minded disposition (Figure 7.3). Based on the Delphi construct the third year nursing students in this study were tolerant of the views of others and open to different perspectives. This was also evident in the qualitative findings in the descriptions of the third year nursing students. The attributes of open-mindedness were described as open to other people and open to change. Being approachable and conveying a sense of openness was essential to nurse patient interaction. The 'ideal critical thinker was open'. This is evident in the following description of a third year nursing student:

> An ideal critical thinker would be someone who is… open to other peoples' opinions and change and other peoples' critical thinking plans and someone who's approachable…. that the patient knows they can talk to and that can interact with the nurse and involve them in their critical thinking. (Y3 Q9S7)

Open-mindedness was also described by another third year nursing student as:

> Open to other people...willing to learn, someone that's... like a broad selection... I think it's very important to be open. (Y3Q9S3)

For another third year nursing student being open-minded was synonymous with critical thinking and without open-mindedness there was no point to critical thinking:

> They are somebody who's able to adapt to new situations...they are somebody who is willing to learn new things and willing to change their behaviour because if you're not open-minded or if you not willing to change and adapt then what is the point of critical thinking because if you're not able to learn from it or change the way you're thinking then there's no point. (Y3Q9S9)

The finding of a positive attitude towards open-mindedness and evidence of this in the qualitative findings indicates that the third year nursing students possessed the essential attributes of open-mindedness. Such attributes are essential to deal with the complex situations encountered in a demanding and complex health care environment. Another critical thinking disposition is analyticity and this is discussed next.

11.2.4 Analyticity in the third year nursing students

Thinking ahead and anticipating consequences is essential in everyday life and significantly so in one's professional life as it has the potential to influence *positive* outcomes. The third year nursing students revealed a positive disposition towards analyticity. A similar positive disposition is reported in the literature for third year nursing students in Korea (Shin et al., 2006b). Positive dispositions toward analyticity are also reported in senior nursing students in the USA (Colucciello, 1997) and in fourth year graduating nursing students in the Middle East (Suliman & Halabi, 2007) (Table 2.4). In contrast, Ip et al. (2000) reported ambivalence towards analyticity in third year nursing students in China and they scored weaker than the nursing students in this study. According to Facione and Facione (2014, p. 18) analyticity is the tendency to be alert to what happens next and anticipation of both the good and the bad potential consequences or outcomes of situations, choices, proposals, and plans. When the percentage proportions of third year nursing students who were in the positive and high positive categories were combined well over half (60%, N =129) were positive for analyticity (Figure 7.4). Based on the Delphi construct the third year nursing

students with a positive disposition were alert and anticipated both the good and the bad potential consequences of situations.

Although the third year nursing students were positive in the analyticity disposition evidence of analyticity was not strongly prevalent in the student's discussions about critical thinking. A third year nursing student revealed evidence of analyticity in the following description:

> When you think of critical thinking... it's trying to get... not just the bad points... if you're reading something and your first impression is... oh my God that's terrible... trying critically to look at good points also as well as bad points...not just take something at face value but look deeper... I think it's looking deeper at a subject and thinking deeper on a subject rather than not just thinking of the first thing that comes to mind...reading deeper. (Y3Q1S2)

For this student analyticity as a skill for critical thinking was evident in judging *'the good and the bad points'*, thinking more deeply and suspending judgment to reach a conclusion after deeper thought and reflection.

Analyticity was found to be in the positive category for the third year nursing students in this study and they demonstrated strength in this skill as a cohort and thus had the capacity to anticipate the good and the bad consequences of situations. It appears that the environment of nursing contributes to the anticipation of situations and the need to be alert and use foresight is a feature. Analyticity was not as strongly prevalent in the interviews with the third year nursing students. However, the cohort demonstrated a positive attitude when this skill was measured and this seems to indicate that they are not consciously aware that thinking ahead and anticipation of consequences are attributes of critical thinking. It may be suggested, that creating a greater awareness of the attributes of analyticity in the nursing curriculum would further improve strength in this disposition.

11.2.5 Systematicity in the third year nursing students

Nursing as a profession tends towards being systematic in approach to the delivery of care and the strong practice component of nursing, which is procedurally based, has

an influence on this. Being systematic in approach is also reflected in the academic and clinical practice components of the undergraduate nursing curriculum with emphasis on the use of the nursing process. The third year nursing students revealed an average score in the *ambivalent category* and were weak for this critical thinking disposition. A comparison with studies reported in the literature revealed a similar ambivalent score for systematicity in third year nursing students in China (Ip et al., 2000) and in Korea (Shin et al., 2006b) (Table 2.4). In contrast, a positive disposition was reported in senior nursing students in the USA (Colucciello, 1997) and in graduating fourth year nursing students in the Middle East (Suliman & Halabi, 2007). According to Facione and Facione (2014, p. 18) systematicity is the tendency or habit of striving to approach problems in a disciplined, orderly and systematic way. While a plan or strategy may or may not be known or used there is a mental desire to approach issues in an organised way. Half of the third year cohort (50%, N=107) were ambivalent in attitude towards systematicity (Figure 7.5). Based on the Delphi construct they were not disciplined, orderly or systematic in their approach to problems, on the other hand, they were not totally disorganised.

Systematicity was not strongly prevalent in the descriptions of the third year nursing students. However, one student described the need for a plan in relation to examination preparation:

> Critical thinking is something like planning ahead... knowing that... I have to go in and do my exam and critically think about what I'm going to do... how I'm going to lay out the exam and thinking all about the layout and you have to plan out your steps and then you have to see the end result before you can carry out the tasks...you're really thinking when you're critically thinking. (Y3Q2S7)

This description of a third year nursing student points to a somewhat restricted perspective of systematicity in the context of examination preparation. An ambivalent disposition towards systematicity was also evident in the third year nursing students and this may be considered somewhat unexpected when they are expected to perform in an organised and systematic way. Given the attributes of systematicity and the emphasis on being organised and the need to plan for the implementation of nursing care it is somewhat a concern that the third year nursing students scored weak for this disposition. Weakness in Korean nursing students reported above was attributed to

cultural factors such as Korean students' intolerance of conflicting viewpoints, as well as difficulty in deciding between competing viewpoints, (Shin et al., 2006b). For the nursing students in this study, the nursing curriculum emphasises a systematic approach to care through the nursing process and the use of care plans. The aim of such approaches is to deliver nursing care in an effective, systematic, organised, holistic way. It appears, that the third year nursing students in this study, may not have been fully engaged with care planning, and therefore were not fully aware of the need for such an approach and this may have influenced an ambivalent disposition towards systematicity. Nursing students up to third year participate in a supernumerary capacity under the supervision of a registered nurse as a preceptor or co-preceptor. The supernumerary status may be placing the nursing students in a position where they are participating in aspects of patient care without the full perspective of a registered nurse and this form of practice may be influencing the development of the systematicity disposition. As only one student described planning, and this was in relation to examination preparation, it indicates a rather restricted view of being systematic in disposition to think critically.

11.2.6 Critical thinking self-confidence in the third year nursing students

Confidence is considered an important attribute in the nursing profession. It is an attribute this is valued and it is expected that the experiences of the nursing curriculum will build students' self-confidence. Self-confidence is also an important component of critical thinking and was measured in this study. The main finding was that the third year nursing students had an average score in the *ambivalent* category and as such they were weak and inconsistent in this disposition towards critical thinking. A comparison with studies in the literature revealed a similar ambivalent disposition in third year nursing students in China (Ip et al., 2000) and in Korea (Shin et al., 2006b). An ambivalent disposition was also reported in fourth year graduating nursing students in the Middle East (Suliman & Halabi, 2007) (Table 2.4). In contrast, senior nursing students in the USA reported a positive disposition (Colucciello, 1997). According to Facione and Facione (2014, p. 18) critical thinking self-confidence is the tendency to trust the use of reason and reflective thinking to solve problems and reach goals. The opposite is the tendency to be mistrustful of reason, to consistently devalue or be hostile to the use of careful reason and reflection as a means to solving problems or discovering what to do or what to believe.

Almost half (45%, N=96) of the third year cohort was ambivalent or weak in the disposition of critical thinking self-confidence (Figure 7.6). They were somewhat inconsistent in their reasoning confidence and thinking about problems. On the other hand, they did not totally ignore reason and reflective thinking in deciding what to believe or do. Confidence was not strongly prevalent in the qualitative findings, however, confidence with knowledge was perceived by a third year nursing student as synonymous with an ideal critical thinker:

> An ideal critical thinker would be someone who is confident...someone who is knowledgeable and who knows exactly what they are doing and is confident. (Y3Q9S7)

Critical thinking self-confidence was weak for the third year nursing students in this study and the similar weakness in self-confidence among Chinese nursing students reported above was considered to be attributed to students lack of confidence in solving problems independently by accessing, interpreting and applying information through self-directed investigation (Ip et al., 2000). The third year nursing students in this study were striving to gain clinical competence as they progressed through their course and they were still supernumerary in status. Such a position may be considered to impact the development of greater confidence. In a supernumerary capacity these students worked closely with their preceptors and co-preceptors and while they had some responsibilities they may have been somewhat cautious about being overly confident in their own judgments. Their supernumerary status does not change until fourth year, during their internship, and this may be considered to have a greater impact in developing their self-confidence. It is reasonable to expect that a positive disposition towards critical thinking self-confidence would develop during their internship in the fourth year.

11.2.7 Inquisitiveness in the third year nursing students

Nursing students are encouraged to be inquisitive and this attribute is expected to be enhanced from entry to the profession and developed in both the academic and clinical components of the nursing degree course. Inquisitiveness as a disposition towards critical thinking was found to be *positive* in strength for the third year nursing students. A similar positive score was reported in the literature for third year nursing students in Korea (Shin et al., 2006b) (Table 2.4). Studies with senior nursing students in the USA

(Colucciello, 1997) and in graduating fourth year nursing student in the Middle East (Suliman & Halabi, 2007) also reported a positive disposition towards inquisitiveness. In contrast, Ip et al. (2000) reported scores in the ambivalent category indicating weakness in disposition towards inquisitiveness in third year nursing students in China. According to Facione and Facione (2014, p. 18) inquisitiveness is the tendency to want to know things, even if they are not immediately or obviously useful at the moment. It is being curious and eager to acquire new knowledge and to learn the explanations for things even when the applications of that new learning are not immediately apparent. The opposite of inquisitiveness is indifference. When the percentage proportions of the third years in the positive and high positive category are combined, three quarters (75%, N=163) of the third year cohort of nursing students in this study were positive towards inquisitiveness (Figure 7.7). Based on the Delphi construct they tended towards being curious and eager to acquire knowledge even when the application of the new knowledge was not immediately apparent.

Evidence of inquisitiveness as a disposition to think critically was not strongly prevalent in the qualitative findings. However, a third year nursing student described inquisitiveness as an attribute of a critical thinker as follows:

> They'd be kind of ... inquisitive toward ... they'd be really...enthusiastic about looking at it...how it works and breaking it down... curious about the topic and asking about the thing... they'd be wanting to understand. (Y3Q9S4)

A positive attitude towards inquisitiveness is necessary in ensuring nursing students gain knowledge and the positive attitude of the third years in this study indicated this desire. As nursing students they were engaging in learning and exposed to new knowledge. Striving to achieve both academically and in clinical practice requires exploration and dealing with new knowledge and this is likely to have influenced a positive disposition. Inquisitiveness was not prevalent in the qualitative findings and it is likely that nursing students are somewhat less likely to view knowledge as a necessary component for critical thinking.

11.2.8 Maturity of judgment in the third year nursing students

An ability to make clinical judgments is essential to clinical nursing practice and the level of clinical judgments varies depending on the clinical situation. An aim of the undergraduate nursing degree course is to prepare nursing students with a strong ability to make clinical judgments. The third year nursing students in this study revealed a positive attitude towards maturity of judgment. A similar positive finding is reported in the literature in senior nursing students in the USA (Colucciello, 1997) (Table 2.4). In contrast, some studies report ambivalence and weakness for maturity of judgment in third year nursing students in China (Ip et al., 2000) and in Korea (Shin et al., 2006b). A similar ambivalent disposition was reported in fourth year graduating nursing students in the Middle East (Suliman & Halabi, 2007) (Table 2.4).

According to Facione and Facione (2014, p. 18), maturity of judgment is the tendency to see problems as complex, rather than black and white. There is a tendency to make judgments in a timely way, not premature and not without delay. There is a tendency towards being firm in one's judgments based on reason and capability of changing one's minds when appropriate to do so. There is a tendency to be prudent in making judgments, aware that multiple solutions may be acceptable and appreciative of the need to accept closure in certain circumstances even in the absence of complete knowledge. Over half of the third year nursing students (54%, N=117) were positive in attitude towards maturity of judgment (Figure 7.8). Based on the Delphi construct they were disposed to seeing problems as complex as opposed to black and white and they were capable of making firm judgments based on reason in a timely way.

Maturity of judgement was not strongly prevalent in the qualitative findings. However, the need for consideration of different aspects in making a judgment about patient care was described by a third year nursing student:

> There could be other things to take into account... more the patient and ... I think maybe you should look at different aspects before coming up with an outcome...you know. (Y3 Q9S1)

For another third year nursing student, being able to think quickly within a time limit and awareness of the temporality of thinking also reflected and attribute of maturity of judgment:

> You'd have to be quick to think as well... you'd have to be able to reach your goal and you'd have to do it within a time limit. (Y3Q9S3)

The third year nursing students in this study were positive for maturity of judgment. They appeared to be as strong as nursing students at the same level in the USA and much stronger than nursing students in eastern cultures as reported in the international studies above. Maturity of judgment with its attributes of more diverse thinking to reach a firm judgment in consideration of the likelihood of multiple solutions appeared evident in the third year nursing students in this study. It may be suggested, that with three years of exposure to the academic and clinical practice components of the course may be considered along with their maturity to have influenced the maturity of judgment disposition.

The discussion to this point addressed overall disposition and seven disposition sub-scales for the third year undergraduate nursing students. The integration of the qualitative findings provided additional insights and expanded the quantitative data by describing attributes of the dispositions as perceived by the nursing students. The qualitative findings provide further evidence of the dispositions in the practice of nursing. In the following section, the critical thinking skills of the third year undergraduate nursing students are discussed.

11.3 Critical thinking skills of the third year nursing students

In this section, the main findings for the critical thinking skills of the third year undergraduate nursing students are discussed. Findings are discussed to address research question four which asked: *what critical thinking skills do undergraduate general nursing students have in year three of the nursing degree course as measured by the Health Sciences Reasoning Test?* Findings in relation to overall skill in critical thinking as well as the sub-skills of analysis, inference, evaluation, inductive reasoning and deductive reasoning are discussed. Qualitative findings are integrated to

compliment the quantitative findings and provide further insights about the critical thinking skills as perceived by the third year nursing students. Qualitative findings which reveal what the third year nursing students perceived as the skills of critical thinking are also discussed.

11.3.1 Overall critical thinking skill of the third year nursing students

As nursing students become more knowledgeable and competent in clinical practice it is expected they will think more critically. It is also expected that as they progress to a more senior level they will think more critically. *Overall or total critical thinking skill* for the third year nursing students was *moderate in strength* (Tables 3.2 & 8.12). According to Facione and Facione (2012, p. 12), 'the total score describes overall strength in using reasoning to form reflective judgments about what to believe or do'. A similar moderate disposition towards overall critical thinking skill was reported for third year baccalaureate nursing students in Canada (Profetto-McGrath, 2003) and in senior baccalaureate nursing students in the USA (Colucciello, 1997; Mc Carthy et al., 1999). In other studies in the USA, May et al. (1999) reported moderate strength in senior nursing students one month prior to graduation while Beckie et al. (2001) also reported moderate strength for three groups of nursing students at the beginning of their senior year. Two of the groups experienced a revised curriculum which emphasised critical thinking. It appears that undergraduate nursing students in the later stages of their course remained in the moderate category in North American studies. All of these studies used the California Critical Thinking Skills Test (CCTST) (Facione & Facione, 1994a) while this study used the Health Sciences Reasoning Test (Facione et al., 2014). Both tests measured the same attributes and revealed scores which were moderate in strength indicating consistency of the tests when the findings are compared.

In this study, a comparison of the overall average score, rounded to 19.00, placed the third year nursing students in the 48th percentile, the median percentile, when compared to a North American aggregated sample of undergraduate nursing students measured on the HSRT (Appendix 8). Compared to a North American aggregated sample of health science students the third year nursing students in this study were in the 41st percentile, just below the 53rd or median percentile. Based on these comparisons, the third year nursing students in this study compared well with North

American undergraduate nursing students. They had moderate ability in overall critical thinking skill and as such they had the potential for skills related challenges when engaging in reflective problem-solving and reflective decision-making associated with learning or employee development (California Academic Press, 2012). A discussion of the critical thinking sub-scales provides further insight about the critical thinking skills of the third year nursing students.

11.3.2 Analysis as a skill for critical thinking in the third year nursing students

In the undergraduate nursing curriculum the ability to analyse is a highly valued skill. Evidence of this is apparent in the skills of critical thinking identified by the lecturers in their descriptions of the skills of critical thinking and discussed later in Chapter 12. Analysis was also evident in the student's descriptions and discussed in this section. The emphasis on analysis in the undergraduate nursing curriculum is likely to have influenced the strength of this skill. *Analysis* as a critical thinking sub-skill for the third year nursing students was found to be *moderate in strength* (Tables 3.3 & 8.12). A comparison with studies reported in the literature revealed moderate strength for analysis in senior nursing students in the USA (Colucciello, 1997). Beckie et al. (2001), also in the US, reported moderate strength in analysis for three groups of baccalaureate nursing students at the beginning of their senior year prior to exit from the course (Table 2.5). According to Facione and Facione (2014, p. 21) analytical reasoning skills enable people to identify assumptions, reasons and claims, and to examine how they interact in the formation of arguments. People with strong analytical skills attend to patterns and details. Slightly over half (51%, N=85) of the third years were moderate in strength for analysis and close to one third (31%, N=51) scored in the strong category (Figure 8.3). This indicates a that analysis as a skill for critical thinking is acquired although as noted above moderate in strength for these third year nursing students

Evidence of analysis was described as being able to pick things apart and necessary for learning in clinical practice:

> I think it's someone who tends to kind of look at things and examine them... it sounds like your picking things apart but in actual fact it's

> trying to learn from things and to develop and to improve all the time on your learning and your clinical practice and all of that. (Y3Q9S8)

Another third year nursing student acknowledged analysis of thought in relation to critical thinking:

> I think critical thinking is kind of like... looking at why you are thinking a way or why you are doing something if you're thinking about something...why you're thinking that way about it... analysing your thoughts. (Y3Q1S9)

The third year nursing students were moderate in strength for the skill of *analysis* and this was also referred to in the qualitative findings. The ability to analyse issues, attention to detail and recognition of patterns is a necessary skill, not only in the academic setting, but also when dealing with clinical situations. The attributes of analysis assist nurses to identify particular elements of clinical situations and interpret these in determining patient outcomes. Analysis is a skill that is emphasised in the nursing curriculum and is brought to the attention of nursing students as they prepare academic work. The term *'analyse'* is frequently used in the statement of examination questions and assignments. The term is also used in relation to preparation for examinations and assignments from entry right through the nursing degree course. It's prevalence of use is determined by the fact that it is a skill that is emphasised and an expected outcome in the Requirements and Standards for Nurse Registration Education Programmes (An Bord Altranais, 2000, p. 13). Moving from the skill of analysis is the ability to use the skill of inference and this is discussed next.

11.3.3 Inference as a skill for critical thinking in the third year nursing students

By third year, nursing students are expected to have achieved a level of competence appropriate to their level and scope of practice. The ability to draw inferences from clinical situations they experience is also expected to have developed. *Inference* as a skill for critical thinking was measured in the third year nursing students and the main finding was that this skill was *not manifested* and as such they were weak in this skill (Tables 3.3 & 8.12). Studies reported in the literature reveal moderate strength in inference for baccalaureate nursing students at the same level in the USA (Colucciello, 1997) while Beckie et al. (2001), also in the USA, reported that three cohorts of

baccalaureate nursing students were moderate and strong for the skill of inference (Table 2.5). According to Facione and Facione (2014, p. 21) inference skills enables us to draw conclusions from reasons and evidence and it is used when we offer thoughtful suggestions and hypotheses. The third year nursing students in this study were weak in the skill of inference and as such they were not showing strength in reaching conclusions based on reason and evidence.

The percentage proportion for the third year cohort of nursing student revealed that just over half (55%, N=92) were moderate in strength for inference. Inference as a skill was *not manifest* for over a third (38% N=63) of the cohort, and a small percentage (7%, N=11) showed strength in this critical thinking skill (Figure 8.4). The qualitative findings revealed evidence of inference although it was not strongly prevalent in the interviews with the third year nursing students. The ability to draw inference from clinical situations was described by a third year nursing student in relation to communication with a patient:

> Being able to read into what the patient is saying and not just take for face value... noticing certain things about the patient... say... the way they were... the way they are acting... the non-verbal cues as well as taking what they are saying. (Y3S3Q5)

A second student described the use of inference in relation to giving meaning to knowledge applied to the assessment of vital signs:

> If someone's blood pressure is dropping and their pulse increasing... then, you know they are bleeding so that's critical thinking... it influences your... how you are going to react... your decision. (Y3S6Q3)

While the students were able to describe clinical situations which required inference as a critical thinking skill, it was also evident in the context of an academic activity such as reading. In this case, inference was seen as a natural process that happens without knowledge or awareness one is engaging in inference:

> I probably wouldn't have been aware that I was doing that (Inference)... I would have done it probably without even thinking... I

> wouldn't have been able to put a word on it...I suppose you do it naturally reading an article... you wouldn't kind of think. (Y3S2Q18)

The skills of inference appeared to be stronger, in the category of moderate strength, for nursing students at the same level in the North American studies reported above. The weak score in inference for the nursing students in this study may be attributed to the supernumerary status where the students have not assumed full responsibility for patient care, and as such they are not using reason and evidence to determine outcomes. While the average score for the cohort was overall weak, it is noted that their score was close to *moderate strength* and it appears they were developing this skill. It is likely that with greater responsibility in the fourth year the skill of inference would gain further strength.

11.3.4 Evaluation as a skill for critical thinking in the third year nursing students

Evaluation, similar to the skill of analysis, is another highly valued skill considered necessary for undergraduate nursing students. *Evaluation* was measured as a skill for critical thinking in the third year nursing students and the main finding was an average score which indicated *moderate strength* (Tables 3.3 & 8.12). A comparison with published studies for baccalaureate nursing students in the USA at the same level revealed scores in the strong category (Beckie et al., 2001; Colucciello, 1997). According to Facione et al. (2014, p. 21) evaluation involves the ability to assess the credibility of sources of information and their claims. Evaluation also permits one to judge the quality of analysis and inferences and strong explanations support high quality evaluation by making evidence available for the claims or conclusions reached. An analysis of the percentage proportion for the third year cohort revealed that over half were in the strong category (54%, N= 89) with (43%, N=71) revealing moderate strength (Figure 8.5). Evaluation is a main component of the nursing process used in clinical practice to deliver of patient care. The nursing process is taught at an early stage in the first year of the undergraduate nursing degree course. It is also a dominant feature of clinical practice and it is likely to have had some influence on the moderate strength in this skill for the third year nursing students

Evaluation as a skill for critical thinking was more familiar to the nursing students and two students included evaluation in their interviews. One student identified evaluation in relation to linking things together in the context of assessment:

> I think if you're inclined to think critically then it means you link things together and you are able to evaluate things... I think within placement if you weren't inclined to critically think it's kind of dangerous, patients would be at risk of you not spotting something. (Y3Q4S6)

A second student identified looking at things in detail in assessing and determining what to do differently the next time the situation arose:

> I think, just looking at something in great detail and how it went ...assessing it... thinking next time, what you do differently... looking at the results of what happened. (Y3Q2S8)

Evaluation as a skill for critical thinking was evident in the third year nursing students and they had *moderate strength* in this skill. It was also evident in the qualitative findings. It is expected that nursing students would be competent in the skill of evaluation and given that it is a main component of the nursing process, used daily in the delivery of nursing care, the nursing students were familiar with this skill. While they scored *moderate in strength* they were moving very close to the strong category and it is very likely that this would be achieved during their internship in the fourth year. However, a study to ascertain this is required.

11.3.5 Inductive reasoning in the third year nursing students

The *ability to reason inductively* is an important skill for critical thinking and the third year nursing students revealed an average score of *moderate strength* for this skill (Tables 3.3 & 8.12). Studies reported in the literature also revealed moderate strength for baccalaureate nursing student at the same level in the USA (Beckie et al., 2001; Colucciello, 1997). According to Facione et al. (2014, p. 21) we use inductive reasoning skills when we draw inference about what we think must probably be true in light of the possibility that our conclusions might be false. Findings for the percentage proportion of the third year cohort revealed that over half (55% N=91) were moderate in strength with less than half (43% N=71) in the strong category for inductive reasoning (Figure

8.6). It appears that the third year nursing students in this study had the ability to reason inductively and with a score close to the strong category they were also closely similar to nursing students in the studies reported above. They had an ability to draw inferences about issues and situations while recognising that better evidence may be available to challenge their beliefs. Inductive reasoning is a cognitive process and while the third years were moderate in strength, it was not a specific skill that was described with conscious awareness in the qualitative interviews. However, reasoning as a skill, in general, was described in relation to critical thinking. For this reason the students' descriptions are discussed after discussion of the findings for deductive reasoning.

11.3.6 Deductive reasoning in the third year nursing students

Deductive reasoning is the process of moving from one or more general statements regarding what is known to a specific application of the general statement (Sternberg & Sternberg, 2012). The main finding for the third year nursing students was an average score in the category of *moderate strength for deductive reasoning* (Tables 3.3 & 8.12). A comparison with studies in the literature revealed scores in the strong category for baccalaureate nursing students at the same level in the USA (Colucciello, 1997) while Beckie et al. (2001) reported scores in the moderate and strong category for three groups at the end of their third year (Table 2.5). According to Facione and Facione (2012, p. 21), deductive reasoning is precise and the assumed truth of a set of beliefs necessitates a conclusion that cannot be false if those beliefs are true.

Findings for the percentage proportion of the third year cohort revealed that less than half (48%, N=80) scored in the *moderate category* and well over two thirds (40%, N=66) were weak and *did not manifest strength* in deductive reasoning. A small percentage (12%, N=20) were *strong* for the skill of deductive reasoning (Figure 8.7). The third year nursing students in this study, while somewhat similar in strength to students in the studies reported above, require further development of this skill to reach the strong category as they were just in the moderate category in strength. This finding indicates they had ability to reach conclusions grounded in beliefs that were confirmable in available evidence as opposed to more loosely held beliefs. Strength in this critical thinking skill also meant their practice was grounded in more sound evidence.

As the third year nursing students just reached *moderate strength* it is expected that a more deliberate effort to seek out strong evidence and apply it to practice would develop this skill to greater strength. Deductive reasoning, like inductive reasoning, was not overtly evident in the qualitative interviews with the third year nursing students. Third year nursing students did describe reasoning in context of critical thinking. For one third year nursing student, the ability to reason set critical thinking apart from ordinary thinking:

> Like if you're ordinary thinking about something you might be just pondering about it... but if it's critically thinking there's a reason behind your thinking. (Y3S6Q2)

For another student the reason behind what one does in clinical practice differentiated critical thinking from normal thinking:

> Critical thinking has more emphasis on it... you need to do this now... there has to be a reason why I'm thinking this way or it's best...say giving medication to a patient... you have to make sure you think about it... giving them at the right time... making sure it has a set out goal more than normal thinking. (Y3S3Q2)

For a third student questioning reasons for actions was deemed as critical thinking:

> Critical thinking is looking back and saying... why am I thinking that way... that makes you question why you did something... the reasons you are doing...thinking that way. (Y3S9Q2)

Reasoning skills are necessary for critical thinking and the third year nursing students in this study *were moderate in strength for both inductive and deductive reasoning*. The qualitative findings provided evidence of the significance of reasoning in the practice of nursing and that for these students differentiate critical thinking from normal thinking. They were aware they were thinking critically when they used reason in clinical practice. To this point this discussion has provided insights about the critical thinking dispositions and skills of the third year cohort of undergraduate nursing students.

Findings in relation to what they perceived as the skills of critical thinking are discussed next.

11.4 Third year nursing students' perceptions of critical thinking skills

The quantitative findings discussed above revealed the critical thinking skills of the third year cohort of undergraduate nursing students. The qualitative findings also revealed some evidence in the course of the interviews of the skills of critical thinking. The nursing students acknowledged their *lack of awareness of critical thinking skills* and they described what they perceived as the skills of critical thinking. A theme which emerged from the qualitative data was identified as *'lack of awareness of critical thinking skills.'* The lack of awareness of the skills of critical thinking was prevalent in discussions with four of the third year nursing students as follows:

> I think there are skills alright but I don't really know enough about the skills to know what they are ... I'm just not aware of them ...I don't know. (Y3Q5S5)

> I wouldn't be aware of what skills exactly ... but I'm sure there is some kind of skills that goes in to critical thinking but...I wouldn't be aware of what they are. (Y3Q5S6)

> I think there are skills to being critical thinker...I'd kind of read over things several times to kind of ...would that be the kind a thing that your thinking about...I'd write things down if I thought...you know... the point...I'm not sure. (Y3Q5S2)

> Are there skills involved? ... I'd say there would be... I don't think you would be (aware) at the time but looking back I was critical thinking there because I did this instead of such a thing, I don't know at the time if I'd be aware of it. (Y3Q5S1)

While these descriptions provide an insight into the student's lack of awareness of critical thinking skills the third year nursing students explained what they perceived as skills of critical thinking. A critical thinker was characterised as being knowledgeable and having good communication skills:

> Someone who would be very knowledge based which is a benefit as well you know. (Y3Q9S1)

> I think if you're good at communication it helps because you might just be doing it (critical thinking) on your own but sometimes people who are not good at communication can find it difficult even to think about things to themselves... because... they are having their own inner thoughts and they cannot even get that across...so... good communication skills. (Y3Q5S8)

An ability to communicate with other people and engage in discussion also characterised a critical thinker:

> Communicating with other people... would be the best way to go about it ...I suppose like communicating...like...when we bounce ideas of colleagues discuss things ...discuss with them... why ... about the topic and think about it a certain way. (Y3Q5S4)

Being an organised and efficient person:

> You have to organise... organizational skills...you have to have that definitely you have to be organized if you want to critically think effectively you have to be efficient. (Y3Q5S7)

> I think being organised... I think you have to be able to organise your own thoughts. (Y3Q5S8)

Be able to assess a situation was seen as a skill for critical thinking:

> you have to kind of critically think in situations and you have to think for yourself and I suppose you have to kind of ... assess the situation to learn how to do that and kind of... watch other people how they act and...think of all the different consequences or outcomes (Y3Q5S1)

Be perceptive or alert and have greater awareness of a patient:

> I suppose just to have an awareness of the patient and just thinking what else might be happening with them or what else might be going on ....why.... they might be acting like they are. (Y3Q5S1)

Being alert, work under pressure, teamwork, use foresight to think ahead, being competent and self-manage were identified as skills of critical thinking:

> You need to be alert ....you need to be kind of good under pressure... you need to... work well in a team, you need to be...planning ahead... you need to be competent in what you are doing as well... I think a big thing to be able to work under pressure and to be able to manage your stress level. (Y3Q5S10)

The qualitative findings identified above reveal what the third year nursing students perceived as the skills for critical thinking from their perspective. What the students considered as the skills of critical thinking are attributes that they perceived and considered necessary in nursing. Attributes such as being knowledgeable, organised, efficient, perceptive, alert, be able to assess, self-manage, work under pressure and engage in team work were what they considered critical thinking. While these attributes are necessary in their repertoire of skills they did not include analysis, evaluation, inference and reasoning skills. It appears they may not consider these skills as skills for critical thinking and this also appears to indicate they may perceive critical thinking as separate for analysis and evaluation. The findings discussed here indicate the need for greater awareness of the skills for critical thinking among nursing students. A greater awareness of the skills for critical thinking in the undergraduate nursing curriculum is highly likely to enhance greater strength in critical thinking. The discussion to this point has addressed the dispositions and skills of critical thinking in the third year undergraduate general nursing students. Key issues arising from the discussion are summarised in the next section.

11.5 Summary of discussion of findings for the critical thinking dispositions and skills of the third year nursing students

The findings discussed in this chapter were the main findings which addressed research question two in relation to the critical thinking dispositions and question four which focused on the critical thinking skills of the third year undergraduate general nursing students. Qualitative findings which addressed research question eight in relation to their perceptions about critical thinking were integrated into the discussion and identified what these third year nursing students perceived as skills of critical thinking. To summarise, the third year nursing students demonstrated an *ambivalent disposition* and based on the Delphi categorisation and score range identified by Facione and Facione (2010) they demonstrated weakness in overall disposition towards critical thinking. The third year nursing students were *positive* for *four* of the seven dispositions in the following order based on the strength of their average scores:

inquisitiveness, maturity of judgment, analyticity and open-mindedness. The difference between the latter two dispositions was marginal. An interpretation of these findings based on the Delphi constructs identified by Facione and Facione (2014, p. 21) gives a clearer understanding of the dispositions towards critical thinking for third year nursing students in this study. They were *positive* in disposition towards *inquisitiveness* and were eager for and desired knowledge. In relation to *maturity of judgment,* they were *positive* and desired firm judgments cognisant that multiple solutions may prevail in relation to issues and situations encountered. In relation to *open-mindedness,* they were *positive* towards the views and opinions of others and capable of seeing issues and situations from different perspectives. Being positive towards *analyticity* meant they were disposed to anticipating the good and bad consequences of situations. The third year nursing students were *positive* for the above dispositions and the attributes of these dispositions are necessary and important for nursing students to be able work in a complex and demanding health care environment.

The third year nursing students scored in the *ambivalent category* and as such were weak for three dispositions in the following order: *critical thinking self-confidence, systematicity and truth-seeking.* They were ambivalent and as such inconsistent in their attitudes and while not hostile or indifferent they were not endorsing these dispositions. Given their ambivalence and inconsistency in these dispositions when it came to *self-confidence,* they lacked confidence in their own reasoning about issues, problems and situations. In relation to *systematicity,* they were inconsistent in being disciplined and orderly in the execution of a mental desire to deal with situations in an organised way. They demonstrated greatest weakness for *truth-seeking* and not desiring the best understanding of a situation, not using reason and evidence to its full potential, they were not challenging situations, issues and problems through questioning and not fully casting aside their biases and preconception in facing issues, problems and situations. An ambivalent disposition towards *critical thinking self-confidence, systematicity and truth-seeking* in third year nursing student points to the need to take steps to develop these dispositions.

In relation to critical thinking skills, the third year nursing students were *moderate in strength for overall critical thinking skill.* They were also *moderate in strength for the sub-skills of analysis and evaluation. Evaluation* was the critical thinking skill for which

the third year nursing students showed the greatest strength followed by the skill of *analysis*. These are not surprising findings given the emphasis on analysis and evaluation and the expectation of these skills from entry in first year. Evaluation and analysis skills are highly valued over other cognitive skills as a priority for nursing practice. This is acknowledged in the undergraduate nursing curriculum given the emphasis on the nursing process which is taught early in the first year of the degree course. Evaluation is one of the main components of the nursing process which consists of the four steps: assess, plan, implement and evaluate. In relation to the term, analyse, this is used frequently and consistently in academic assessments. It is somewhat surprising that, as third years after completion of three years, these nursing students did not reach the *strong category* for these critical thinking skills. *Inference* as a skill for critical thinking was scored in the category of *not manifest* and as such it was weak, however, these third years were very close to the category of *moderate strength for inference*. A possible explanation for not gaining further strength in analysis may be due to the use of analysis with greater awareness in relation to written academic work and limited ability to be more cognisant of its use in practice. Evaluation remained moderate in strength and it is possible that the nursing students implement care with less emphasis on evaluation compared to the registered nurse. The registered nurse may be considered more likely to weigh up and evaluate care to a greater extent than the nursing students as they have greater accountability for their actions. Inference was weak and not manifested and it is possible that if the suggestions and opinions nursing students in clinical practice have to offer are acknowledgement this skill may develop greater strength at an earlier stage in their course.

In relation to reasoning skills for critical thinking, the third year nursing student were much stronger for *inductive than for deductive reasoning* and they were bordering on the strong category. Deductive reasoning just reached the category of *moderate strength*. The critical thinking skills measured using the Health Sciences Reasoning Test were not strongly prevalent in the qualitative descriptions of the third year nursing students. Analysis as ability to *'analyse'* and *'pick things apart'* was described. Evaluation as, *'linking things together'* and *'being able to perform patient assessment'* was evident in the students' descriptions. The third year nursing students described their lack of awareness of the skills of critical thinking and they described skills for critical thinking as: *being knowledgeable, use of good communication skills, being alert, confident, competent, using foresight, self-management and working as a team*

member. These attributes reflect aspects of the undergraduate nursing curriculum and while important and essential for undergraduate nursing students they do not reflect the components of the dispositions and skills as measured in this study. They fall short of the Delphi conceptualisation of critical thinking as an ideal to be aspired to.

11.6 Conclusion

This chapter discussed the critical thinking dispositions and skills of the third year undergraduate general nursing students. The integration of the qualitative data with the quantitative data expanded the discussion and provided additional insights about critical thinking in the third year nursing students. Evidence of the Delphi constructs emerged from the discussion with the nursing students although the focus of the interviews was critical thinking as opposed to a specific focus on the Delphi constructs. This appears to verify that the constructs measured using the CCTDI and the HSRT were relevant constructs which were inherent in these nursing students. The third year nursing students demonstrated ambivalence for overall disposition towards critical thinking. They were positively disposed for the subscales: inquisitiveness, maturity of judgment, being open-minded and analyticity. They were inconsistent in self-confidence, systematicity and truth-seeking dispositions. They were moderate in overall strength for critical thinking and they demonstrated greatest strength in the skills of evaluation and analysis. They did not manifest the skill of inference although they were very close to moderate strength. Knowledge of these findings has potential use for the development of the undergraduate nursing curriculum and for the development of the critical thinking dispositions and skills of nursing students at all levels in the undergraduate nursing degree course. A reasonable expectation is that progression through fourth year with internship would enhance both the dispositions and skills for critical thinking. To confirm this, a further study is recommended. In the next chapter, Chapter 12, differences in the critical thinking dispositions and skills of the first and third year nursing students are discussed.

Chapter 12 Differences in Critical Thinking Dispositions and Skills of Undergraduate Nursing Students

12.1 Introduction

The main findings for the differences in critical thinking of the first and third year undergraduate nursing students are discussed in this chapter. Two quantitative research questions, questions five and six, addressed differences in critical thinking dispositions and skills. The results were presented earlier in Chapter 9 and the main findings are discussed here. Qualitative findings address research question nine which asked: *what are the perceptions of nurse lecturers about critical thinking in the undergraduate nursing curriculum?* The less-dominant qualitative findings are integrated into the discussion and add further insights about critical thinking in the undergraduate nursing curriculum. This chapter concludes with a discussion of implications of critical thinking for nurse educators, nursing education in the Irish context and for the investigation of critical thinking.

12.2 Differences in critical thinking dispositions of undergraduate nursing students

In this section, differences in the critical thinking dispositions of the first and third year undergraduate general nursing students are discussed. The main findings discussed address research question five, which asked: *what difference exists in the critical thinking dispositions of the first and third year undergraduate general nursing students?* The results of an independent samples t-test which addressed this question were presented in Chapter 9 and the main findings are discussed here. First, it is necessary to discuss the difference in *overall critical thinking disposition.* This is followed by a discussion of the disposition sub-scales which provide further knowledge of differences in critical thinking dispositions and allow inferences be made with regard to critical thinking in context of the nursing curriculum.

12.2.1 Difference in overall critical thinking disposition of undergraduate nursing students

An overall or total measure of disposition towards critical thinking is an estimation of an overall attitude towards critical thinking. *The first year nursing students in this study scored in the 'positive category' and had strength in overall critical thinking disposition.*

The third year nursing students scored in the 'ambivalent category' and as such were weak in overall critical thinking disposition. However, the difference between the two groups was not statistically significant (Tables 5.14, 9.3 & 9.4). Studies reported in the literature reveal positive dispositions at junior and senior level and the more senior level students scored higher in overall critical thinking disposition. In a Canadian study nursing students were positive and the third years scored higher compared to first years (Profetto-McGrath, 2003). Graduating fourth year students in the Middle East also scored higher (Suliman & Halabi, 2007). However, the improvements in these studies were not statistically significant. Statistically significant improvements were reported for senior nursing students in the USA (Colucciello, 1997; Mc Carthy et al., 1999). In contrast, Ip et al. (2000) reported scores in the ambivalent category for first and third year nursing students in China and the third years scored statistically significantly lower than first years (Table 2.4).

An important finding was that the third year nursing students, in this study, revealed a weak overall disposition towards critical thinking. While it is not known what their overall disposition score was at the beginning of the course, it is reasonable to expect that by third year they would be positive in overall critical thinking disposition, but instead, they scored in the ambivalent category and were considered weak compared to the first years in the positive category. *The difference between the first and third years in this study was not statistically significant.* The expectation of nurse educators and An Bord Altranais (2000) is the development of critical thinking. The finding of a weak overall critical thinking disposition for the third year nursing students is of concern in the preparation of nursing graduates who are expected to think critically. If nursing students are to think critically the nursing curriculum needs to foster a positive disposition towards critical thinking throughout the four years of the programme. To enhance a positive disposition nurse educators need to address the dispositions towards critical thinking in teaching and learning. While the above findings provide knowledge of overall disposition towards critical thinking an analysis of the sub-scales provides further insight about the differences in critical thinking dispositions and these are discussed next.

12.2.2 Difference in truth-seeking of the undergraduate nursing students

Differences in the *truth-seeking* disposition were explored for the first and third year nursing students. The first and third year nursing students revealed average scores in the *ambivalent category* and as such they were weak for truth-seeking. There was a slightly higher score for the third years compared to the first years but this was not statistically significant (Tables 3.1, 9.3 & 9.4). Higher scores in truth-seeking, in the ambivalent category, for seniors compared to junior level are reported in the literature for Chinese nursing students (Ip et al., 2000). Higher scores in the positive category are also reported for Korean (Shin et al., 2006b) and Middle Eastern nursing students (Suliman & Halabi, 2007). The gains in the scores in all of these studies were not statistically significant. Colucciello (1997), in the USA, reported a statistically significant higher score for seniors compared to juniors although they remained in the ambivalent category (Table 2.4). Mc Carthy et al. (1999), also in the USA, reported that seniors scored statistically significantly higher than sophomores for truth-seeking, however, they did not include category scores in their study.

According to Facione and Facione (2014, p. 18), *truth-seeking* is the *'habit of mind'* which means an individual seeks the best possible understanding of a situation, uses reason and evidence, asks questions and seeks to avoid bias in the search for knowledge and truth. *Both first and the third year nursing students in this study with scores less than 40.00 and in the ambivalent category were inconsistent when it came to seeking the best understanding of a situation.* They were inconsistent in the use of reasoning, evidence, questioning and they were not completely free from the influences of biases and preconceptions in the search for truth. The slightly higher score for the third years, while not statistically significant, is somewhat promising in that they appeared to have slightly greater strength in the truth-seeking disposition. It may be suggested that it is likely that by third year the nursing curriculum may be influencing the attributes of truth-seeking through the use of questioning, evidence based practice and the acquisition of knowledge for nursing practice. Sustained emphasis on these aspects of the curriculum may further influence a positive disposition for truth-seeking.

12.2.3 Difference in open-mindedness of the undergraduate nursing students

Nurses in their professional role care for people from diverse backgrounds. The nursing curriculum aims to prepare nurses to deal with diverse backgrounds and as such open-

mindedness is a necessary disposition. *The first and third year nursing students in this study were positive for the open-mindedness disposition*. The third year nursing students scored very slightly lower than the first years but this was not statistically significant (Tables 3.1, 9.3 & 9.4). Senior year nursing students, in a cross-sectional study, in the Middle East also scored lower than beginning first years but the finding was not statistically significant and both groups were positive in disposition (Suliman & Halabi, 2007). Third year nursing students, in a cross-sectional study, in China were ambivalent and scored statistically significantly lower than first years for open-mindedness (Ip et al., 2000). Third year nursing students, in a longitudinal study, in Korea (Shin et al., 2006b) and in a cross-sectional the USA (Colucciello, 1997) showed statistically significant higher scores compared to first years for open-mindedness, yet they remained in the positive category (Tables 2.4 & 3.1). Studies among nursing students in a Canadian study (Profetto-McGrath, 2003) and in the USA (Mc Carthy et al., 1999) reported no statistically significant differences between junior and senior undergraduate nursing students for open-mindedness.

Both first and third year nursing students in this study were *open-minded and just in the positive category,* however, the third years were very slightly weaker but this was not statistically significant and they remained positive for open-mindedness. Open-mindedness according to Facione and Facione (2014, p. 18) is tolerance of others' opinions and views. The opposite is closed-minded and intolerance of the opinions of others. The nursing students in this study had a positive disposition for tolerance of the opinions of others and were open to different perspectives. These are necessary attributes for nursing and especially so given the diversity of situations and patients that nursing students encounter. It may be suggested that the nature of nursing, the environment of nursing, as well as the nursing curriculum through emphasis on being open contributes to the development of an open-minded disposition and tolerance of others. The finding of a slightly lower score, though not statistically significantly lower, for third years indicates that after three years open-mindedness, while still positive, was that bit weaker. It appears that the third years in this study were not any more positive in open-mindedness than the first years. If nursing students are to gain strength in the open-minded disposition, as they progress through the course to third year and beyond, then the nursing curriculum needs to emphasise the attributes of open-mindedness as a disposition for critical thinking.

12.2.4 Difference in analyticity of the undergraduate nursing students

Differences in analyticity as a critical thinking disposition were explored in this study. *The first and third year nursing students were positive for analyticity with scores above the cut-off score of 40.00.* The third years scored slightly lower compared to the first years, but this was not statistically significant (Tables 3.1, 9.3 & 9.4). A similar but statistically significantly lower score for third year nursing students was reported in a cross-sectional study in China and they scored in the ambivalent category and were weaker than the first years and also weaker than both cohorts of nursing students in this study (Ip et al., 2000). The researchers report that a culture of obedience and conformity in Chinese culture was a likely influence. In contrast, senior nursing students in two cross-sectional studies, in the USA, reported statistically significant higher scores for analyticity when compared to juniors yet, they remained in the positive category (Colucciello, 1997; Mc Carthy et al., 1999). Higher scores were also reported for the analyticity disposition in third year nursing students in a longitudinal study in Korea (Shin et al., 2006b), and in a cross-sectional study in fourth year graduating students in the Middle East (Suliman & Halabi, 2007). However, the findings in these two latter studies were not statistically significant and student's remained in the positive category (Table 2.4).

The first and third year nursing students in this study were *positive for analyticity* and they scored stronger than first and third year nursing students in China and as was mentioned above may have been due to conformity in Chinese culture. Nursing students in other North American and Middle Eastern studies reported above had higher positive scores. Analyticity, according to Facione and Facione (2014, p. 18), is seen as fore-sight-fulness. It involves being alert to impending situations, anticipation of both the good and the bad potential consequences or outcomes of situations, choices, proposals, and plans. The nursing students, in this study, being positive had these attributes, although, it is notable they scored at the lower end of the positive category.

The very slightly lower score for the third years meant that the attributes of the analyticity disposition were not as positive as the first year cohort. The higher scores for senior nursing students, in the positive category, reported above were statistically significant for North American nursing students but not for nursing students in the Middle East or Korea. The higher scores may be an indication that nursing curricula,

particularly in North America may be having a greater impact on the development of the attributes associated with analyticity. The nursing students in this study in first and third year appeared to have the attributes of analyticity disposition such as foresight-fullness, alertness to impending situations, and anticipation of consequences and outcomes of situations. The finding of a slightly lower score for third years is somewhat of a concern given the nature of unpredictable situations nursing students encounter and a strong disposition in analyticity is of utmost importance. The lack of development in analyticity may be attributed to the supernumerary status and working under the supervision of a preceptor who takes full accountability for patient care.

12.2.5 Difference in systematicity of the undergraduate nursing students

Systematicity is another important disposition for critical thinking. In the undergraduate nursing curriculum the nursing process is taught in the first year to prepare nursing students for clinical practice. The nursing process approach offers a systematic approach to the delivery of nursing care and nursing students are expected to gain competence and confidence in its use. Given the emphasis on the nursing process in the academic and in the clinical practice setting it is expected that nursing students would gain strength in being systematic to think critically. *The first and third year nursing students in this study were ambivalent in the systematicity disposition with scores below the cut-off of score of 40.00. The third years scored lower than the first years, but this finding was not statistically significant* (Tables 3.1, 9.3 & 9.4). Statistically significantly lower scores in the ambivalent category were reported for third nursing students compared to first years in a cross-sectional study in China (Ip et al., 2000). Higher scores in systematicity were reported in third year nursing students in a longitudinal study in Korea, although not statistically significant, and they remained weak and in the ambivalent category (Shin et al., 2006b) (Table 2.4). Graduating fourth year nursing students, in a cross-sectional study, in the Middle East revealed higher scores in systematicity compared to first year nursing students. Both groups were positive in strength but the very slightly higher score in fourth year was not statistically significant (Suliman & Halabi, 2007). The researchers reported that the lack of a statistically significant finding may have been due to the fact that problem-solving alone in the curriculum may not have been enough. However, it is noted that there was emphasis on problem-solving in the curriculum and it may have contributed to the positive systematicity score. Third and fourth year nursing students in a Canadian study achieved scores statistically significantly higher than first and second year

students (Profetto-McGrath, 2003) and Colucciello (1997), in the USA, also reported a statistically significant improvement in the positive category for systematicity for senior nursing students compared to juniors in the ambivalent category. In another study, also in the USA, Mc Carthy et al. (1999) reported no statistically significant difference between sophomores and seniors for systematicity but did not report the category scores. All of the above North American and the Canadian study were cross-sectional in design and Colucciello (1997) was the only researcher to report the category score.

The nursing students in this study were ambivalent in the systematicity disposition. According to Facione and Facione (2014, p. 18) systematicity as a *'habit of mind'* is the tendency to approach problems in a disciplined, orderly and systematic way. A strong systematicity disposition means there is a mental desire and tendency to approach questions and issues in an organized way. The opposite of systematicity is being disorganized. While it may not be completely acceptable in first year to score low in systematicity it is of concern that the third years, in this study, were weak and scored slightly lower than the first years, although this was not statistically significant. Weakness was also evident in Chinese and Korean nursing students in the studies reported above. Nursing students in the Middle Eastern, North American and in the Canadian study achieved higher scores and were reported positive in the studies by Colucciello (1997) and Suliman and Halabi (2007) and for some, the higher scores were also statistically significant. Middle Eastern, North American and Canadian nursing students scored higher and were more positive compared to the first and third year nursing students in this study. If the nursing students in the Irish context are to achieve a positive systematicity disposition then it's attributes needs consideration in the undergraduate nursing curriculum.

Nursing students are expected to have a systematic approach to their work both academically and in clinical practice placements. Being systematic in approach to nursing practice is valued and taught from entry to the course through the nursing process which requires nursing students to assess, plan, implement and evaluate care. It may well be, that the nursing process as a systematic approach is ideal and theoretical as opposed to practical and closer to the real situations that nursing students encounter. The nursing students may not fully comprehend or apply the nursing process effectively in clinical practice and they may be using their own

systematized plans, methods or approaches. This may be considered as a factor in the development of the systematicity disposition. It is likely that the systematic approaches used by nursing students are limiting in ways and the students in this study, by third year, were immune to, or took for granted the nursing process and care plans and were performing in a less organized, less systematic way. The current climate of clinical practice is also possibly challenging to an effective systematic approach to the implementation of nursing and the current demands of a chaotic health service may be considered a factor. Nursing students are also continuously changing and adapting to a wide variety of clinical placements and for this reason, by third year, they may not have had sufficient continuous clinical practice. This situation, it may be suggested, is likely to have had an influence on the ambivalent disposition towards systematicity for the first and third year nursing students in this study.

12.2.6 Difference in critical thinking self-confidence of the undergraduate nursing students

The undergraduate nursing curriculum aims to develop nursing students who are capable of delivering quality health care in a very challenging multi-professional health care service. To achieve this, emphasis is placed on evidence based practice, effective interpersonal skills and competencies in relation to professional practice in nursing. As nursing students' progress from first year to a more senior level on the course it is expected they will be more confident and competent. However, while confidence is expected to develop, this raises the issue of confidence in disposition to think critically. *The first and third year nursing students were ambivalent for the critical thinking self-confidence disposition with scores below 40.00 and as such were considered weak. The third year students scored lower compared to the first years but this was not statistically significant* (Tables 3.1, 9.3 & 9.4). Studies reported in the literature revealed a similar ambivalent disposition for critical thinking self-confidence. First and third year nursing students in China were ambivalent and third years scored statistically significantly lower that first years (Ip et al., 2000). Ambivalent findings were also reported in a cross-sectional study for nursing students in the Middle East (Suliman & Halabi, 2007) and in a longitudinal study in Korea (Shin et al., 2006b)(Table 2.4). There were statistically significant improvements, in the ambivalent category, for the third year nursing students in Korea and fourth year graduating nursing students in the Middle East for the critical thinking self-confidence disposition. In contrast to the above studies, and to this study, Colucciello (1997) in the USA reported a positive disposition

in sophomore and senior level two nursing students. The senior level two nursing students scored statistically significantly higher than the junior nursing students. In another North American study, Mc Carthy et al. (1999) also reported a statistically significantly higher score in critical thinking self-confidence for seniors compared to juniors, but did not report the category scores in the study.

The first and third year nursing students in this study were ambivalent and considered weak in the critical thinking self-confidence disposition. According to Facione and Facione (2014, p. 18) critical thinking self-confidence is the tendency to trust the use of reason and reflective thinking to solve problems and reach goals. The opposite is the tendency to be mistrustful of reason, to consistently devalue or be hostile to the use of careful reason, and reflection as a means to solving problems or discovering what to do or what to believe. The nursing students in this study, scoring in the *ambivalent category* were weak in relation to trusting the outcomes of their reasoning and reflective thinking, in solving problems and reaching goals. Instead, they were weak in confidence in reasoning and knowledge gained from reflection. Apart from the Chinese nursing students, reported above, who were similar to the nursing students in this study, nursing students in other international studies although weak and while remaining in the ambivalent category scored statistically significantly higher. As such, they were becoming more confident in their knowledge gained from reasoning and reflective thinking. *This was not the case for the third year nursing students in this study. The third year nursing students in this study were no better and scored lower than first years for this disposition.*

The nursing students in this study, as well as nursing students internationally, being students, are not yet registered nurses and therefore are not carrying full responsibility for patient care. Lack of full responsibility may act, not only to prevent nursing students from engaging fully in goal setting in clinical practice but also act to prevent them applying their knowledge gained from reflective thinking about clinical experiences and in goal setting for patient care. Nursing students are striving to achieve competence and they are somewhat detached and without full responsibility for goal setting. They are not engaging fully in problem-solving and decision-making. These conditions arising from lack of full responsibility may not permit the direct application of the knowledge from their reasoning and reflective thinking. It may be suggested, that they

remain ambivalent until they use their reasoning skills in a more direct and applied way. A more direct application of their reasoning with greater responsibility is likely to provide feedback and enhance their self-confidence in critical thinking. The building of self-confidence through reflective thinking and reasoning is likely to lead to a more positive disposition toward critical thinking self-confidence.

Suliman and Halabi (2007) reported that seniors in fourth year improved statistically significantly in critical thinking self-confidence and it is likely, that in the case of the graduating fourth years, the extra year accounted for the higher scores, also, problem-solving was a focus in the curriculum and may have had an impact. The concern in this study of a slightly weaker, though not statistically significantly weaker, score raises a concern for nurse educators, clinical nurse managers and An Bord Altranais, especially with the expected requirement that nursing students will be competent in the organisation of care and integration of knowledge (An Bord Altranais, 2000). A positive disposition in critical thinking self-confidence is more likely to lead to better integration of knowledge as students would have greater confidence in their reasoning and reflective thinking. Apart from Chinese nursing students, other international studies reported higher scores by third year and some were statistically significantly higher. It may be suggested, that engaging more in learning experiences in the practice environment would lead to greater responsibility and integration of knowledge. This would build confidence and possibly lead to a positive disposition towards critical thinking self-confidence.

Critical thinking self-confidence can be expected to improve for the third year nursing students, in this study, during the fourth year with the taking on of a patient case load and participation in the work force with employee status. Hands-on care, with indirect supervision, as opposed to a supernumerary hands-off role with direct supervision is likely to enhance the critical thinking self-confidence disposition. Also, the structured reflective time in fourth year would possibly act to enhance critical thinking self-confidence. It is a concern that the third year nursing students were weak in the critical thinking self-confidence disposition. It may be suggested that to enhance this, the taking on of some responsibility for aspects of patient care at an earlier stage in the course would enhance critical thinking self-confidence in undergraduate nursing students.

12.2.7 Difference in inquisitiveness of the undergraduate nursing students

Inquisitiveness is an important attribute which is necessary for critical thinking and was one of the disposition sub-scales measured in this study. *The first and third year nursing students were positive for inquisitiveness with scores above the cut-off score of 40.00. The third years scored slightly lower compared to first years and this was statistically significant* (Tables 3.1, 9.3 & 9.4). A slightly low score in the positive category was reported for third year nursing students in a longitudinal study in Korea, although not statistically significant (Shin et al., 2006b). Third year nursing students in a cross-sectional study in China revealed a statistically significantly lower score, in the ambivalent category, for inquisitiveness compared to first years who were positive (Ip et al., 2000). Other cross-sectional studies in the literature also revealed higher scores for third and fourth year nursing students in disposition towards inquisitiveness. Graduating fourth year nursing students in the Middle East had slightly higher scores in the positive category, but this was not statically significant (Suliman & Halabi, 2007). In the USA, senior nursing students revealed statistically significantly higher scores in inquisitiveness compared to junior nursing students (Colucciello, 1997; Mc Carthy et al., 1999) (Table 2.4). A study by Profetto-McGrath (2003) found nursing students across the four years of a baccalaureate nursing programme, in Canada, showed no statistically significant difference in critical thinking disposition score for inquisitiveness. Inquisitiveness disposition was the highest scored disposition in her study.

The first and third year nursing students in this study were positive for inquisitiveness. While remaining positive, the third years revealed a slightly lower score which was statistically significant. According to Facione and Facione (2014, p. 18) inquisitiveness is intellectual curiosity. It is the tendency to want to know things, even if they are not immediately or obviously useful at the moment. It is being curious and eager to acquire new knowledge and to learn the explanations for things even when the applications of that new learning are not immediately apparent. The opposite of inquisitiveness is indifference. The nursing students in this study were positive in disposition towards inquisitiveness and this was also evident for the third years although with a slightly lower score which was statistically significant. At the beginning of the course the nursing students are curious to acquire new knowledge and the positive disposition sustained itself for the third years. The positive disposition towards inquisitiveness is likely to be enhanced by the curriculum with emphasis on knowledge for application in clinical nursing practice. The emphasis on knowledge and its acquisition is driven by

the learning outcomes of the nursing curriculum which emphasise a knowledge base for a competent professional nurse (An Bord Altranais, 2000, p. 13). Continuous assessment along the way is likely to maintain a positive disposition. The slightly lower scores for the third years may be the likely result of having acquired a level of knowledge and the eagerness or curiosity is less exciting than in the first year. It may be suggested, that the motivation for the acquisition of new knowledge is not as strong in the third year as it is in first year of the course. It is likely that the first years demonstrate greater eagerness for new knowledge earlier in the course. This eagerness may be related to their anxiety or fear of not knowing, or a concern that they will be faced with questions in clinical practice that would reflect negatively on them if they did not have the necessary knowledge.

12.2.8 Difference in maturity of judgment of the undergraduate nursing students

A hallmark of professional nursing is the ability of nurses to make clinical judgments within their scope of practice and it is acknowledged that clinical judgment requires critical thinking (Facione & Facione, 2008; Pesut & Herman, 1999). The nursing curriculum provides educational experiences to prepare nurses for entry to the register of nurses. The curriculum also aims to ensure that graduate nurses are prepared and competent to make judgments, in a mature way, that are professional and grounded in critical thinking. As nursing students progress through the curriculum it is expected they will have developed in this respect and demonstrate the maturity of judgment disposition. Maturity of judgment was measured in this study to determine differences between the first and third year nursing students. *The main finding was that, the first and third year nursing students were positive in attitude for the maturity of judgment disposition with scores above 40.00. The third year nursing students revealed a slightly higher score in maturity of judgment compared to the first years but this was not statistically significant* (Tables 3.1, 9.3 & 9.4). Third year nursing students in China (Ip et al., 2000), and graduating fourth year nursing students in the Middle East (Suliman & Halabi, 2007) were weak, in the ambivalent category, and had very slightly lower scores compared to first year nursing students. Both of these studies were cross-sectional in design and the differences were not statistically significant (Table 2.4). Third year nursing students in a longitudinal study in Korea (Shin et al., 2006b) scored statistically significantly higher than first years but the improvement was only slight and the students were ambivalent in disposition (Table 2.4). A cross-sectional study in the

USA (Colucciello, 1997) reported positive scores with senior students revealing higher scores than sophomores for maturity of judgment. The difference was not statistically significant (Table 2.4) In another study in the USA Mc Carthy et al. (1999) reported no significant difference between junior and senior students for maturity of judgment but did not report the category score.

According to Facione and Facione (2014, p. 18) maturity of judgment is the tendency to see problems as complex, rather than black and white. It involves making timely judgments, being firm in one's judgment when there is reason to do so and changing one's mind when appropriate to do so. Awareness of multiple solutions may be acceptable while appreciating the need for closure in certain circumstances in the absence of complete knowledge. *The nursing students in this study were just in the positive category and as such were disposed towards seeing problems as complex rather than black and white.* Nursing students in the Eastern and Middle Eastern studies reported above were weaker, in the ambivalent category, compared to the nursing students in this study who were positive. The positive disposition of the Irish nursing students in this study reflected the positive disposition of the North American nursing students for the maturity disposition. Third year nursing students in the above studies also revealed weaker scores compared to first years with the exception of Korean nursing students who improved statistically significantly, although remaining in the ambivalent category. The longitudinal nature of the Korean study by Shin et al. (2006b) may have accounted for the statistically significant difference between first and third year nursing students as the same cohort was investigated over time.

The third year nursing students in this study scored slightly higher than the first years for maturity of judgment, although not statistically significant. Exposure to patients with complex needs in the practice setting and preparation in the academic setting is a likely reason for the development of a positive disposition towards maturity of judgment. The scores for both cohorts of nursing students in this study were just in the positive category. The slightly higher score for the third year nursing may be an indication that the curriculum experience may not be enough to enhance greater development by third year. It is also likely, that the slightly higher score for the third year students was related to maturity due to age as opposed to the curriculum. By the third year the nursing students have matured by age and have encountered very challenging

traumatic and life altering situations. Exposure to such situations is a challenge to one's thinking and may interact with age to enhance a more positive disposition as was the case for the third year nursing students in this study. The positive score indicated that the nursing students, in this study, were positive in attitude in dealing with complex situations. They demonstrated an ability to stand over judgments and were aware that multiple solutions may be available to solve problems.

The main findings for the differences in critical thinking dispositions which were discussed above revealed that the third year nursing students had a lower score, and were ambivalent, compared to the first year students' positive score for overall critical thinking disposition. Both first and third years were positive for four disposition sub-scales of open-mindedness, analyticity, inquisitiveness and maturity of judgment. They were ambivalent for the three disposition sub-scales of truth-seeking, systematicity and critical thinking self-confidence. Inquisitiveness was the only disposition which was statistically significantly different with the third years scoring lower than the first years. By the third year of the undergraduate nursing degree course the third year nursing students appeared to be slightly weaker than first year students. If an expected outcome of the undergraduate nursing degree course is to enhance the critical thinking dispositions for nursing students, across all years of the course, then critical thinking requires more active consideration both in the nursing curriculum and in teaching pedagogies. While positive and strong dispositions are necessary for critical thinking, skills in critical thinking are also important. According to Facione and Facione (2014) critical thinking is a skill as well as a *'habit of mind'* and one must have the skills as well as be disposed to think critically. In the next section, the differences in the critical thinking skills of the first and third year undergraduate nursing students are discussed.

12.3 Difference in critical thinking skills undergraduate nursing students

In this section, differences in the critical thinking skills of the first and third year undergraduate nursing students are discussed in relation to research question six, which asked: *what difference exists in the critical thinking skills of the first and third year undergraduate general nursing students?* The results of an independent samples t-test to address this question were reported in Chapter 9. The differences in overall critical thinking skill are discussed first and this is followed by a discussion of the

difference in the critical thinking skill sub-scales. Published studies which investigated improvements in critical thinking sub-scales, from junior to senior level, do not appear to be very prevalent in published literature compared to the prevalence of studies which addressed improvements in critical thinking dispositions.

12.3.1 Difference in overall critical thinking skill of undergraduate nursing students

Differences in overall or total critical thinking skill were examined for the first and third year nursing students. It is reasonable to expect that more senior nursing students would display stronger skills in critical thinking having had greater exposure to curriculum experiences, in both academic and clinical practice settings. *The first and third year nursing students in this study were moderate in strength for overall critical thinking skill. The third year nursing students revealed a higher average score compared to the first year students and this was statistically significant* (Tables 3.2, 9.7 & 9.8). Studies in the literature also report statistically significantly higher moderate category scores in overall critical thinking skill. Senior nursing students in a cross-sectional study, in the USA, had statistically significantly higher scores of moderate strength (Colucciello, 1997). In another North American study, in the USA, undergraduate nursing students undertaking a four year baccalaureate degree revealed a statistically significant higher score in overall critical thinking skill in the superior category from entry to exit point (Spleic et al., 2001). Canadian undergraduate nursing students, in third year, revealed lower over critical thinking skill score compared to first, second and fourth years, but the finding was not statistically significant, and all were moderate in strength (Profetto-McGrath, 2003).

The nursing students in this study were moderate in strength and this was similar in strength for overall critical thinking skill in nursing students in the international studies reported above, in North America, and in the Canadian study. The finding, that both the first and third year nursing students had moderate strength in overall critical thinking skill and that the third years had a statistically significantly higher score provides a degree of confidence that the students in this study had the capacity to think critically. This is encouraging, and while on one hand it indicates overall critical thinking skill among the first and third year nursing students, on the other hand, both cohorts were moderate strength and it could be expected that the third year nursing students would have scored in the strong category. The nursing students in this study, as

mentioned above, were similar in moderate strength to international nursing students at the same level. It appears that critical thinking as an expected outcome of a nursing curriculum requires more to bring about strong critical thinking skills. A suggestion here is to have greater awareness of critical thinking as a skill and to encourage it more directly, both in the academic and clinical practice settings. Overall critical thinking skill incorporates the sub-skills of analysis, evaluation, inference as well as inductive and deductive reasoning and differences in these are subsequently discussed here.

12.3.2 Difference in analysis as a critical thinking skill of the undergraduate nursing students

The skill of analysis is a recognised and esteemed skill in the undergraduate nursing curriculum. It is prevalent in everyday discourse of students and lecturers as well as in relation to assessment of course content. It is also a skill that is familiar to nursing students and this was evident in the qualitative findings discussed earlier in the previous discussion chapters. Analysis is also an essential skill for critical thinking. Given its prevalence and recognition in the undergraduate nursing curriculum it is a skill in which nursing students are expected to gain in strength over the course of the undergraduate nursing degree. *The first and third year nursing students in this study were moderate in strength for the skill of analysis. The third years scored slightly higher compared to the first years and were therefore considered slightly stronger and this was statistically significant* (Tables 3.3, 9.7 & 9.8). However, both groups were just in the category of moderate strength.

A study of baccalaureate nursing students in the USA by Beckie et al. (2001) found, that nursing students prior to a curriculum revision to improve their critical thinking showed a statistically significant decline from junior to senior level while remaining moderate in strength (Table 2.5). The first cohort to experience a revised curriculum which emphasised critical thinking revealed a statistically significant improvement in the skill of analysis, while remaining moderate in strength from entry to exit. A second cohort to experience the revised curriculum declined in the skill of analysis but, remained moderate in strength. The skill of analysis according to Facione and Facione (2014, p. 21) is the ability to 'attend to patterns and details, identify the elements of a situation and determine how these elements interact'. *The undergraduate nursing students in first and third year had moderate strength in analysis and the third years had statistically significantly higher scores.* Analysis as a skill is highly valued by nurse

educators in the academic setting and this may have accounted for the strength in this skill. Another factor which is very likely to have enhanced the skill of analysis is that nurse educators, in the Irish setting, appear to place a strong emphasis on Bloom's taxonomy of educational objectives. Bloom's taxonomy, with analysis as the first level skill, appeals to nurse educators and they tend to place great emphasis on this skill in their teaching and in course assessment. Analysis as a cognitive skill features at all levels in the undergraduate nursing curriculum and the finding that the third year nursing students revealed a slightly higher score is somewhat reassuring that they were stronger than the first year nursing students in the skills of analysis. Moderate strength in analysis and a slight gain for the third years indicates they have ability in this skill to analyse not only theoretical knowledge but also clinical situations they encounter.

12.3.3 Difference in inference as a critical thinking skill of undergraduate nursing students

Inference as a skill for critical thinking was explored to find out if there was a difference between the first and third year nursing students. *The first and third year nursing students revealed an average score in the 'not manifested' category and as such demonstrated weak ability for the critical thinking skill of inference. There was very little difference in the average scores between the cohorts and the very small difference that was observed was not statistically significant (Tables 3.3, 9.7 & 9.8).* Beckie et al. (2001) found that the skill of inference in a cohort of undergraduate nursing students in the USA, prior to a revised curriculum, showed a statistically significant decline from junior to senior level. The first cohort to experience a revised curriculum with emphasis on critical thinking achieved a statistically significant improvement for the skill of inference (Table 2.5). Emphasis on critical thinking in the curriculum resulted in higher scores over the programme.

According to Facione and Facione (2014, p. 21), inference skills enable us to draw conclusions from reasons and evidence. We use inference when we offer thoughtful suggestions and hypotheses. Inference skills indicate the necessary or very probable consequences of a given set of facts and conditions. The finding that both the first and third year nursing students did not manifest the skill of inference is a concern and especially in the third year nursing students. It is a concern as weakness in the ability to effectively form an inference from reason and evidence indicates that the

consequences of situations critical to patient outcomes will be different to what they should be, or may even be missed to the detriment of the patient in their care. In the study by Beckie et al. (2001) reported above inference skill was seen to improve in a curriculum which enhanced critical thinking. In the case of the students in this study the teaching and learning in the nursing curriculum, it appears, may not be influencing this skill and by third year the nursing students did not appear to have the ability to draw conclusions based on reason and evidence. In the earlier discussion of the critical thinking dispositions the third year nursing students were weak in the critical thinking self-confidence disposition and as such they were weak when it came to making judgments based on reason. This weakness may account for the weakness in the critical thinking skill of inference. The supernumerary status as a third year nursing student and the situation where students are answerable to their preceptor means that they may not have been using this skill effectively and as such it did not manifest itself. By third year, the nursing students are similar in supernumerary status to first years but have acquired greater knowledge. They are still somewhat, *'hands-off'* and not carrying full responsibility and this may be a factor contributing to the weakness in the critical thinking skill of inference. Full responsibility for a patient case load places an onus on the nursing student to deal hands on with health care situations which require application of knowledge. This calls for the disposition of confidence in reasoning to deal with the consequences of a situation and use of inference has the potential to develop in dealing with clinical situations and problems.

The findings reported above revealed that the skill of inference was *not manifested* for either the first or the third year nursing students. It is noted, that the average scores for of both the first and third years, were approaching, *moderate strength* for the skill of inference. If the skill of inference is to develop, these students need to engage with greater awareness of the skill of inference. Greater awareness of the skill of inference along with responsibility for patient care is likely to result in greater strength in this critical thinking skill. It is reasonable to expect that the third years nursing students will gain strength in the skill of inference by the end of the fourth year as the internship provides *'hands-on'* care and greater responsibility.

12.3.4 Difference in evaluation as a critical thinking skill of undergraduate nursing students

Evaluation is another skill that is highly valued in the nursing curriculum and this is due in no small part to the need to evaluate nursing care. Evaluation is a main component of the nursing process in clinical practice which is composed of, assessment, planning, implementation and evaluation. It is expected that nursing students will develop this skill and it was measured as a critical thinking skill in this study. *The first and third year undergraduate nursing students were moderate in strength for evaluation as a critical thinking skill. The third years scored higher for this skill compared to the first years and this was a statistically significant finding (Tables 3.3, 9.7 & 9.8).* Beckie et al. (2001), in a North American study, found that undergraduate nursing students prior to a curriculum revision showed an improvement from junior to senior level, but the improvement was not statistically significant. The first cohort to experience a revised curriculum which emphasised critical thinking revealed a statistically significant improvement in the skill of evaluation (Table 2.4). Here we can see that critical thinking in the nursing curriculum has the potential to enhance the skill of evaluation.

According to Facione et al. (2014) evaluative reasoning skills enable us to assess the credibility of sources of information and the claims they make. We use these skills to determine the strength or weakness of arguments. Applying evaluation skills we can judge the quality of analyses, interpretations, explanations, inferences, options, opinions, beliefs, ideas proposals, and decisions'. The undergraduate nursing students in this study were *moderate in strength* and were capable of evaluation and it could be expected that by third year they would reach the strong category for this critical thinking skill. Evaluation, as was pointed out already, like analysis, is highly valued by nurse educators and is taught as part of the nursing process. Nursing students are expected to develop and become competent in evaluation as they implement the nursing process in clinical practice. As was pointed out earlier in relation to the skill of analysis, nurse educators also tend to place a high value on evaluation and here again familiarity with Blooms taxonomy is a strong influence. By third year, nursing students are expected to gather evidence for academic assignments and about patients and this is a skill that is acknowledged in the curriculum. The stronger score for the third year nursing students indicates, that the curriculum through teaching, learning and also in relation to the assessment of theoretical evidence enhances the development of the skill of evaluation. Also, nurse educators as well as nurses in clinical practice are more aware

of this skill by virtue of the nursing process and this emphasis is likely to have developed this skill for the undergraduate nursing students. Although the third years scored statistically significantly higher this is not too surprising given the emphasis on evaluation in the undergraduate nursing degree course. What is somewhat disappointing is that, given the emphasis on evaluation in the nursing curriculum, the third year nursing students had not reached the strong category for the skill of evaluation and remained moderate in strength similar to the first year nursing students. Analysis, inference and evaluation skills along with reasoning skills are necessary for critical thinking. Inductive and deductive reasoning are discussed in the next and subsequent sections.

12.3.5 Difference in inductive reasoning of the undergraduate nursing students

Inductive reasoning is a necessary critical thinking skill to be able to reach judgments, make decisions and solve problems which are essential cognitive strategies used in nursing. Differences in inductive reasoning as a critical thinking skill were explored in this study. *Both the first and third year nursing students were moderate in strength for inductive reasoning. Third years were much stronger than the first years and this was statistically significant (Tables 3.3, 9.7 & 9.8).* Beckie et al. (2001) found that for nursing students in a study in the USA, prior to a curriculum revision, revealed a slight improvement from junior to senior level, but the finding was not statistically significant (Table 2.5). The first cohort to experience a revised curriculum revealed a slight improvement in inductive reasoning which was statistically significant. According to Facione et al. (2014, p. 21), we use inductive reasoning skills when we draw inference about what we think must probably be true in light of the possibility that our conclusions might be false. The third year nursing students in this study were statistically significantly stronger than the first years in the use of inductive reasoning. It is likely that greater experience and repertoire of academic knowledge were factors and they also had greater capability to draw tentative conclusions about situations. Inductive reasoning uses the skill of inference. The nursing students in this study, as discussed above, did not manifest the skill of inference and this would limit their ability to gain strength in inductive reasoning. Further strength in the skill of inference is likely to enhance inductive reasoning and the conclusions drawn about situations. The ability to make inferences and arrive at a conclusion based on induction is an essential critical thinking skill in nursing.

12.3.6 Difference in deductive reasoning of the undergraduate nursing students

Deductive reasoning is another important critical thinking skill. The nursing curriculum with emphasis on empirical knowledge for application in the real world of nursing practice requires that nursing students have ability to reason deductively in the application of empirical knowledge. This critical thinking skill was explored to determine if it developed in strength for the third year nursing students compared to the first years. *A main finding was that the first year nursing students were weak in this skill and had an average score in the category of 'not manifested'. The third years were 'moderate in strength' for the skill of deductive reasoning. The difference between the two groups was not statistically significant (Tables 9.7 & 9.8).* Beckie et al. (2001), in a North American study, found that a cohort of nursing students, prior to a curriculum revision, revealed a decline in the skill of deductive reasoning from junior to senior level, but this was not statistically significant. The first cohort to experience a revised curriculum which emphasised critical thinking revealed a statistically significant improvement in deductive reasoning (Table 2.5). According to Facione and Facione (2014, p. 21), deductive reasoning is precise and the assumed truth of a set of beliefs necessitates a conclusion that cannot be false if those beliefs are true. The finding that the first years in this study were weak for deductive reasoning indicated they were not yet fully capable of arriving at outcomes and making decisions based on rigorously established facts. The third year nursing students scored higher than the first years and although this was not statistically significant they had strength in drawing firm conclusions from established evidence. In the undergraduate nursing curriculum, in the Irish context the skills of literature searching, analysis, evaluation and application of research findings are taught. This is a likely factor in the development of deductive reasoning for the third year students whereas the first year students are learning these skills. In contrast to the nursing students in this study were the nursing students in Beckie et.al's, (2001) North American study in which baccalaureate nursing students who experienced a revised curriculum, with emphasis on critical thinking, improved statistically significantly in deductive reasoning by second year and at exit from the course. It is reasonable to expect that the skill of deductive reasoning would develop for the first years and that the third years would gain further strength as they progress into fourth year and complete their internship.

The quantitative findings discussed to this point identify the differences in the critical thinking dispositions and skills of the undergraduate nursing students in this study. Findings revealed a *difference in overall critical thinking disposition* with the first years scoring positive and the third years scoring ambivalent and as such weak. Both cohorts scored in the positive category for open-mindedness, analyticity, inquisitiveness and maturity of judgment. Both cohorts were ambivalent or weak for truth-seeking, systematicity and critical thinking self-confidence. In relation to *differences in critical thinking skills,* overall critical thinking skill and the sub-skills of analysis, evaluation and inductive reasoning were moderate in strength. Inference was not manifested for both cohorts and while deductive reasoning was not manifested for first year nursing students it was moderate in strength for the third year students. Further knowledge is gained from the qualitative data and provides insights about the perceptions of nurse lecturers about critical thinking in the undergraduate nursing curriculum. The insights provided allow further inferences be made about critical thinking in the undergraduate nursing curriculum and these are discussed in the next section.

12.4 Nurse Lecturers' perceptions of critical thinking in the undergraduate nursing curriculum

To this point, the focus of the discussion has been on the differences in the dispositions and skills of the first and third year undergraduate general nursing students in context of the nursing curriculum. Qualitative findings which emerged from the interviews with nurse lecturers provide additional insights about critical thinking in the undergraduate nursing curriculum and the main findings are discussed in this section. First it is important to explain the characteristics of the nurse lecturers who participated in this study.

12.4.1 Demographics of the nurse lecturers

Eight lecturers who taught the undergraduate nursing curriculum volunteered to participate in an interview as per the recruitment process described in, Chapter 3, Section 3.12.4. Three of the lecturers were male and five were female. Six were educated at the PhD level and two were completing their PhD studies. All were registered nurses. Each lecturer also held a teaching qualification and was registered with An Bord Altranaisas as a Registered Nurse Tutor (RNT). The main findings of their perceptions about critical thinking in the undergraduate nursing curriculum are discussed in the following section.

12.4.2 Lecturers' perceptions of critical thinking in the nursing curriculum

To explore the lecturers' perceptions of critical thinking in the nursing curriculum a topic guide was used during the interviews (Appendix 21). Nine themes emerged from the qualitative data and these are identified in Appendix 32. Each of the themes provided insights about critical thinking in the undergraduate nursing curriculum. As was pointed out in the introduction to in Chapter 10, it was not feasible discuss all the themes in this thesis for two main reasons. One reason was that the qualitative data was less-dominant and complimentary to the quantitative data served to expand this study. The second reason was that the Delphi conceptualisation as the theoretical framework determined the inclusion of themes to compliment the quantitative data. Two very relevant themes which provide insights about critical thinking in the undergraduate nursing curriculum are discussed here: *'critical thinking in the curriculum'* and '*skills for critical thinking'*. The first theme, *'critical thinking in the curriculum'* had three sub-themes identified as *'implicitness', 'evidence'* and *'facilitation of critical thinking in the curriculum*'. The following descriptions for the sub-theme, *' implicitness'* revealed that critical thinking was perceived as implicit from an academic perspective, yet it was perceived as happening in the practice setting and influenced by reflective practice:

> Critical thinking is implicit in the curriculum, so we don't have it explicit, now in saying that I suppose critical thinking... stroke... reflective time seems to be more readily accommodated in clinical practice than it is here. (Lecturer 1)

The implicitness of critical thinking was related to a lack of understanding in undergraduate nursing students and there was a perception that if it was made more explicit it would be helpful to students:

> I don't think they know what's understood of them and I never make it explicit. So, I suppose I should make it explicit, I think that if they knew maybe that might help. (Lecturer 2)

Another lecturer perceived critical thinking as in need of more direct attention in the curriculum. While not a clear concept, critical thinking is widely discussed and addressed in reflective practice, evidence based practice and in the critique of articles:

> I think that it's not addressed directly in many curricula, I think that it's something that we probably need to, if I was to say one thing that we need to do in this regard is to actually address it more directly...I think we talk around it a lot ...there are concepts that are very closely related, things like reflective practice, the idea of, you know, we always talk about critiquing articles or we talk about evidence based practice. (Lecturer 5)

The above descriptions reveal that critical thinking is implicit in the undergraduate nursing curriculum and is perceived to be addressed in reflective practice and in evidence based practice. These findings mirror the conception of critical thinking in the context of '*evidence base'* identified by the Nursing Education Forum (Government of Ireland, 2000) and '*reflective practice'* as part of the Requirements and Standards for Nurse Registration Education Programmes (An Bord Altranais, 2000). The perceptions described above portray a limited perspective of critical thinking on the part of the lecturers in this study and points to the need for critical thinking to be addressed more directly in both the written curriculum and in teaching and learning across the curriculum. Making critical thinking more explicit through a curriculum statement that would permeate down to teaching and learning would enhance nursing students to grasp critical thinking in a more effective and direct way.

The second sub theme related to: *'evidence of critical thinking'.* Critical thinking was perceived to be evident in curriculum documents and in terminology and this is evident in the lecturer's following description:

> I think it is represented in the curriculum, in that, it's liberally written in whatever bit of the curriculum I've seen... so, in terminology it's there. (Lecturer 7)

Critical thinking was also viewed as explicitly represented in curriculum terminology, in module structure and in learning outcomes:

> I think its explicitly represented in module structure and particularly in statements of learning outcomes, and if you read learning outcomes you know, you see its representation in the official curriculum, in the proposed curriculum, in the explicit curriculum of instruction, that is,

represented in documentation like on-line and modular structures or in group modular structures, so its represented that way. (Lecturer 4)

Critical thinking was also perceived as evident in the discourse of nurse teachers when discussing the programme at curriculum meetings and especially at examination boards in context of the depth of learning:

I guess one way that it's represented is in the everyday discourse of the educators themselves,... if you sit around a meeting where you're discussing modules, a year, a program or particularly around times like examination boards, so in the everyday discourse of academics, we'll say... oh... its very superficial learning is being considered here or these were really excellent, really done well and students are really stepping up to the plate and they're really presenting some really high level thinking. (Lecturer 4)

Critical thinking is talked about. It is an expected outcome and expected of students as they go through the course and this was evident in the following lecturer's description:

We do talk about it quite a bit and it is there...you know... in terms of... you know, what sort of students are we going to churn out at the end of the day and there's five or six headings, one of which is a critical thinker, I'm not exactly too sure where it is though, we just sort of expect students as they go along to become more critical, that's the feeling I get about it. (Lecturer 1)

Critical thinking was perceived as higher order learning incorporating the skill of analysis and evident towards the end of the programme in projects, grades awarded and discussion with external examiners. It was also acknowledged that there was doubt if the higher order learning discussed applies to the entire cohort of graduates or if lecturers are clear about critical thinking:

At the end point of a program we tend to have things like a project, we have certain things in the final three or four years that we can speak to and say, yes, that student is demonstrating or that cohort that we just assessed in that major project work, when we look at the ... and when our external examiners discuss it and when we grade, we can say that there is evidence of certain higher order learning and

> there's certain analysis going on and there's certain (inaudible) going on, I'm not so sure that we're actually necessarily clear about whether our graduates are getting that or not as a cohort or whether in fact we're actually clear ourselves about it. (Lecturer 4)

Critical thinking was perceived as non-essential and it was considered present in students who obtain the top marks in the academic component of the degree course at the end of the four years, while students who achieve a pass grade do so by regurgitation of knowledge and are considered to be devoid of critical thinking. The following description of a nurse lecturer confirms this:

> I suppose the students who would begin to show elements of it would be getting the top marks, whereas those students who just produce knowledge will be barely passing, but it's not a requirement to pass the course, you can pass the degree course by demonstrating very little in terms of critical thinking skills. (Lecturer 7)

To summarise, the above findings provide insights about the lecturers' perceptions of critical thinking in the undergraduate nursing curriculum. Critical thinking is evident in the discourse of lecturers, in curriculum terminology and in grades awarded towards the end of the course. There appeared to be doubt about lecturers understanding of critical thinking and whether critical thinking is achieved by a whole cohort versus those with high grades and who demonstrate ability in analysis. This finding is reflective of the sentiment in a submission to the Nursing Education Forum (Government of Ireland, 2000) which indicated that 'the nursing degree will foster a *'cadre'* of critical thinkers'. These findings appear to indicate that there is a lack of understanding about critical thinking among the nurse lecturers in this study. There also appears to be a limited perception of the skills of critical thinking with analysis emerging as a significant skill towards the end of the nursing degree course. Knowledge was identified in the literature review by Beyer (1987) as a component of critical thinking together with dispositions and skills. High grades in the theoretical component at the end of the course, with students getting the highest grades, seen as critical thinkers, while those getting lower grades possess knowledge but may be critical thinkers. Again, these perceptions indicate a lack of understanding of critical thinking.

The third sub-theme under the theme 'critical thinking in the curriculum' was *'facilitation of critical thinking.'* It was perceived that critical thinking has not been addressed since the degree course commenced in September 2002. Critical thinking was perceived as not happening in the academic setting and that it should have been given more attention. There was some consolation in that critical thinking is perceived to be happening in clinical practice. There was also some doubt as to whether students were becoming critical thinkers or getting better at it:

> I really maintain that here we haven't in the last eight or nine years, we haven't harnessed the good ones and developed the other ones, and maybe students develop over time, I don't know...but I suppose from our own point of view I'd be of the opinion that we should really have been grabbling with it more so than we have been... definitely. But in saying that, the good thing is... as I said, that we get it in practice, but...I would say it's probably not happening in the academic... I mean... I meet my students regularly and what not, as do others, and there's a bit of sort of critical thinking talk goes on there but in terms of... you know... are students becoming more critical thinkers, are they becoming better at it, I don't know if they are. (Lecturer 1)

Critical thinking was considered to be integrated into the curriculum which in effect meant that it was never facilitated but expected. It was perceived, that while represented in assignments, students were not getting what critical thinking is. There was concern that content was being delivered but critical thinking was not facilitated when the perception is that critical thinking is integrated into the curriculum:

> If you were to say to me where is the critical thinking, I could say to you... well... it's integrated into everything and we all know what happens with integrated, integrated can mean that it's never... it's always mentioned but never actually facilitated, or you expect critical thinking in the assignment but you don't tell them how are they going to get there. (Lecturer 3)

There was a perception that lecturers are discontented with the absence of critical thinking in factual and descriptive knowledge in student's academic work:

> Educators will bemoan if they see students reproducing facts in a non-critical way, that kind of finding out, they're saying there's no

> evidence of analysis here, the students are simply stating facts and they're showing very descriptive knowledge but they're not really as it were showing evidence, so it's this bemoaning and that comes across in every day discourse. (Lecturer 4)

In relation to the facilitation of critical thinking, it is very clear from the descriptions of the nurse lecturers that critical thinking has not been fully addressed in the undergraduate nursing curriculum and there was some consolation that it may be happening in clinical practice. Critical thinking was considered integrated and as such not happening. It is talked about and acknowledged as an outcome of the course and its absence bemoaned by lecturers in student's written work and absence of analysis. These findings appear to suggest a rather restricted perception with analysis as the dominant skill of critical thinking and that factual knowledge is undervalued and may not be seen as relevant or having a contribution to critical thinking. This concern was evident in the following statement by a nurse lecturer:

> I think there is a risk that descriptive knowledge is not valued, that if you're not hitting that mark then it's not important, where of course that is not true, to get to critical thinking you've got to hit these other levels first. You've got to know facts and you've got to comprehend facts and that's very, very important point. (Lecturer 4)

Critical thinking in the curriculum emerged as a theme with three sub-themes: *critical thinking as implicit in the curriculum, evidence, and facilitation of critical thinking in the curriculum.* The knowledge derived provides an insight about critical thinking in the undergraduate nursing curriculum. Given these insights, those involved in nurse education need to develop their own knowledge of critical thinking in order that it may be enhanced at all levels in nurse education. The apparent lack of understanding and the perception that critical thinking is poorly addressed is detrimental to the development of critical thinking dispositions and skills. It is likely that the weak dispositions and skills of the undergraduate nursing students in this study, and especially at third year, has been influenced by the way in which critical thinking is perceived and approached in the undergraduate nursing curriculum.

12.4.3 Lecturers' perceptions of critical thinking skills in the nursing curriculum

Skills for critical thinking emerged as a theme from the interviews with the nurse lecturers. Three sub-themes emerged which reflected *'cognitive skills', 'literary skills'* and *'interpersonal skills'* as skills for critical thinking. Here we see the impact of the Requirements and Standards for Nurse Registration Education Programmes of An Bord Altranais (2000) and the Nursing Education Forum (Government of Ireland, 2000) in relation to the sub-themes which emerged from the data. While these are considered important skills they were perceived as skills for critical thinking and it appears that the nurse lecturers were unable to think beyond these in relation to critical thinking skills. Only the sub-theme of cognitive skills is addressed here as it was the most prevalent across the interviews with the lecturers. The cognitive skills identified were; *analysis, decision-making, and problem-solving* and this was reflected in the following lecturers description:

> My view of critical think is if you have an enquiring mind...that it represents some ...analysis in it and rationale... why you're doing a particular thing or why you take that particular pathway it would incorporate decision making ... problem solving. Lecturer 6

Critical thinking was perceived as an ability to look at things from different perspectives. Skills were identified which reflected Bloom's taxonomy for educational objectives, such as; *analysis, synthesis, evaluation* and *application.* The following descriptions reflect what the lecturers perceived as skills for critical thinking:

> Critical thinking is the ability to be able to think about things from various angles and to be able to sort of summarise and put them together, the various ideas into something else. And then to look at that, I suppose it would be, as I say it reminds me of analysis, synthesis and evaluation... that sort of level. (Lecturer 2)

Critical thinking was perceived as the ability to analyse, and it's synonymous with critical thinking:

> Weighing up the information you have and if you're weighing up another word for that if you want ...you are analysing, you know, what I think is a critical thinker is someone that analyses the information

> the information just doesn't come to you, you actually process that information. (Lecturer 8)

For another lecturer while analysis was perceived as a skill for critical thinking the ability to use analysis to challenge assumptions and seek deeper meaning to arrive at an evaluated judgment was necessary for critical thinking:

> To me critical thinking is a form of thinking, a cognitive process that doesn't accept facts and propositions at face value but is willing to take those facts and propositions and ideas and tenets and so forth and analyse them, you know, dig a little bit deeper about the assumptions that underpin those facts, propositions and tenets and maybe even to come to some kind of an evaluated judgement about the merits or the demerits of those facts, propositions and so forth. (Lecturer 4)

This perception reflects a much more broad view and captured more elements of critical thinking in terms of the use of the skill of analysis to check assumptions, source more information in order to arrive at an evaluated judgment. Checking of assumptions is considered a very important component of critical thinking. According to Brookfield (2012) challenging of assumptions through analysis and evaluation of evidence is necessary for informed judgment and adds to the quality of critical thinking. The above lecturers' description indicates an awareness of the importance of assumptions as an important and necessary component of critical thinking.

Critical thinking was seen as higher level thinking and achieved through the skills of analysis, synthesis and application. Use of these skills was perceived as synonymous with critical thinking:

> Well... critical thinking to me is the ability to take something beyond what you're given on paper or in a lecture and actually apply it in some way that makes... either to a clinical situation which is a real aim but even to actually link two pieces of information together and actually come up with something new. So it's really, it is an analysis, a power of analysis at a very... it can start at a very basic level and it moves up higher depending on where you're coming from. (Lecture 3)

Lecturers' critical thinking skills were identified as the ability to assess, evaluate and question. Source information, analyse, synthesise and apply it:

> A critical thinker is somebody who will....in the first instance, assess the situation as it is...look at it... look at what is going on... evaluate it ...what's the strengths of it...what are the weaknesses of it... and then begin to question... question the strengths, question the weaknesses...and begin asking is there a better way to do this and...questioning ... evaluating and questioning is definitely one...then information seeking is your third characteristic and knowing how to get the information and then knowing what to do with that information...so ...knowing how to...analyse it ...knowing how to synthesise it...knowing how to apply it to the situation that they are in. (Lecturer 7)

The ability to transfer and apply knowledge was identified as a skill for critical thinking:

> It's that ability to transfer the knowledge you got from one situation to another. So you know that idea of transference of knowledge would be characteristic of critical thinkers. (Lecturer 3)

Skill for reflection and information seeking were also identified for critical thinking:

> Well they need the skill of reflecting... they would need the skill of information searching... It's linked in with the whole thing about skill of effective change management...the skill of... effective communication...the skill of assertiveness...but that is also a characteristic...do you know what I mean... they are linked...the characteristic often comes out in the skill. (Lecturer 7)

> Then you would need your ability to reflect, you know and that's where I always think reflection is always bandied around as something that we should teach students, its one critical thinking skill and I think reflection, that's where... we are looking at in reflection but we narrow it down so tightly, that we can lose the whole essence of what it's about. (Lecturer 3)

The qualitative findings reported above identify what the lecturers in this study perceived as the skills of critical thinking. *Problem-solving* and *decision-making* were identified as skills of critical thinking and these findings are consistent with those

reported in the literature review (Boychuck Duchscher, 2003; Gordon, 2000; Turner, 2005; Walthew, 2004). Beyer (1987) identified problem-solving and decision-making as strategies which require critical thinking. *The nurse lecturers also identified skills such as analysis, synthesis, evaluation and application of knowledge as the skills of critical thinking.* These skills reflect Bloom's taxonomy (Anderson & Krathwohl, 2001) and given their prevalence in the interviews they are highly valued by nurse lecturers and considered synonymous with critical thinking. The emphasis on these skills and especially the skills of analysis and evaluation in the nursing curriculum may have influenced the statistically significant higher scores of third year nursing students' critical thinking skills. However, despite the emphasis on these skills they did not reach the strong category.

The qualitative findings reported here provide an added perspective and compliment the quantitative findings which revealed differences in the critical thinking skills of the first and third year nursing students. *It was somewhat disappointing that, the third years were weaker than the first years for the dispositions of open-mindedness, analyticity, systematicity, critical thinking self-confidence and inquisitiveness. They did not move from the weaker category of ambivalence for the skills of truth-seeking and maturity of judgment and remained weak for overall disposition towards critical thinking.* While they gained in *overall critical thinking skill* and in the skills of *analysis and evaluation* as well as ind*uctive reasoning,* they did not score in the *strong category* and remained weak for the skills of *inference and deductive reasoning*. It was also evident, and discussed earlier in the previous section, that use of *'evidence base'* and '*reflective practice'* constituted critical thinking for the graduate nurse (An Bord Altranais, 2000; Government of Ireland, 2000). This clearly reflects a lack of understanding of what constitutes critical thinking and the reaction of curriculum planners to include critical thinking in the nursing curriculum without a full understanding. This mirrors the point made in the literature review by Rubenfeld and Scheffer (2006, p. 253) that nurse educators have 'jumped on the bandwagon' and been reactive to curriculum requirements and strived to achieve critical thinking without fully understanding what critical thinking is and how it should be best achieved. More is required in the preparation of undergraduate nursing students to enhance critical thinking and recommendations from this study will contribute the enhancement of critical thinking in Irish nursing education.

12.5 Summary of the differences in critical thinking dispositions and skills of the undergraduate nursing students

The main differences in the critical thinking dispositions and skills scores of the first and third year undergraduate nursing students discussed in this chapter are summarised here. *The first year nursing students were positive for overall critical thinking disposition while the third year nursing students were ambivalent and as such they were weaker in overall disposition. However, as the difference between the two cohorts was not statistically significant, as such, there was no real difference in overall critical thinking disposition scores.* Both first and third year nursing students were *positive* for open-mindedness, analyticity, inquisitiveness and maturity of judgment with average scores above the cut-off score of 40.00. They were *ambivalent* for truth-seeking, systematicity and critical thinking self-confidence. Their scores were below 40.00 on these sub-scales and they were considered weak. The third year nursing students scored slightly lower than the first years for five disposition sub-scales of, open-mindedness, analyticity, systematicity, critical thinking self-confidence and inquisitiveness and as such they were weaker. Inquisitiveness was the only sub-scale for which the difference was statistically significant. The third year nursing students scored slightly higher than the first year students for truth-seeking and maturity of judgment. However, the difference was not statistically significant. For both first and third year nursing students truth-seeking was the weakest while inquisitiveness was the strongest disposition. *In effect, there was no difference in the critical thinking disposition subs-scales between the first and third year nursing students apart from the statistically significant difference in inquisitiveness and the score was lower for the third year nursing students compared to the first year students.*

The slightly lower scores for both cohorts of nursing students for the dispositions of open-mindedness, analyticity, systematicity, critical thinking self-confidence and inquisitiveness raise concern and especially so for the third year nursing students with lower scores indicating they were weaker that the first year nursing students. The weaker disposition scores of the undergraduate nursing students indicate the need for attention, not just for the weak dispositions, but also for the attributes of the all seven critical thinking dispositions to enhance these in the nursing curriculum. It is reasonable to expect that both first and third year nursing students would achieve higher scores with progression through the course. For the third year nursing students, transition to the fourth year includes internship and engagement in the practice setting with greater

responsibility for patient care combined with structured reflective time. This is likely to enhance critical thinking dispositions as well as overall critical thinking disposition. However, a further study is required to confirm this.

It may be suggested, that the higher scores in the first year nursing students were determined by their early stage in the course, the challenges of the curriculum and the novelty of entering the nursing profession as their career of choice. They are likely to be more motivated and the curriculum experiences may appear more exciting, but by the third year there is familiarity with the curriculum and the novelty may be considered to have worn off and their disposition to think critically lacks stimulation. This indicates the need for a more proactive approach in the nursing curriculum to develop a more positive disposition towards critical thinking. Without the appropriate positive dispositions and encouragement to foster dispositions nursing students are potentially less likely to engage in critical thinking.

The first and third year nursing students in this study were moderate in strength for overall critical thinking skill. This was similar to nursing students at the same level internationally (Colucciello, 1997; Profetto-McGrath, 2003; Spleic et al., 2001). Both first and third year nursing students were *moderate* in strength for the skills of analysis and evaluation. Inference skill was weak and both first and third year students scored in the category of *not manifested*. In relation to reasoning skills, both first and third years were *moderate* in strength for inductive reasoning and the third years scored statistically significantly higher than the first years. For deductive reasoning the first years were weak and did *not manifest* this skill while the third year nursing students scored slightly higher and just reached moderate strength. However, the difference was not statistically significant.

Critical thinking requires both positive dispositions and strong skills. In this study, the third year nursing students scored lower in overall disposition and five of the disposition sub-scales compared to the first years with the exception of truth-seeking and maturity of judgment for which the third year students had slightly higher scores. Although the third years scored higher for these two dispositions the improvement in maturity of judgment, in the positive category, was only slight, while the improvement in truth-seeking, in the ambivalent or weak category, was also only slight. Third year nursing

students scored higher than the first year students for the critical thinking skills of analysis and evaluation as well as for the skill of inductive reasoning. The skills of inference and deductive reasoning were weak for both cohorts. *In general, the third year nursing students did not appear to have stronger critical thinking dispositions and skills, compared to the first year nursing students, to a strength that is necessary if the graduate nurse is to practice as a critical thinker in their professional role. This indicates the need to place stronger emphasis on both critical thinking dispositions and skills, not only in the undergraduate nursing curriculum, but also in teaching pedagogies used by nurse educators.*

The qualitative findings revealed that the nurse lecturers in this study perceived that critical thinking was implicit in the nursing curriculum. Critical thinking also lacked understanding among nurse lecturers. It was perceived as evident in curriculum terminology, in the discourse of lecturers and in the written curriculum documents. It was also evident in the achievement of high grades on completion of the course and in the graduate nurse who could use the skill of analysis. The qualitative findings also revealed that critical thinking is not adequately addressed in the nursing curriculum and it is perceived to develop in clinical practice. *Findings revealed that the lecturers perceived skills of analysis, synthesis, evaluation and application as skills of critical thinking.* This strongly reflected Bloom's taxonomy of educational objectives and is not overly surprising given that Bloom's taxonomy is a rather dominant model which the nurse lecturers in this study subscribed to in the context of nursing education. *Literary* skills, such as information seeking was perceived as a skill for critical thinking. *Problem-solving* and *decision-making* were considered skills for critical thinking. *Interpersonal skills* for communication and *self-management* in terms of coping with stress were also considered as skills of critical thinking. This is somewhat consistent with findings is reported in international literature in relation to faculty and nursing students perceptions of critical thinking ((Boychuck Duchscher, 2003; Raymond & Profetto-McGrath, 2005; Twibell et al., 2005; Walthew, 2004)

The findings for the differences in critical thinking dispositions and skills of the first and third year undergraduate nursing students, their perceptions and the perceptions of the lecturers about critical thinking have been discussed and summarised. The discussion has given rise to considerations about the performance of the nursing students in

critical thinking dispositions and skills and how these constructs interact with each other. The Delphi conceptualisation and derived constructs as the framework for this study also gave rise to implications for nursing education in the Irish context. The performance of the undergraduate nursing students in relation to critical thinking dispositions and skills and how they interact is discussed next followed by a discussion of the implications for nursing education in the Irish setting.

12.6 Differences in performance and interaction of critical thinking dispositions and skills of undergraduate general nursing students

It is acknowledged that strong critical thinking skills depend on positive critical thinking dispositions and according to Facione and Facione (2010, p. 4) one must be disposed to think critically as well as have the skills to do so. However, one may have positive dispositions and be poor in critical thinking skill and there is also the potential for the opposite to exist. This appears to indicate the variable nature of critical thinking and gives rise to some speculation as to why this is likely to occur. An individual may choose to engage or not engage in critical thinking and the consideration here is the influence one has over their own critical thinking performance. This investigation used a case study approach incorporating mixed methods and it was also cross-sectional in that data were collected from two different cohorts of first and third year nursing students at one point in time. Differences were found between the cohorts in relation to critical thinking dispositions. Third year nursing students were overall weaker and scored lower in all disposition sub-scales compared to the first year nursing students. Both cohorts scored in the same categories for the disposition sub-scales. While both cohorts were different a concern arises as to why the third year nursing students scored slightly lower in critical thinking dispositions. The third year nursing students scored higher for critical thinking skills apart from the skill of inference which was not manifest in either cohort. Higher scores among the third year nursing students is somewhat reassuring for the skills of critical thinking. As they were moderate in strength with scores only slightly higher than the first year nursing students it highlights the need to further enhance critical thinking skills. While it is not possible to state categorically why these differences occurred for dispositions and skills of critical thinking, some speculation can be considered as to why the differences may have occurred. Bothe cohorts experienced a curriculum with similar curriculum requirements,

however, a range of factors aside for the curriculum such as, age, maturity, teaching pedagogies and assessments are likely to impact critical thinking.

The third year nursing students were older and therefor more mature by virtue of their *age* and this may have had an influence on their critical thinking skills. *Motivation* may have influenced the differences in the scores between the cohorts. On the other hand lack of motivation or a complacent attitude may have influenced the dispositions while motivation brought about through engagement with assessments may have enhanced the skills, especially the skills of analysis an evaluation. The stronger emphasis on these skills in the nursing curriculum and by nurse educators in teaching and assessment are likely factors which may have strengthened these skills, especially in the third year nursing students. *Socialisation* into the nursing profession may be considered likely to have had greater impact on the third years at a more advanced stage on the course compared to the first year cohort at an early stage. The process of socialisation into nursing and their experiences as well as adoption of values of the profession may have influenced their critical thinking dispositions and skills. However, the positive or negative impact remains to be determined. Another factor to consider is the nursing curriculum with its disciplinary content, teaching pedagogies and assessment methods which may have influenced the slightly stronger critical thinking scores of the third year nursing students. Clinical practice was greater for the third years at the time of testing in this study and this experience and achievement in clinical competence may have contributed to the differences between the cohorts. The factors considered above provide an indication of the factors which impact critical thinking as well as challenge the assessment of critical thinking. The above factors can be considered to have influenced critical thinking dispositions and skills of the undergraduate nursing students. However, it is not possible to determine from this study the nature and extent of any of these influences. To determine this, further investigations are required.

While the above factors provide some considerations about the differences in the critical thinking dispositions and skills, further speculation arises in relation to the likely interaction of dispositions and skills. Both cohorts were ambivalent or weak for truth-seeking and critical thinking self-confidence dispositions, while inference skill was not manifested for either cohort. If the dispositions of truth-seeking and critical thinking

self-confidence were positive then it is possible that inference skill would gain in strength, since students would be likely to make stronger efforts to seek truth and gain confidence in their own reasoning. Inductive reasoning was moderate in strength for both cohorts and it is also possible that the cultivation of more positive attitudes in truth-seeking and self-confidence dispositions would strengthen inductive reasoning through drawing inferences from knowledge and curriculum experiences. Deductive reasoning was not manifested in the first year nursing students and moderate for the third year cohort. Here again, more positive dispositions in truth-seeking and critical thinking self- confidence dispositions is likely to develop this at an early stage. It is likely that the lower score for the skill of deductive reasoning for the first year cohort may be related to the fact that they were entering from school and adjusting to knowledge utilisation as opposed to knowledge recall, a significant feature of their secondary school education. The third year cohort just reached moderate strength and it appears they were just beginning to master the skill of deductive reasoning.

In consideration of the above it is not possible, in this study, to confirm or attribute the differences in dispositions and skills measured to these factors or determine their impact on critical thinking. Critical thinking requires dispositions and skills and positive dispositions are likely to impact on and determine the strength of critical thinking skills. On the other hand, one's own reasoning can come to play, in a conscious way, and one can decide to be positively disposed to think critically or decide not use critical thinking skills, irrespective of the nature of one's disposition or strength in critical thinking skills. Also, knowledge of the attributes of the dispositions can be considered to bring greater awareness and having such knowledge can also be considered beneficial as it can lead one to use their critical thinking skills more effectively and especially when critical thinking is according to Ennis (1987) deciding what to believe or do. This has impact for nursing students and for nurse educators. If nurse educators are aware of the attributes of the dispositions and the skills of critical thinking they may be considered likely to have more potential to promote them. The qualitative findings from this study revealed poor knowledge and understanding about critical thinking among the nursing students and the lecturers. However, the value of critical thinking was acknowledge and requires more input in teaching pedagogies to enhance it. This investigation of critical thinking gave rise to implications for nursing education and the assessment of critical thinking and these are discussed in the next and subsequent section.

12.7 Implications Arising for Critical Thinking in Nursing Education and the Assessment of Critical Thinking

The findings of this case study discussed in Chapters 10, 11 and in this chapter gave rise to implications for critical thinking in nursing education in Ireland. First is to address the implications of the appropriateness of the Delphi conceptualisation for nursing education. Second is to address implications for nurse educators, the nursing curriculum and for the enhancement of critical thinking in the nursing curriculum. Third, is to address implications in relation to the conceptualisation and measurement of critical thinking in research.

12.7.1 Implications arising for the Delphi conceptualisation in nursing education

The Delphi conceptualisation provides a theoretical statement of the ideal critical thinker. This conceptualisation can be viewed as providing a bench mark or ideal to be aspired to for the development of critical thinking. The derived constructs of dispositions and skills as well as their attributes can be used as a guide to achieve critical thinking. Nurse educators as well as educators in all other disciplines, in Ireland continue to aspire towards critical thinking as an attribute of higher level learning. The Delphi constructs and attributes provide a means for nurse educators to enhance positive dispositions and strong skills in nursing students, both undergraduate and post graduate. It was evident from the findings of this study that the nurse educators were not fully aware or clear of what constituted critical thinking. A clear understanding of conceptualisation of critical thinking, such as that set out in the Delphi conceptualisation provides a framework, not only for research as used in this study, but a very appropriate and applicable framework to enhance critical thinking. Teaching pedagogies focused around the attributes of dispositions and skills would serve to enhance critical thinking in nursing education in the Irish setting. While the Delphi conceptualisation can be considered appropriate for nursing education there are further implications arising for nurse educators, the nursing curriculum and the enhancement of critical thinking in the undergraduate nursing curriculum, these are subsequently addressed here.

12.7.2 Implications arising for nurse educators

The nurse lecturers in this study perceived that critical thinking was implicit and poorly addressed since the new degree course commenced in 2002. Critical thinking was

considered achieved with high grades in knowledge and with achievement of clinical competence on completion of the course. From this perspective it appears that critical thinking was considered embedded in knowledge and in clinical practice. This also appears to reflect the view of the Nursing Education Forum (Government of Ireland, 2000) who considered critical thinking embedded in evidence based practice. The implication here for nurse educators is that critical thinking requires more than curriculum content as knowledge and evidence based practice. It implies limited knowledge and understanding of critical thinking also identified by the nurse lecturers in this study. In the absence of a clear understanding nurse educators may not effectively nurture critical thinking in undergraduate nursing students. They cannot afford to expect that knowledge transfer, evidence based practice and clinical placement as independent entities will effectively enhance and nurture critical thinking without further consideration and nurturing. Nurse educators have the potential to nurture critical thinking and this was evident in the development of the skills of analysis and evaluation identified in this study. Qualitative findings revealed that both the nursing students and the lecturers were familiar with and developed the skills of analysis and evaluation. This reflected components of Bloom's taxonomy of educational objectives, a taxonomy which the lecturers in this study were familiar with to stimulate and achieve these two important critical thinking skills. However, more is required from nurse educators in terms of dispositions and skills of inference and reasoning as well as challenging assumptions to enhance critical thinking. Another implication of limited knowledge and understanding of critical thinking may impact on the ability of nurse educators to assess and effectively evaluate critical thinking. Over a decade ago Profetto-McGrath (2003) in a Canadian study, identified the need for nurse educators to know what to assess in relation to critical thinking. This is very relevant to nurse educators in Irish nursing education today and attention is required not only to address their awareness but also to develop their ability to assess and evaluate critical thinking. If nurse educators do not fully understand critical thinking the question is: how can they be expected to nurture it? The likely result is poor critical thinking development in undergraduate nursing students.

Nurse educators in this study identified literary skills of information seeking, problem-solving, decision-making and reflective practice as skills of critical thinking. Interpersonal skills for communication and self-management in terms of coping with stress were considered skills of critical thinking. This reflects outcomes of the

undergraduate nursing degree course commensurate with the Requirements and Standards for Nurse Registration Education Programmes (An Bord Altranais, 2000). These outcomes are well represented in the nursing curriculum and nurse educators are more knowledgeable about and experienced in their achievement, thus, they are actively enhanced in their teaching pedagogies. The same cannot be said for critical thinking and as was pointed out above critical thinking is considered to be achieved, embedded in knowledge and evidence based practice. This is possibly a reason for the perceptions of critical thinking by the nurse lecturers in this study and it gives rise to an implication for An Bord Altranais to provide stronger guidance for nurse educators on critical thinking. Internationally, in North America, nursing bodies responsible for nurse education such as the National League for Nursing in 1992 and the National League for Nursing Accrediting Commission in 1996 provided required outcome criteria for critical thinking (Shin et al., 2006a; Stewart & Dempsey, 2005). In Canada, the Alberta Association of Registered Nurses (AARN), in 1999, included critical thinking as part of the Nursing Practice Standards (Raymond & Profetto-McGrath, 2005). Stronger guidance such as that in North America would be a step forward to enhance critical thinking in the Irish setting among nurse educators, the nursing curricula, and in nursing practice. The findings from this study have given rise to implications for nurse educators and An Bord Altranais which need to be considered to enhance critical thinking at both undergraduate and postgraduate levels. There are also implications for critical thinking in the nursing curriculum and these are addressed next.

12.7.3 Implications for critical thinking in the nursing curriculum

This study gives rise to implications for critical thinking in the nursing curriculum. A curriculum provides educational experiences and in the case of the nursing curriculum a theoretical component with knowledge acquired in the academic setting for application in a clinical practice setting. The traditional models of nurse education, apprenticeship and registration-diploma, were not deemed adequate to prepare the nursing profession to meet the demands of a changing health service (Fealy, 2006). With the new degree course and transition of nurse education to the higher education sector a stronger interest developed in higher level learning and critical thinking. Nurse educators were charged with designing a new curriculum to enhance higher level learning and critical thinking. Critical thinking was considered of such importance that is was a main outcome of the undergraduate nursing degree at national level. The findings of this study among two cohorts of undergraduate nursing students, at two

university sites revealed weaker dispositions scores for the third year nursing students compared to the first years. The third year nursing students had only slightly higher scores for four of five critical thinking skills and they appeared to have the same strength as the cohort of first year nursing students. These findings are not as surprising when considered in context of the qualitative findings which revealed that first and third year nursing students indicated they were not aware of the skills of critical thinking. The findings for the lecturers revealed that critical thinking is implicit in the nursing curriculum, is talked about, evident in the discourse of nurse lecturers but not well addressed, if at all, since the degree course commenced and needs to be more made more explicit. The implication here is, that while educators espouse critical thinking in discourse there appears to be a weakness in developing it through the curriculum experiences and in teaching pedagogies. This study did not focus on the curriculum or teaching pedagogies as a cause of critical thinking, but nevertheless based on the findings highlight the need to enhance and nurture critical thinking.

It is also important to acknowledge that aside from the nursing curriculum other variables impact on critical thinking such as, age, maturity, stage of development and motivation. There is also the hidden curriculum and its impact on critical thinking. The impact of these variables is beyond full consideration this study and they provide a focus for future studies to assess their impact on critical thinking. While the nursing curriculum specifies the educational outcomes for higher level learning and critical thinking there are inherent implications for teaching pedagogies in the curriculum which aim to enhance and nurture critical thinking. If the teaching pedagogies used by nurse educators are to enhance critical thinking then it is necessary to work with disciplinary knowledge using teaching pedagogies in ways that stimulate thinking and nurture positive dispositions and strong critical thinking skills. Approaches to enhance thinking and critical thinking and their implications are discussed next.

12.7.4 Implications for the enhancement of critical thinking in nursing education

Components of the nursing curriculum perceived by the lecturers, in this study, to achieve higher level learning and critical thinking included disciplinary knowledge, evidence based practice, reflection, research skills and nursing process. Strong emphasis was also placed on the development of the skills of analysis and evaluation, components of Bloom's taxonomy. These components of the nursing curriculum and

the teaching pedagogies to achieve them emphasised knowledge transfer and the application of knowledge to clinical practice to achieve critical thinking. It was perceived by the lecturers in this study that critical thinking would happen in clinical placement. The components of dispositions and skills as well as challenging of assumptions, necessary for critical thinking, did not appear as evident. An implication arises here in that teaching pedagogies to transfer knowledge in the hope that critical thinking will happen in clinical practice does not go far enough to nurture thinking and critical thinking in undergraduate nursing students. More active approaches are required and these are discussed next.

Two approaches to enhance thinking identified by McGuinness (2005) are, *enrichment approaches* which focus on general thinking strategies such as, instrumental enrichment, cognitive acceleration and use of philosophical perspectives and *infusion approaches.* Infusion approaches include, thinking skills and meta-cognitive strategies, the Activating Children's Thinking Skills (ACTS) Project in Northern Ireland and types of intelligences. An explanation of all of these approaches is beyond exploration here and a detailed explanation of these approaches is provided in McGuinness's work and included in the reference list. While enrichment and infusion approaches are relevant to nursing education the Activating Children's Thinking Skills (ACTS) as an infusion approach is considered here as it has potential for application in the undergraduate nursing curriculum. The infusion approach is defined by McGuinness (2005, p. 115), based on 'Webster's Dictionary' definition of infusion which is to, *'introduce into one thing a second thing that gives it extra life, vigour and a new significance'*. According to McGuinness (2005, p. 115), 'infusion in the context of teaching thinking, means that the teaching of curricular content is infused with explicit instruction in thinking, with developing of understandings of the kinds of thinking that might be required and with being strategic and self-regulatory about one's own thinking' (p115).

The ACTS infusion approach although designed for children, offers concepts which are both useful and practical as an approach for consideration and application in the undergraduate nursing curriculum. The core concepts identified are, *explicit, active, challenging, dialogue, disposition, and beliefs. The* use of *meta-cognition* provides the overarching cognitive approach to these concepts and serves to invigorate and give significance to thinking. *Explicitness* pertains to, meaningful learning, flexible thinking

and reasonable judgments. *Active* pertains to, searching out meaning, imposing structure, thinking flexibly, going beyond information given, adopting a critical attitude to information and argument as well as communicating effectively. *Challenging*, pertains to, non-routine, more complex thinking to reveal multiple solutions, judgments, interpretation imposing meaning, finding structure, needing effort and self-regulation. *Dialogue* pertains to, bringing conceptions or misconceptions to the classroom where new knowledge is socially constructed not only through teacher instruction but through reflection and dialogue. *Disposition* pertains to, support for open-minded attitude about the nature of knowledge and thinking to create and educational atmosphere where talking about thinking, questioning, predicting, contradicting doubting is not only tolerated but actively pursued. *Beliefs* pertains to, a shift in the pupils' and teachers' beliefs about the nature of learning and thinking, realising that learning to think is possible, and that teaching thinking may be a form of cognitive coaching rather than direct instruction. *Meta-cognition* pertains to, thinking about one's thinking and reflecting on one's strategies for thinking and this is considered a powerful tool for promoting thinking skills curriculum. The adoption of the above concepts identified by McGuinness (2005) for infusion to invigorate thinking offers strong potential for an approach to enhance critical thinking in both the undergraduate nursing curriculum and among nursing students.

Other approaches for consideration by nurse educators for infusion of critical thinking across the curriculum are Bloom's taxonomy (Anderson & Krathwohl, 2001) and Facione's Holistic Critical Thinking Scoring Rubric (Facione & Facione 1996). Bloom's taxonomy with broad categories address cognitive skills in relation to, remembering or recall of information, understanding, applying, analyzing, evaluation and creation at the highest cognitive level provide an approach to the development of higher level learning and thinking (Anderson & Krathwohl, 2001). Facione's (1996) Holistic Critical Thinking Scoring Rubric also provides an approach for infusion to nurture dispositions and skills of critical thinking. The Holistic Critical Thinking Scoring Rubric provides a pedagogical guide for modelling and nurturing critical thinking in the classroom or clinical setting to externalize critical thinking (Facione & Facione 1996). Infusion approaches with emphasis on the concepts and metacognition identified above by McGuinness (2005), Bloom's taxonomy, and Facione's Holistic Critical Thinking Scoring Rubric for externalizing critical thinking have strong potential to enhance critical thinking in undergraduate nursing students. Infusion approaches have strong potential to move

from critical thinking as discourse among nurse educators to activation of critical thinking in the undergraduate nursing curriculum. The use of these infusion approaches also warrants further research to evaluate their effects on the development of critical thinking in undergraduate nursing students. While this study was a case study incorporating mixed methods and a cross-sectional design with a focus on two different cohorts across two university sites a longitudinal study would provide stronger evidence of the development of critical thinking over time.

The transfer of nurse education to the higher education sector was deemed to lead to higher level learning and critical thinking. The knowledge component is addressed in the curriculum in teaching pedagogies, through increased theoretical input and through assessment. Nurse educators in this study perceived that students who received high grades at the end of the course were critical thinkers. This appears to be the only measure of critical thinking available at this point in time. The findings of this case study, although with two different cohorts at two sites, revealed knowledge of the critical thinking ability of these nursing students. The third year nursing students had lower disposition scores, in the weak category, compared to the first year cohort with stronger scores in the positive category. Third year nursing students had similar strength to the first year nursing students for critical thinking skills. A concern is that, the move to the higher education sector with greater emphasis on higher level learning and critical thinking appears to have given more attention to knowledge and pedagogies to enhance knowledge transfer than to nurturing critical thinking. Evidence based practice was also considered to achieve critical thinking and nurse educators took this on board and as Rubenfeld and Scheffer (2006, p. 253) state, 'jumped on the bandwagon' by reacting to requirements of national bodies without fully understanding what critical thinking is or how it should be best achieved. The findings for the nurse lecturers, in this study, revealed their lack of knowledge of critical thinking skills apart from analysis and evaluation. While greater awareness and understanding is required there is a greater need to be more pro-active in the nurturing critical thinking through the infusion approaches identified above. Without these approaches knowledge transfer is likely to continue without the activation of thinking and critical thinking. The implications addressed to this point pertain to nursing education and implications for the Delphi conceptualisation and the measurement of critical thinking in research are discussed in the next and subsequent section.

12.7.5 Implications for the conceptualisation of critical thinking in research

The Delphi conceptualisation of the ideal critical thinker developed by Facione (1990) underpinned this study and was the core concept of the theoretical framework. The derived constructs of critical thinking dispositions and skills were the dominant focus and provided the theoretical explanations to integrate and interpret the findings. Critical thinking was determined and measured as seven disposition sub-scales and five critical thinking skills. The Delphi conceptualisation and derived constructs bounded or set the parameters for the measurement of critical thinking in this study. A different conceptualisation, for example, the Watson Glaser Critical Thinking Appraisal (WGCTA), (Watson & Glaser, 1957), with a focus on a different set of constructs provides a different perspective of critical thinking. The implication is, that with different conceptualisations providing different perspectives of critical thinking researchers may not be capturing the full extent of critical thinking as different conceptualisations identify different constructs of what is considered as critical thinking. Findings are in context of the particular conceptualisation adopted and in this study the Delphi conceptualisation. The availability of different conceptualisations of critical thinking requires researchers to consider which is best for their research focus and in doing so pre-determine critical thinking based on a set of constructs for measurement.

The Delphi conceptualisation of critical thinking was developed between 1987 and 1989 with a consensus on critical thinking determined by forty six experts in, Education, Psychology, Philosophy and Social Sciences (Facione, 1990). It now almost twenty five years in existence, and it remains the dominant and most widely used conceptualisation in the measurement of critical thinking internationally. It provides a conceptualisation of the ideal critical thinker and the derived measures of the dispositions and skills provided a strong conceptualisation for the investigation of critical thinking in this study. As was discussed above in relation to nursing education it also provides an ideal to aspire to in terms of the enhancement of critical thinking. The main implication for researchers is that different conceptualisations of critical thinking measure different aspects of what is considered critical thinking. Implications arising in relation to the measurement of critical thinking are discussed next.

12.7.6 Implications for the measurement of critical thinking

Critical thinking was measured in this study using two tests derived from the Delphi conceptualisation. The California Critical Thinking Disposition Inventory (CCTDI) measured dispositions for seven sub-scales considered important for a critical thinker. Critical thinking skills were measured as five sub-skills using the Health Sciences Reasoning Test (HSRT). While the psychometric properties of these measures are considered robust and capture the constructs they purport to measure, it is arguable if critical thinking skills are best captured using a set of items in a single test. Individuals may demonstrate critical thinking skills more effectively in writing as opposed to selection from items in response to a statement or scenario. A written test may permit an individual to articulate better quality critical thinking in terms of demonstration of skills and in articulating a challenge of assumptions about a particular issue or situation. The implication for researchers is which approach best measures critical thinking skills and the consideration that more than one approach is likely to provide a more complete assessment of critical thinking. According to Beckie et al. (2001) a standardized test of critical thinking skills is best supplemented with other evaluation methods to assess students' critical thinking. The HSRT also measures reasoning ability and in relation to clinical reasoning, which is of relevance to health science students such as the nursing students in this study, Huhn, Black, Jensen, and Deutsch (2011, p. 186) state that, a single tool is insufficient to measure the highly complex skill of clinical reasoning. It appears that existing measures while of value in the measurement of critical thinking dispositions and skills may not be capturing the complexity and totality of critical thinking and reasoning in very complex situations.

Implications also arise in relation to interpretation of the content of a test of critical thinking skills, item response and performance. An individual may not interpret a statement designed to assess a particular critical thinking skill appropriately and thus may not select the most appropriate item in their response. This has implications for the particular critical thinking skill assessed and for subsequent test results. Item response has implications for the results of a critical thinking skills test and this relates to the use of the California Critical Thinking Skills Test (CCTST) which has been used extensively to measure critical thinking skills. O'Hare and McGuinness (2009) highlight concerns identified by McMorriss (1995) and Michael (1995) about the choice and placement of items in the CCTST. They argue that in a few cases the best answer is not the one outlined in the marking scheme as the correct answer. The Health

Sciences Reasoning Test (HSRT) was used in this study and like the CCTST is derived from the Delphi conceptualisation. The implication to consider here is that a similar issue, such as that identified above by Mc Morris and Michael in relation to the CCTST, is likely for the HSRT. The lack of availability of information about factor structure precludes further analysis of the factor structures of both CCTST and the HSRT.

Another implication is performance, in that scores may be somewhat distorted on a challenging test of critical thinking skills such as the CCTST and the HSRT used in this study. In a longitudinal study of critical thinking skills to investigate the impact of a curriculum Beckie et al. (2001), in a North American study, reported that performance on the CCTST for one cohort experiencing a revised curriculum, with emphasis on critical thinking, failed to demonstrate improved scores when tested over time, at entry, on completion of one year, and at exit from the course. The likely explanations were, that the particular cohort had life transitions unique to the group, awareness of no direct benefit to their grades, the group in question found the test particularly challenging and lacked motivation to complete the test accurately at testing on the third occasion close to exit from the nursing programme. Beckie et al. (2001) also suggests that each cohort takes on a 'unique personality' over the course of a programme and this can impact on a test of critical thinking. A second cohort to complete the critical thinking curriculum and who complete the CCTST reported significant gains over time. The implication is that the results may be influenced by the performance of the particular group at the time of testing. In this study students who completed the Health Sciences Reasoning Test were willing to do so and there was no coercion, thus, the findings may be considered to be free of negative influences at the time of testing. However, a question is: what might the findings be like if the non-responders had completed the test? Willingness, motivation and the particular mind-set of respondents at the time of testing has implications for the outcomes of a test to measure critical thinking. These implications require researchers to take this into consideration in measuring critical thinking as their findings may be under or overestimated and considered biased. The above could also be considered as threats to the validity of the study.

Another implication arising is the use of the more recent Health Sciences Reasoning Test (HSRT) as opposed to the California Critical Thinking Skills Test (CCTST) to measure critical thinking skills. Both the CCTST and the HSRT, grounded in the Delphi conceptualisation of critical thinking, measure critical thinking skills and the HSRT is specifically oriented to health science students. The HSRT provides a strong measure

of the critical thinking skills it purports to measure. It was most appropriate in this study of undergraduate nursing students due to its health science orientation, strong theoretical underpinnings and psychometric properties. Findings for the category scores reported in this study when compared to other studies of nursing students which used the CCTST revealed comparable category scores. This provided a degree of assurance that the HSRT compared well with the category scores of other international students measured using the CCTST. Also, the norm values compared well with the norms of North American nursing and other health science students. With more extensive use of the HSRT into the future more evidence will become available to further strengthen the use of the HSRT in the health sciences and among nursing students.

Another implication in relation to the measurement of critical thinking pertains to the correlation of critical thinking dispositions and skills. Positive critical thinking dispositions are considered necessary for strong critical thinking skills (Facione & Facione, 2010, p. 4). Studies of critical thinking with undergraduate nursing students have revealed a positive correlation between critical thinking dispositions and critical thinking skills (Colucciello, 1997; Mc Carthy et al., 1999; Profetto-McGrath, 2003; Shin et al., 2006a). While none of these studies indicated the strength or impact of such correlations they merely suggest a correlation exists. Positive correlations with very large samples, in excess of 1500, are reported by Facione (2000, p. 78) for critical thinking dispositions and critical thinking skills as well as between individual sub-scales. However, he cautions that, 'it may be unwise to advance a theory that implicitly or explicitly pairs one and only one critical thinking skill in a positive correlation with one and only one dispositional factor. Facione (2000) found that in thirty three of the thirty five possible relationships explored (seven disposition sub-scales of the CCTDI and five critical thinking sub-skills of the CCTST) correlations in all cases were very weak and never stronger than .194. In consideration of this he acknowledges a development perspective of King and Kitchener (1995) which suggests that skills and dispositions are mutually reinforcing. The implication here is that, while critical thinking can be measured, nurturing the dispositions and skills of critical thinking would lead to an outcome of greater value in terms of critical thinking development. The implications arising above highlight issues for consideration in relation to the conceptualisation and measurement of critical thinking. They indicate that the assessment of critical thinking using a predetermined set of factors determined by a particular conceptualisation limits

critical thinking and that a particular measurement may not be capturing the full dimension of critical thinking.

12.8 Conclusion

This chapter discussed the differences for critical thinking dispositions and skills of a cohort of first and third year nursing students undertaking the new undergraduate nursing degree course. The third year nursing students scored statistically significantly weaker that the first year nursing students in overall and all seven disposition sub-scales. Both first and third year nursing students were moderate in strength for overall critical thinking skill as well as for analysis, evaluation and inductive reasoning. Deductive reasoning was not manifest for the first year and just reached the moderate category for the third year nursing students. These differences are not what might be expected from nursing students in the third year of the nursing degree course. These findings can be considered somewhat disappointing and raise concerns about critical thinking development of undergraduate general nursing students. However, it is acknowledged that the first years have four years to complete and the third years a final year to complete. While it is not known what the dispositions and skills of third year cohort was at entry the lower scores are somewhat concerning and identify the need to enhance critical thinking dispositions and skills. The lower disposition scores is even more concerning when one considers the qualitative findings of the nurse lectures which point to a poor understanding of critical thinking and it being synonymous with problem-solving and decision-making, literary skills and interpersonal skills. There is some consolation that the skills of analysis and evaluation are emphasised but this is not sufficient to gain more positive attitudes and stronger critical thinking skills. There is need to enhance critical thinking dispositions and skills with stronger emphasis in the undergraduate nursing degree course. While the findings discussed in Chapters 10, 11 and in this chapter provided insights about critical thinking dispositions and skills and the differences between the first and third year cohorts they also gave rise to implications for critical thinking in nursing education and in research. The implications arising point towards the need for greater awareness of critical thinking among nurse educators and the need to give greater consideration to the development of critical thinking if nurse education is to achieve critical thinking in graduate nurses. This is of paramount importance if graduate nurses are to perform at a level that aims to achieve health care outcomes of the highest standard and which ensures that patients and clients they care for are provided with the highest quality and safety of care available.

Critical thinking will also aim to ensure that the disastrous consequences of poor quality care which threatens patient safety is identified and averted. Recommendations arising from this study are discussed in the next and final chapter of this thesis.

Chapter 13 Recommendations and Conclusion

13.1 Introduction

This chapter discusses the recommendations arising from this study. Recommendations are made for critical thinking in nurse education and in the nursing curriculum. Recommendations are also made for critical thinking in relation to nurse educators, clinical practice and for further research. The final section includes the conclusion to this study.

13.2 Recommendations for nurse education and the nursing curriculum

The undergraduate nursing degree course commenced, in Ireland, in September 2002 with the transition of nurse education to the higher education sector. While this was welcomed by the nursing profession it brought with it significant changes and adaption to the higher education sector was challenging for nurse educators coming from a background of a registration–diploma model which had emerged from a one hundred year old apprenticeship model of nurse education. In light of the change and the need for higher level learning An Bord Altranais provided each School of Nursing with a set of Requirements and Standards for Nurse Registration Education Programmes (An Bord Altranais, 2000). The Nursing Education Forum also identified important components for inclusion in the curriculum, such as, *flexibility, eclecticism, transferability and progression, utility, evidence base, and shared learning* (Government of Ireland, 2000). As was discussed in the literature review, in Chapter 2, critical thinking was identified in the context of *'evidence base'*. Critical thinking, while considered important in higher level learning was somewhat implicit and this was identified in the qualitative findings reported by the nurse lecturers and discussed in Chapter 12. A main recommendation arising, at a national level, is that *critical thinking needs to be addressed in a more explicit way.* The inclusion of a statement on critical thinking into education policy documents and in requirements and standards documents to clearly identify the significance of critical thinking in nurse education is strongly recommended. *At a national level, An Bord Altranais needs to include a more explicit and formal statement on critical thinking in all documents which details the standards of courses for registration as a nurse, midwife and nurse teacher and this should also apply to standards for post-registration courses in nursing. At a more local or institutional level a recommended is, that curriculum developers in nursing include a*

statement on critical thinking in nursing curricula and that such a statement must acknowledge critical thinking in the academic and practice components of the undergraduate nursing degree course. The Delphi conceptualisation of critical thinking (Facione, 1990) can be recommended as one such statement as it provides a strong conceptualisation of critical thinking in the Irish nursing education context.

13.3 Recommendations for nurse educators and critical thinking in nursing

Nurse educators are central to the development and nurturing of critical thinking at all levels in nurse education and in clinical practice. They need to be influential in this respect, to prepare nursing students with a *positive disposition* or what Facione and Facione (2010) identify as, *'habits of mind'* as well as *strong skills* for critical thinking. To achieve this, *it is recommended that nurse educators develop greater knowledge of critical thinking to be able to facilitate the development of critical thinking in nurse education and more importantly in nursing students.* Nurse educators need to be familiar with the components of critical thinking to enhance and evaluate them. I*t is recommended that a short facilitated exploratory seminar be provided locally to address this recommendation. It is also recommended that courses which prepare nurse educators for registration as nurse teachers include a unit of learning on critical thinking.* Such an approach would be a step forward for the future of critical thinking development in nursing.

Findings in this study identified that nurse educators value critical thinking as evident in everyday discourse and it was also acknowledged that critical thinking is, *implicit*, talked about but not well addressed to date. *It is strongly recommended that nurse educators take a more pro-active approach in incorporating approaches to enhance the dispositions and skills of critical thinking in their own teaching pedagogies.* This is likely to happen when the above recommendations are fully addressed. *A further recommendation to address this, and to enhance critical thinking, is for each School of Nursing and Midwifery to establish its own forum for nurse educators to facilitate on-going discourse about critical thinking. A forum would assist nurse educators to remain mindful of critical thinking as well as to address and evaluate approaches to the enhancement of critical thinking. This would create a heightened awareness of critical*

thinking in the nursing curriculum and sustain its enhancement through appropriate teaching pedagogies

Recommendations for critical thinking in clinical practice are also important. Nurses in clinical practice make clinical judgments within their scope of practice and they also engage in multi-professional clinical judgments. To ensure high quality clinical judgments in nursing, at a multi-disciplinary and multi-professional level, requires critical thinking. Nurses in clinical practice need to be informed in relation to the benefits of critical thinking to achieve quality health care outcomes. *It is recommended that a unit of learning on critical thinking be included in all courses at Masters' degree level to enhance nurses' critical thinking development. Another recommendation is, that courses for the preparation of registered nurses as preceptors should incorporate a unit of learning on critical thinking.* These recommendations would familiarise clinical nurses with the dispositions and skills of critical thinking necessary for nursing practice.

13.4 Recommendations for further research on critical thinking in nursing

This study, investigated two cohorts of nursing students across two university sites and is the first study to investigate critical thinking as dispositions and skills in undergraduate general nursing in the Republic of Ireland and it has given rise to recommendations for further research. As this study investigated first and third year nursing students only, second year, and more importantly, fourth year nursing students need to be investigated to determine their critical thinking. *A recommendation is that this study be replicated to include undergraduate nursing students across all four years of the undergraduate nursing degree course to gain further knowledge of critical thinking. As this study is limited to first and third year nursing students a pre-test, post-test study is recommended among fourth year nursing students to examine critical thinking in context of the internship year.* This study was cross-sectional and involved two different cohorts at one point in time and is limited in that respect and the inference that can be made in terms of the developmental trajectory of critical thinking. A *longitudinal study is recommended to investigate the development in a single cohort over the four years of the course. A longitudinal study of critical thinking is also recommended in newly graduated nursing students to trace the development of critical thinking over a period of time after graduation. A study is also recommended among*

other health science students as this would provide comparative knowledge of critical thinking among these students and nursing students in the wider Irish health care context.

Studies in published literature in relation to critical thinking in nurse educators are rather limited. A component of this study investigated nurse educators from a qualitative perspective to ascertain their views of critical thinking in the undergraduate nursing curriculum. There does not appear to be any knowledge to date on the status of nurse educators in terms of their dispositions and skills in critical thinking. *A recommendation is that a study to gain knowledge of nurse educators' dispositions and skills is recommended. It is also recommended that further qualitative studies among academic teaching staff, nursing students, preceptors, and clinical nurses would add further to the body of knowledge on critical thinking in the Irish nursing setting.*

The undergraduate nursing curriculum consists of both theoretical and clinical components. A finding in this study was the perception that critical thinking happens in the clinical practice setting and this raises the issue of research on critical thinking in clinical practice to develop knowledge from that perspective. *Studies among registered nurses who have advance in their role would also provide insights of the critical thinking of those nurses as they act as preceptors for undergraduate nursing students.* Studies such as these would provide knowledge of critical thinking in clinical nursing practice.

Nurse educators and clinical nurses as preceptors are responsible for the teaching and learning of undergraduate nursing students. Knowledge of the effects of teaching and learning on critical thinking would lead to further enhancement of critical thinking both in the academic and clinical practice setting. *Studies of a pre-test post-test design are recommended to ascertain the influence of teaching pedagogies on critical thinking as this would evaluate the effectiveness of teaching on critical thinking.* Nursing in Ireland, apart from general nursing being the largest discipline, includes the disciplines of Psychiatric nursing, Intellectual disability nursing and Children's nursing. A *recommendation is to investigate critical thinking in these other disciplines.*

The above recommendations arising from this study provide opportunities for the further investigation of critical thinking in both the academic and clinical practice setting in the Irish nursing context. The achievement of the above recommendations requires consideration as well as action by nurses at all levels, in developing policy, in education, research and clinical practice to ensure critical thinking is enhanced for all in the Irish nursing context.

13.5 Conclusion to the study

This study investigated critical thinking in general nursing students in context of an undergraduate nursing curriculum at two Irish university sites. The need for critical thinking was identified in Chapter 1 and it was evident that critical thinking is a necessary requirement for all professions including nursing. The significance of this study and its contribution to knowledge of critical thinking in the context of Irish nursing and to the wider body of knowledge on critical thinking was also identified. Critical thinking was seen to have three main components; *knowledge, dispositions* or what Facione and Facione (2010, p. 4) describe as, *'habits of mind'* as well as *critical thinking skills*. Various definitions of critical thinking were identified by academics identified as, the *'big five'* such as Ennis, Lipman, McPeck, Paul and Siegel. The work of Facione (1990) may be added to make, a *'big six'*. The definition of critical thinking used in this study was the Delphi consensus statement and the derived constructs of the dispositions and skills (Facione & Facione, 2012, 2014; Facione, 1990). This definition conceptualized critical thinking and also provided core components of the theoretical framework. The theoretical framework assisted to define critical thinking as the *main case*, integrate the findings in the interpretation phase of the study, and provide conceptual meanings to understand the critical thinking disposition and skills investigated.

This study had **four main aims.** The *first aim* was, to find out the critical thinking dispositions and skills of undergraduate nursing students. The *second aim* was, to find out if there was a difference in the critical thinking dispositions and skills of first year nursing students versus more senior third year nursing students. The *third aim* was, to explore the perceptions of nursing students and their lecturers about critical thinking in the undergraduate nursing curriculum and further expand this study. A *fourth aim* was

the development of new knowledge about critical thinking of undergraduate general nursing students in the context of the nursing curriculum.

Six quantitative questions addressed the dispositions and skills of a cohort of first and a cohort of third year nursing students. Chapters 5 and 6 presented results for the dispositions and skills of the first year nursing students, respectively. Chapters 7 and 8 presented results for the critical thinking dispositions and skills of the third year nursing students, respectively. Chapter 9 presented results for the differences in the critical thinking dispositions and skills of the first and third year nursing students. An Independent samples t-test was used in the analysis of the data and the assumptions of these tests were met to ensure the results were meaningful and reliable. **Three qualitative questions** explored the perceptions of first and third year nursing students and their lecturers to add further insights and expand this study. The quantitative component of the study was dominant and the qualitative component was less-dominant.

A single embedded case study approach which incorporated a mixed methods concurrent triangulation strategy and a cross-sectional design was used. This was appropriate as the components of the case study approach served to identify critical thinking as the *'main case'* investigated in the context of the undergraduate nursing curriculum. Three embedded units of analysis as sources of the data also determined critical thinking as the *'main case'* and the first and third year cohorts provided data at one point in time. The results of this study presented in chapters five through to chapter nine provide the basis for the new knowledge and the main findings were discussed in chapters ten, eleven and twelve. Quantitative and qualitative data were integrated using data triangulation and a complimentarity model of data triangulation facilitated integration and expanded this study by providing further insights which would not have been achieved using a mono-method approach.

*Findings revealed that for **overall disposition** towards critical thinking third years were ambivalent and as such weaker than the first years with a positive overall disposition.* Both first and third years were positive for the dispositions of open-mindedness, analyticity, inquisitiveness and maturity of judgment. They were ambivalent or weak for the dispositions of critical thinking self-confidence,

systematicity, and truth-seeking was the weakest of the disposition sub-scales. Inquisitiveness was the only disposition which was statistically significant and the third years scored lower than the first year. Otherwise there was no difference in overall critical thinking disposition or any of the other disposition subscales.

*Findings for the **critical thinking skills** revealed that first and third year nursing students were moderate in strength for overall critical thinking skill as well as for the sub-skills of analysis and evaluation.* Third year nursing students had statistically significantly higher scores for overall critical thinking skill as well as for analysis and evaluation compared to the first year nursing students. There was no difference between the first and third years for the skill of *inference* and this was *'not manifested'* but very close to *'moderate' strength.* For *inductive reasoning,* both first and third years were *'moderate'* in strength and the third years scored statistically significantly higher that the first years but remained *'moderate'* in strength. For *deductive reasoning* the first years did *not manifest* this skill and the third years just reached *'moderate'* strength but the difference was not statistically significant. *While there were statistically significant differences in overall critical thinking skill as well as in the skills of analysis, evaluation and inductive reasoning, neither the first nor third year nursing students reached the 'strong' category for any of the critical thinking skills.*

The **qualitative findings** revealed that critical thinking was *'implicit'* and needed to be further addressed in the nursing curriculum. *Critical thinking was perceived to be achieved if the skill of 'analysis' was achieved and in the students who achieved high grades at the end of the course. Critical thinking skills were perceived in relation cognitive skills of, analysis, synthesis, evaluation and application.* This appeared to be consistent with Bloom's taxonomy of educational objectives. *Literary skills and interpersonal skills were also perceived as skills for critical thinking together with problem-solving and decision-making.* Findings consistent with those reported in international literature.

The **focus of this study was** to contribute new knowledge to the existing body of knowledge on critical thinking. The aims and research questions were addressed and added new knowledge of critical thinking in the undergraduate nursing students as well as insights about critical thinking from the perspectives of the nursing students and

their lecturers. *More specifically, it has contributed, for the first time, new knowledge of the skills and dispositions of undergraduate nursing students undertaking the nursing degree course in an Irish education setting, albeit, at two university sites.* This new knowledge has potential for the enhancement of critical thinking in Irish nursing education. This potential can be achieved through addressing the attributes of the Delphi constructs through teaching pedagogies in the nursing curriculum. Approaches to assist the enhancement of critical thinking are the, '*infusion approaches'* identified by McGuinness (2003) and additional approaches such as Bloom's taxonomy of educational objectives (Anderson & Krathwohl, 2001) and the Holistic Critical Thinking Scoring Rubric developed by Facione and Facione (1994b). It is acknowledged that this study is limited to first and third year undergraduate nursing students and there is scope for further research to build on this study through the recommendations discussed above in the previous section.

This new knowledge also contributes to the wider body of knowledge on critical thinking and allows for this knowledge be evaluated in context of international studies. The integration of qualitative findings expanded this study and complimentarity was achieved in the integration of the quantitative and qualitative findings. Addressing differences in the first and third year undergraduate nursing students is evidently new knowledge and it provides nurse educators with insights, unavailable here-to-fore, apart from speculative knowledge without an empirical basis. *Academics, policy makers, national bodies and the profession of nursing in Ireland have knowledge from this study, albeit a single study, to provide insight about critical thinking.* This study provides an impetus for more academics to complete research on critical thinking and to generate a more substantial knowledge base on critical thinking in the Irish nursing context. Having the views of nurse lecturers is valuable knowledge about critical thinking in the nursing curriculum.

This study used **a single embedded case study approach** and critical thinking was the main case. Sampling was purposeful, of a non-probability type versus probability sampling and this has implications for ***generalization*** in all research designs including a case study design. According to Woodside (2010, p. 9) 'case study results are not generalized to a population, the particular case included in a given case study is so unique that it represents a one-off context'. Such was the nature of this study. Stake

(1995, p. 8) states that the real business of case study is *particularisation, not generalisation. In this study, the findings reflect critical thinking as the 'main case' and the knowledge developed provides insights about critical thinking in first and third year nursing students and their lecturers as embedded units of analysis against a background of the undergraduate nursing curriculum.* While findings may not be generalized beyond the case in this study they are valid and reliable and have standing in terms of the precision undertaken to ensure that what is reported is both accurate and truthful. The findings can be accepted as *truthful*, in that, the tests used had strong reliability and validity and pilot tests used in this study further substantiated this. Tests were administered strictly using the recommended guidelines for the testing of subjects. These approaches served to reduce and eliminate threats to validity. Truthfulness of the qualitative data was also established and a rigorous approach was applied to the analysis of the data. A detailed *audit process* and *audit trail* is shown in the appendices which add further to the trustworthiness of the data. These methods ensured that the knowledge claims from this study are of equal standing to the methods used in international peer reviewed published research on critical thinking. Readers of this thesis will determine for themselves to take on board the findings as they see relevant. According to Loxley (2010, p. 25) a reader by virtue of their experience and understanding 'accept or reject what the researcher is saying. In other words the case study story being told *seems* plausible'.

Recommendations are made with regard to critical thinking in nurse education and for further research. It is imperative that nurse educators engage in further research on critical thinking in the context of Irish nursing, in both education and in clinical practice. This study is a starting point and it is significant in that it is the first study to investigate critical thinking in the new undergraduate nursing degree course underpinned by the Delphi conceptualisation. It can be considered an initial study which provides significant knowledge of critical thinking in the context of the new undergraduate nursing degree course.

In conclusion, the findings of this study provide strong evidence of the status of critical thinking among two different cohorts of undergraduate general nursing students undertaking an undergraduate nursing degree course. The findings appear to identify a strong need for nurse educators to develop, as a priority, their knowledge of critical

thinking. Nurse educators must also ensure that critical thinking is more actively enhanced in their teaching pedagogies. Greater awareness and infusion of critical thinking into teaching pedagogies and into the nursing curriculum will foster its development among nursing students at all levels, so that graduate nurses will be effectively prepared with positive dispositions and strong skills in critical thinking. Nurses form the largest body of front line health care workers and they, as well as all involved in health care delivery, must think critically. Failure to think critically has serious consequences for the quality and standards of care delivered. Enhancement of critical thinking dispositions and skills must be pursued enthusiastically not only in nursing education, but amongst all health care personnel, to ensure high quality patient care and eliminate threats to patient safety now and into the future.

Glossary

An Bord Altranais (The Nursing Board): An Bord Altranais as established under the Nurses Act of 1985 (Government of Ireland, 2011).

Central Applications Office (CAO): Established in 1976, the Central Applications Office is a limited company set up by the third-level institutions as an administrative mechanism for dealing with applications and admissions. While the CAO administers a common applications system, all institutions retain full control over their own admission policies (Hyland, 1999a).

Children's and General Nursing – Integrated: is defined as the discipline of nursing identified by the theoretical and clinical placement requirements of An Bord Altranais and shown in Appendix 1 (Nursing Careers Centre, 2013).

Clinical Placement: An approved learning experience that provides nursing students with the practice elements of the nursing degree programme (Government of Ireland, 2000, p. 5).

Co-Preceptor: A registered nurse who has been specially prepared to guide and direct student learning during clinical placement (Government of Ireland, 2000, p. 5) In the role of co-preceptor guides and directs student learning when a preceptor is unavailable.

Course: In the context of this study refers to the four years of the undergraduate nursing degree.

Critical Thinking: is defined in this study using the Delphi consensus statement of the ideal critical thinker and the full definition is stated in Chapter Four: Section 4.3 (Facione, 1990, p. 3).

Critical Thinking Dispositions: are the dispositions of; truth seeking, open-minded, analyticity, systematicity, critical thinking self-confidence, inquisitiveness and maturity of judgment derived from the Delphi consensus statement (Facione & Facione, 2010; Facione et al., 1994; Facione, 1990).

Critical Thinking Skills: are the skills of; analysis, evaluation, inference, inductive reasoning and deductive reasoning derived from the Delphi consensus statement (Facione & Facione, 2012; Facione, 1990).

Curriculum: The word 'curriculum' as used in this study is defined using the definition proposed by Quinn and Hughes (2007, p. 108) and means, 'all the educational opportunities encountered by students as a direct result of their involvement with an educational institution'. This definition was appropriate as it encompasses, 'all educational opportunities' and can be seen to take into account both academic and practice components of the undergraduate nursing degree course with an influence on critical thinking.

Degree Programme: Four year pre-registration degree programme leading to registration as a nurse (Government of Ireland, 2000).

Discipline: Discipline in the Irish context refers to the branches of nursing which are registerable with the Board, namely general, psychiatry, mental handicap, midwifery, sick children's, public health nursing and nurse tutors (Government of Ireland, 1999, p. v)

Gate Keeper: A gatekeeper acts as a link between a researcher and respondents in a research study. The individual the researcher must visit before entering a group or cultural site (Creswell, 2013, p. 292)

General Nursing: is defined as the discipline of nursing identified by the theoretical and clinical placement requirements of An Bord Altranais and shown in Appendix 1 (Nursing Careers Centre, 2013).

Internship: Clinical practice placement of thirty six week duration in the fourth year of the undergraduate nursing degree programme during which the nursing students is a paid employee by the Health Service Provider.

Leaving Certificate: Also known as the Leaving Certificate (Established) to differentiate it from the Leaving Certificate Vocational Programme (LCVP) and the Leaving Certificate Applied. It is the terminal examination of post-primary education. This is the most widely taken programme in which students must take at least five subjects, including Irish. Those intending to pursue higher education at a third-level institute normally take this examination and access to third-level courses depends on results obtained (Department of Education and Skills, 2011, p. 10).

Lecturer in Nursing: is defined as an academic member of staff who is a registered nurse, who may also hold a Registered Nurse Teachers (RNT) qualification and teaching on the undergraduate nursing degree course in a University School of Nursing and Midwifery approved by An Bord Altranais (The Nursing Board).

Module: A component of the undergraduate nursing degree course comprising of aims learning outcomes, subject matter as units of learning, contact teaching hours, method of assessment and credit weighting.

Nursing Student: is defined as, 'a student whose name is entered on the candidate register' held by An Bord Altranais (An Bord Altranais, 2000, p. 9).

Preceptor: A registered nurse who has been specially prepared to guide and direct student learning during clinical placement (Government of Ireland, 2000, p. 5).

Registered Nurse Tutor (RNT): A nurse/midwife who is registered with An Bord Altranais may apply to undertake a specific master's programme. Successful completion of the master's programme, with the appropriate strand, will entitle the candidate to apply for registration with An Bord Altranais as a nurse tutor (RNT) (Nursing Careers Centre, 2013, p. 45).

Supernumerary: Nursing students not included in the rostered complement of nurses who are employed by health service providers (Government of Ireland, 2000, p. 5).

Reference List

Abbercrombie, N., Hills, S., & Turner, B. S. (2006). *The Penguin Dictionary of Sociology* (5th ed.). London: Penguin.

Acton, C., & Miller, R. (2009). *SPSS for Social Scientists*. London: Palgrave McMillan.

Alfaro-LeFevre, R. (2010). *Applying Nursing Process: A Tool for Critical Thinking* (7th ed.). Philadelphia: Lippincott Williams & Wilkins.

An Bord Altranais. (2000). *Requirements and Standards for Nurse Registration Education Programmes* (2nd ed.). Dublin: An Bord Altranais.

Anderson, L., & Krathwohl, D. (Eds.). (2001). *A Taxonomy for Learning, Teaching and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*. London: Longman.

Aron, A., Aron, E., & Coups, E. (2008). *Statistics for the Behavioural and Social Sciences: A Brief Course* (4th ed.). New Jersey: Pearson Prentice Hall.

Arskey, H., & Knight, P. (1999). *Interviewing for Social Scientists*. London: Sage.

Arthur, S., & Nazroo, J. (2003). Designing Fieldwork Strategies and Materials. In J. Ritchie & J. Lewis (Eds.), *Qualitative Research Practice: A Guide for Social Science Students and Researchers*. London: Sage.

Bandman, E. L., & Bandman, B. (1995). *Critical Thinking in Nursing* (2nd ed.). Connecticut: Appleton & Lange.

Bartlett, F. C. (1958). *Thinking: An Experimental and Social Study*. London: Allen & Unwin.

Bauwens, E. E., & Gerhard, G. G. (1987). The use of the Watson-Glaser Critical Thinking Appraisal to predict success in a baccalaureate nursing rogramme. *Journal of Nursing Education, 26*(7), 278 - 271.

Beckie, T. M., Lowry, L. W., & Barnett, S. (2001). Assessing critical thinking in baccalaureate nursing students: A longitudinal Study. *Holistic Nursing Practice, 15*(3), 18-26.

Beherns, P. J. (1996). The Watson-Glaser Critical Thinking Appraisal and academic performance of diploma school students. *Journal of Nursing Education, 35*(1), 34-36.

Benner, P. E. (1984). *From Novice to Expert*. Menlo Park, California: Addison-Wesley.

Berg, B. L. (2009). *Qualitative Research Methods for the Social Sciences* (7th ed.). Boston: Pearson Education.

Beyer, B. K. (1979). *Teaching Thinking in Social Studies: In Beyer, Barry K. (1987), Practical Strategies for the Teaching of Thinking.* Boston: Allyn and Bacon.

Beyer, B. K. (1985). Teaching critical thinking: A direct approach *Social Education, 49*(4), 279-303.

Beyer, B. K. (1987). *Practical Strategies for the Teaching of Thinking*. Boston: Allyn and Bacon.

Boychuck Duchscher, J. E. (2003). Critical thinking: Perceptions of newly graduated baccalaureate nurses. *Journal of Nursing Education, 42*(1), 14-27.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77-101.

Brookfield, S. D. (1987). *Developing Critical Thinkers: Challenging Adults to Explore Alternative Ways of Thinking and Acting*. San Francisco: Jossey-Bass.

Brookfield, S. D. (2012). *Teaching for Critical Thinking*. San Francisco: Jossey Bass.

Bryman, A. (2012). *Social Research Methods* (4th ed.). Oxford: University Press.

Bryman, A., & Burgess, R. (Eds.). (1994). *Analyzing Qualitative Data*. London: Routledge.

Butler, H. A., Dwyer, C. P., Hogan, M. J., Franco, A., Rivas, S. F., Saiz, C., & Almeida, L. S. (2012). The Halpern critical thinking assessment and real-world outcomes:Cross-national applications. *Thinking Skills and Creativity, 7*, 112-121.

California Academic Press. (2012). Health Science Reasoning Test - HSRT 2012 Norms. Milbrae, California: Insight Assessment.

Cherryholmes, C. H. (1992). Notes on pragmatism and scientific realism. *Educational Researcher, 26*(6), 13-17.

Cloft, H. J. (2006). The Value of a P Value. *American Journal of Neuroradiology, 27*(7), 1389-1390.

Colucciello, M. L. (1997). Critical thinking skills and dispositions of baccalaureate nursing students: A conceptual model of evaluation. *Journal of Professional Nursing., 13*(4), 236-245.

Connolly, B., & Ryan, A. B. (2000). *Women and Education in Ireland Volume 1*. Maynooth: Mace.

Creswell, J. W. (2003). *Research Design Quantitative, Qualitative, and Mixed Methods Approaches*. (2nd ed.). Thousand Oaks, California: Sage

Creswell, J. W. (2013). *Qualitative Inquiry and Research Design: Chosing Among Five Approaches* (3rd ed.). Thousand Oaks, California: Sage.

Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative & Mixed Methods Approaches* (4th ed.). Thousand Oaks, California: Sage.

Creswell, J. W., & Plano Clark, V. L. (2007). *Designing and Conducting Mixed Methods Research*. Thousand Oaks, California: Sage

Creswell, J. W., Plano Clark, V. L., Gutmann, M. L., & Hanson, W. E. (2003). Advanced Mixed Methods Research Designs. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of Mixed Methods in Social and Behavioural Research* (pp. 209-240). Thousand Oaks, California: Sage

Crites, J. O. (1965). Test reviews. *Journal of Counselling Psychology, 12*(3), 328-330.

Cronbach, L. J. (1990). *Essentials of Psychological Testing*. London: Harper & Row.

Crotty, M. (1998). *The Foundations of Social Research: Meaning and Perspectives in the Research Process*. London: Sage

Curriculum Document. (2007). *B.Sc. Honours in Childrens' and General Nursing*. Trinity College Dublin: School of Nursing and Midwifery Trinity College Dublin.

Curriculum Document. (2009). *B.S.c Honours in Childrens' and General Nursing*. Trinity College Dublin: School of Nursing and Midwifery Trinity College Dublin.

Curriculum Document. (2012). *B.Sc. Honours in Childrens' and General Nursing*. Trinity College Dublin: School of Nursing and Midwifery Trinity College Dublin.

Denscombe, M. (2012). *The Good Research Guide*. Maidenhead: McGrawhill.

Denzin, N. K. (1970). *Sociological Methods*. London: Butterworths.

Department of Education and Science. (2004). *A Brief Description of the Irish Education System*. Dublin: Communications Unit Department of Education and Science.

Department of Education and Skills. (2011). *OECD Project Overcoming School Failure: Policies that Work*. Dublin: Department of Education and Skills.

Department of Health. (2012). *Report of the Review of Undergraduate Nursing and Midwifery Degree Programmes*. Dublin: Department of Health.

Dewey, J. (1910). *How We Think*. Boston: D.C. Heath & Company.

Dowling, M. (2006). Approaches to reflexivity in qualitative research. *Nurse Researcher, 13*(3), 7-21.

Doyle, W. (1983). Academic Work. *Review of Educational Research, 53*(2), 163-173.

Drennan, J. (2009). Critical thinking as an outcome of a Masters's degree in nursing programme. *Journal of Advanced Nursing, 66*(2), 422-431.

Egan, A. H. (2006). *The Development and Evaluation of a Learning Skills Intervention for Psychology Students.* (Unpublished Ph.D. Thesis), University College Dublin, School of Psychology

Ennis, R. H. (1985). A logical basis for measuring critical thinking skills. *Educational Leadership*(October 1985), 44-48.

Ennis, R. H. (1987). A Taxonomy of Critical Thinking Dispositions and Abilities. In: Lewis, Arthur and Smith, David (1993). Defining Higher Order Thinking. *Theory Into Practice, 32*(3), 131-137.

Ennis, R. H. (1993). Critical thinking assessment. *Theory Into Practice, 32*(3), 179-186.

Erzberger, C., & Kelle, U. (2003). Making Inferences in Mixed Methods: The Rules of Integration. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of Mixed Methods in Social & Behavioural Research* (pp. 457-488). Thousand Oaks, California: Sage.

Facione , N. C., & Facione, P. A. (1994a). The California Critical Thinking Skills Test and the National League for Nursing Accreditation Requirement in Critical Thinking: A Resource Paper. Milbrae, California: California Academic Press.

Facione , N. C., & Facione, P. A. (1994b). Holistic Critical Thinking Scoring Rubric. Milbrae, California: California Academic Press.

Facione, N. C., & Facione , P. A. (1996). Externalizing critical thinking in knowledge development and clinical judgement. *Nursing Outlook, 44*, 129-136.

Facione, N. C., & Facione, P. A. (2008). *California Critical Thinking Skills Test Manual.* Milbrae: California Academic Press.

Facione , N. C., & Facione, P. A. (2008). Critical thinking and clinical judgment *Critical Thinking and Clinical Reasoning in the Health Sciences: A Teaching Anthology* (pp. 1-9). Millbrae, Calfiornia: California Academic Press.

Facione, N. C., & Facione, P. A. (2010). *The California Critical Thinking Disposition Inventory Test Manual.* Milbrae: California Academic Press.

Facione, N. C., & Facione, P. A. (2012). *The Health Sciences Reasoning Test Manual.* Milbrae: California Academic Press.

Facione, N. C., & Facione, P. A. (2014). *California Critical Thinking Dispsoition Inventory: User Manual*. San Jose: Insight Assessment, California Academic Press.

Facione, N. C., Facione, P. A., & Sanchez, C. A. (1994). Critical thinking dispsoition as a Measure of competent clinical judgment: The development of the California Critical Thinking Disposition Inventory. *Journal of Nursing Education, 33*(8), 345-350.

Facione, N. C., Facione, P. A., & Winterhalter, K. (2014). *The Health Sciences Reasoning Test: Test Manual*. Milbrae: Insight Asessment, California Academic Press.

Facione, P. A. (1984). Toward a theory of critical thinking. *Liberal Education, 70*, 253-261.

Facione, P. A. (1990). *Critical Thinking: A Statement of Expert Consensus for Purposes of Educational Assessment and Instruction*. Fullerton: California State University.

Facione, P. A. (2000). The disposition toward critical thinking: Its character, measurement and relationship to critical thinking skill. *Informal Logic, 20*(1), 61-84.

Facione , P. A., & Facione , N. C. (1992). *CCTDI: A Disposition Inventory*. Insight Assessment CA: California Academic Press.

Fealy, G. M. (2006). *A History of Apprenticeship Nurse Training in Ireland*. London: Routledge.

Flick, U. (2006). *An Introduction to Qualitative Research* (3rd ed.). London: Sage

Gadzella, B. M., Hogan, L., Masten, W., Stacks, J., Stephens, R., & Zascavage, V. (2005). Reliability and validity of the Watson Glaser Critical Thinking Appraisal forms for different academic groups. *Journal of Instructional Psychology, 33*(2), 141 - 143.

Gendrop, S. C., & Eisenhauer. (1996). A transactional perspective on critical thinking. *Scholarly Inquiry for Nursing Practice, 10*(4), 329-345.

Glaser, B. G., & Strauss, A. G. (2008). *The Discovery of Grounded Theory: Strategies for Qualitative Research*. New Jersey: Transaction Publishers, Rutgers.

Gordon, J. (2000). Congruency in defining critical thinking by nurse educators and non-nurse scholars. *Journal of Nursing Education, 39*(8), 340-351.

Government of Ireland. (1998). *Report of the Commission on Nursing: A Blurprint for the Future*. Dublin: The Stationery Office.

Government of Ireland. (1999). Commission on the Points System: Final Report and Recommendations. Dublin: The Stationery Office.

Government of Ireland. (2000). *Nursing Education Forum: A Strategy for a Pre-Registration Nursing Education Degree Programme*. Dublin: The Stationery Office.

Government of Ireland. (2011). *Nurses and Midwives Act*. Dublin: The Stationery Office.

Gray, D. E. (2009). *Doing Research in the Real World*. London: Sage Publications, Ltd.

Green, J. C., Caracelli, V. J., & Graham, W. F. (1989). Towards a Conceptual Framework for Mixed Methods Evaluation Designs. *Educational Evaluation and Policy Analaysis, 11*(3), 255-274.

Griffith, A. I. (1998). Insider/Outsider: Epistemological privilege and mothering work. *Human Studies, 21*(4), 361-376.

Guba, E. G., & Lincoln, Y. S. (1989). *Fourth Generation Evaluation*. Newbury Park, California: Sage

Halpern, D. F. (1996). *Thought & Knowledge: An Introduction to Critical Thinking* (3rd ed.). New Jersey: Lawerence Erlbaum Associates.

Halpern, E. S. (1983). *Auditing Naturalistic Inquiries: The Development and Application of a Model.* (Unpublished Doctoral Dissertation), Indiana University.

Hammersley, M., & Atkinson, P. (2007). *Ethnography: Principles in Practice* (3rd ed.). London: Routledge.

Hegarty, J. (2014). [Personal Communication 14th April].

Hegarty, J., Walsh, E., & McCarthy, G. (2008). *Critical thinking ability of students undertaking a bachelors degree in nursing in Ireland*. Paper presented at the NET/NEP 2nd International Nurse Education Conference: Research and Innovation in International Nurse Education, Dublin.

Henderson, V. (1982). The nursing process-is the title right? *Journal of Advanced Nursing, 7*, 103-109.

Henderson, V. (1987). The nursing process in perspective. *Journal of Advanced Nursing, 12*, 657-658.

Holland, K., Jenkins, J., Solomon, J., & Whittman, S. (Eds.). (2012). *Applying the Roper, Logan, Tierney Model in Practice* (2nd ed.). Edinburgh: Churchill Livingstone.

Holloway, I., & Wheeler, S. (2004). *Qualitative Research in Nursing* (2nd ed.). Oxford: Blackwell Science.

Howe, K. R. (1988). Against the quantitative-qaualitative incompatibility thesis. *Educational Researcher, 17*(8), 10-16.

Howell Adams, M., Stover, L. M., & Whitlow, J. F. (1999). A longitudinal evaluation of baccalaureate nursing students' critical thinking abilities. *Journal of Nursing Education, 38*(3), 139-141.

Huckaby, L. M. (2009). Clinical reasoned judgment and the nursing process. *Nursing Forum, 44*(2), 72-78.

Huhn, K., Black, L., Jensen, G., & Deutsch, J. (2011). Construct Validity of the Health Sciences Reasoning Test. *Journal of Allied Health, 40*(4), 181-186.

Hyland, A. (1999a). *Commission on the Points System: Final Report and Recommendations*. Dublin: Government of Ireland.

Hyland, A. (1999b). *Entry to Higher Education in Ireland in the 21st Century*. Dublin: Higher Education Authority.

Ip, W. Y., Lee, D. T., Lee, I. F., Chau, J. P., Wootton, Y. S., & Chang, A. (2000). Disposition towards critical thinking: A study of Chinese undergraduate nursing students. *Journal of Advanced Nursing, 32*(1), 84-90.

Jick, T. D. (1979). Mixing qualitative and quantitative methods: Triangulation in action. *Administrative Science Quarterly, 24*(4), 602-611.

Johnson, R. H. (1992). *The Problem of Defining Critical Thinking. In: Norris, Stephen, P. (ed.) (1992). The Generalizability of Critical Thinking. Multiple Perspectives on an Educational Ideal*. New York: Teachers College Press.

Jones, J. H., & Morris, L. V. (2007). Evaluation of critical thinking skills in an associate degree programme. *Thinking and Learning in Nursing, 2*, 109-115.

Kawashima, A., & Petrini, M. (2004). Study of critical thinking skills in nursing students and nurses in Japan. *Nurse Education Today., 24*, 286-292.

Kemper, E. A., Stringfield, S., & Teddlie, C. (2003). Mixed Methods Sampling Strategies in Social Science Research. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of Mixed Methods in Social & Behavioural Research* (pp. 273-296). Thousand Oaks, California: Sage

King, P., & Kitchener, K. (1995). *Developing Reflective Judgment*. San Francisco, CA: Josey-Bass.

King, P., M., & Kitchener, K., S. (1994). Developing Reflective Judgment. In: Reed Geertsen, H. (2003). Rethinking Thinking about Higher Level Thinking. *Teaching Sociology, 31*(1), 1-19.

Kumar, R. (2011). *Research Methodology: A Step by Step Guide for Beginners* (4th ed.). London: Sage

Lauder, W., & James, B. (2001). Acomparison of critical thinking skills in standard and non-standard entry diploma students. *Nurse Education in Practice., 1*, 212-220.

Lewis, A., & Smith, D. (1993). Defining higher order thinking. *Theory Into Practice, 32*(3), 131-137.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic Inquiry*. Newbury Park, California: Sage

Lipman, M. (1988). Critical thinking what can it be? *Educational Leadership*(September), 38-43.

Loxley, A. (2010). *Introducing Case Studied: In: Loxley, Andrew et al., (2010). An Introduction to Research Methods*. Oxford: Oxford University Press.

Loxley, A., & Seery, A. (2008). Some Philosophical and Other Reated Issues of Insider Research. In P. Sikes & A. Potts (Eds.), *Researching Education from the Inside: Investigations from within* (pp. 15-32). London: Routledge.

Lund, A., & Lund, M. (2013). Testing for Normality using SPSS Statistics. Retrieved 30/06/2014, from http://Statistics.laerd.com/SPSS-tutorials/testing-for-normality-using-SPSS-statistics.php

Maier, N. R. F. (1933). An Aspect of Human Reasoning. In: Lewis, Arthur and Smith, David (1993). Defining Higher Order Thinking. *Theory Into Practice, 32*(3), 133-137.

May, B. A., Edell, V., Butell, S., Doughty, J., & Langford, C. (1999). Critical thinking and clinical competence: A study of their relationship in BSN seniors. *Journal of Nursing Education, 38*(3), 100-110.

Mc Carthy, P., Schuster, P., Zehr, P., & Mc Dougal, D. (1999). Evaluation of critical thinking in a baccalaureate nursing programme. *Journal of Nursing Education, 38*(3), 142-144.

McGuinness, C. (1990). Talking About Thinking: The Role of Metacognition in Teaching Thinking. In K. J. K. Gilhooly, M.T.G. Logie, R.H. Erdos, G. (Ed.), *Lines of Thinking: Reflections on the Psychology of Thought* (pp. 301-312). Chichester: John Wiley & Sons.

McGuinness, C. (1991). Teaching thinking in Europe. *British Journal of Educational Psychology, 61*, 174-186.

McGuinness, C. (2003). ACTS 2 Sustainable Thinking Classrooms: A Methodology for Enhancing Thinking Across the Curriculum (3rd ed.). Northern Ireland: Queen's University Belfast.

McGuinness, C. (2005). Teaching thinking: Theory and practice. *British Journal of Educational Psychology Monograph Series 2, 3*, 107-127.

McManus, B. (2007). *How to enhance critical thinking skills of paediatric critical care nurses in clinical practice*. Paper presented at the School of Nursing and Midwifery, Trinity College Dublin: 8th Annual Interdisciplinary Research Conference: Transforming Healthcare Through Research, Education and Technology, Trinity College Dublin.

McMorriss, R. (1995). Review of the California Critical Thinking Skills Test. In J. Conoley & J. Impara (Eds.), *The Twelfth Mental Measurements Yearbook* (pp. 143-145). Lincoln, NE: University of Nebraska Press.

McPeck, J. (1981). *Critical Thinking and Education. In: Johnson. Ralph, H. (1992).The Problem of Defining Critical Thinking. In: Norris, Stephen, P. (ed.) (1992). The Generalizability of Critical Thinking. Multiple Perspectives on an Educational Ideal*. New York: Teachers College Press.

Michael, W. (1995). Review of the California Critical Thinking Skills Test. In J. Conoley & J. Impara (Eds.), *The Twelfth Mental Measurements Yearbook* (pp. 145-146). Lincoln, NE: University of Nebraska Press.

Miller, M. A. (1992). Outcomes evaluation:measuring critical thinking. *Journal of Advanced Nursing, 17*, 1401-1407.

Miller, S. I. (1994). Evidence as an idealized cognitive model. *Social Epistemology, 8*(2), 163-165.

Morse, J. M. (2003). Principles of Mixed Methods and Multimethod Research Design. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of Mixed Methods in Social & Behavioural Research* (pp. 189-208). Thousand Oaks, California: Sage

Morse, J. M. (Ed.). (1991). *Qualitative Nursing Research: A Contemporary Dialogue*. Newbury Park, California: Sage

Morse, J. M., & Field, P. A. (2002). *Nursing Research: The Application of Qualitative Approaches* (2nd ed.). Cheltenham: Nelson Thornes.

National Qualifications Authority of Ireland. (2007). *The National Framework of Qualaifications*. Dublin: National Qualifications Authority of Ireland.

National Strategy for Higher Education. (2011). *National Strategy for Higher Education 2030*. Dublin: Department of Education and Skills.

Neuman, L. (2011). *Social Research Methods: Qualitative and Quantitative Approaches* (7th ed.). Boston: Pearson Education Inc.

Newell, R., & Burnard, P. (2006). *Research for Evidence Based Practice*. Oxford: Blackwell Publishing Ltd.

Newman, F. M. (1990). Higher Order Thinking in Teaching Social Studie: A Rationale for the Assessment of Classroom Thoughtfulness. In: Lewis, Arthur and Smith, David (1993). Defining Higher Order Thinking. *Theory Into Practice, 32*(3), 131-137.

Norris, S. P. (1985). Synthesis of research on critical thinking. *Educational Leadership*(May 1985), 40-45.

Nunnally, J. C. (1978). *Psychometric Theory*. New York: McGraw Hill.

Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric Theory* (3rd ed.). New York: McGraw Hill.

Nursing Careers Centre. (2007). *Nursing and Midwifery a Career for you: Pre-Registration Honours Degree Programmes*. Dublin: An Bord Altranais.

Nursing Careers Centre. (2009). *Nursing and Midwifery A Career for you: Pre-Registration Honours Degree Programmes*. Dublin: An Bord Altranais.

Nursing Careers Centre. (2010). *Nursing and Midwifery A Career for you: Pre-Registration Honours Degree Programmes*. Dublin: An Bord Altranais.

Nursing Careers Centre. (2013). *Nursing and Midwifery A Career for you: Pre-Registration Honours Degree Programmes*. Dublin: An Bord Altranais.

O'Hare, L., & McGuinness, C. (2009). Measuring critical thinking, intelligence, and academic performance in psychology undergraduates. *The Irish Journal of Psychology, 30*(3-4), 123-131.

Onwuegbuzie, A. J., & Teddlie, C. (2003). A Framework for Analyzing Data in Mixed Methods Research. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of Mixed Methods in Social and Behavioural Research* (pp. 351-383). Thousand Oaks, California: Sage

Paul, R. W. (1982). *Teaching Critical Thinking in the Strong Sense: A Focus on Self Deception, World Views, and a Dialectical Mode of Anaysis. In: Johnson. Ralph, H. (1992).The Problem of Defining Critical Thinking. In: Norris, Stephen, P. (ed.) (1992). The Generalizability of Critical Thinking. Multiple Perspectives on an Educational Ideal*. New York: Teachers College Press.

Paul, R. W., & Nosich, M. (1992). A Model for the National Assessment of Higher Order Thinking. In R. Paul (Ed.), *Critical Thinking* (pp. 78-123). Santa Rosa, California: Foundation for Critical Thinking.

Pesut, D. J., & Herman, J. (1999). *Clinical Reasoning: The Art & Science of Critical & Creative Thinking*. Albany: Delmar.

Pontin, D. (1997). Single Case Study. In D. Cormack (Ed.), *The Research Process in Nursing* (4th ed., pp. 237-261). Oxford: Blackwell Science.

Price, I. (2000). Analysing the Data: Determining if Skewnwss and Kurtosis are Significantly Non-Normal. Retrieved 25/04/2012, from http://www.une.edu.au./WebStat/unit_descriptive_statistics/determine_sk

Profetto-McGrath, J. (2003). The relationship of critical thinking skills and critical thinking dispositions of baccalaureate nursing students. *Journal of Advanced Nursing, 43*(6), 569-577.

Profetto-McGrath, J. (2005). Critical thinking and evidence-based practice. *Journal of Professional Nursing., 21*(6), 364-371.

Quinn, F. M., & Hughes, S. J. (2007). *Quinn's Principles and Practice of Nurse Education* (5th ed.). Cheltenham: Nelson Thornes.

Rane-Szostak, D., & Fisher-Robertson, J. (1996). Issues in Measuring Critical Thinking: Meeting the challenges. *Journal of Nursing Education, 35*, 5 - 11.

Raymond, C. L., & Profetto-McGrath, J. (2005). Nurse educators' critical thinking:Reflection and measurement. *Nurse Education in Practice., 5*, 209-217.

Reed Geertsen, H. (2003). Rethinking thinking about higher-level thinking. *Teaching Sociology, 31*(1), 1-19.

Resnick, L. (1987). Education and Learning toThink. In: Lewis, Arthur and Smith, David (1993). *Theory Into Practice, 32*(3), 131-137.

Rubenfeld, M. G., & Scheffer, B. K. (2006). *Critical Thinking Tactics for Nurses*. Canada: Jones and Bartlett.

Ryen, A. (2011). Ethics and Qualitative Research. In D. Silverman (Ed.), *Oualitative Research* (3rd ed., pp. 416-438). London: Sage

Sanchez, C. A. (1996). *Doctoral Dissertation Study.* University of California.

Sarantakos, S. (2005). *Social Research* (3rd ed.). Basingstoke: Palgrave Macmillan.

Scheffer, B. K., & Rubenfeld, M. G. (2000). A consensus statement on critical thinking in nursing. *Journal of Nursing Education, 39*(8), 352-359.

Shin, K., Jung, D. Y., Shin, S., & Kim, M. S. (2006a). Critical Thinking Dispositions and Skills of Senior Nursing Students in Associate, Baccalaureate, and RN-to-BSN Programs. *Journal of Nursing Education, 45*(6), 233-237.

Shin, K. R., Lee, J. H., Ha, J. Y., & Kim, K. H. (2006b). Critical thinking dispsoitions in baccalaureate nursing students. *Journal of Advanced Nursing, 56*(2), 182-189.

Shin, S., Ha, J., Kyungrim, S., & Davis, M. (2006). Critical thinking ability of associate, baccalaureate and RN-BSN senior students in Korea. *Nursing Outlook, 54*(6), 328-333.

Shuster, E. (1997). Fifty years later: The significance of the Nuremberg Code. *The New England Journal of Medicine*(November), 1436-1440.

Siegel, H. (1988). *Educating Reason: Rationality, Critical Thinking and Education. In: Johnson, Ralph H. (1992) . The Problem of Defining Critical Thinking. In: Norris, Stephen P. (ed.) (1992) The Generalizability of Critical Thinking: Multiple Perspectives of an Educational Ideal*. New York: Teachers College Press.

Silverman, D. (2010). *Doing Qualitative Research* (3rd ed.). London: Sage

Silverman, D. (2013). *Doing Qualitative Research* (4th ed.). London: Sage

Silverman, D. (Ed.). (2011). *Qualitative Research* (3rd ed.). London: Sage

Simmons, H., Clarke, J. B., Gobbi, M., Long, G., Mountford, M., & Wheelhouse, C. (1998). *Nurse Education and Training Evaluation in Ireland. Independent External Evaluation: Final Report*. Southhampton: University of South Hampton.

Smith, B. O., Peterson, D., Borg, J. M., Bullerman, M., & Underbakke, M. (1991). Teaching for Higher Order Thinking (THOK),Domain 3: Assessing Arguments. In: Lewis, A. and Smith, D. *Theory Into Practice, 32*(3), 131-137.

Smith, L. (1974). *An Aesthetic Education Workshop for Administrators: Some Implications for a Theory of Case Studies*. Paper presented at the Paper Presented at the Annual General Meeting of the American Educational Research Association, Chicago.

Smitt, C. (2015). [Personal Communication. 15th April. Milbrae: California Academic Press].

Spleic, S., Parsons, M., Hercinger, M., Andrews, A., Parks, J., & Norris, J. (2001). Evaluation of critical thinking outcomes of a BSN program. *Holistic Nursing Practice, 15*(3), 27-34.

Stake, R. E. (1995). *The Art of Case Study Research*. Thousand Oaks, California: Sage.

Stake, R. E. (2000). The Case Study Method in Social Inquiry. In R. Gomm, M. Hammersley & P. Foster (Eds.), *Case Study Method* (pp. 19-26). London: Sage

Steckler, A., McLeroy, K. R., Goodman, R. M., Bird, S. T., & McCormack, L. (1992). Toward Integrating Qualitative and Quantitative Methods: An Introduction. *Health Education Quarterly, 19*(1), 1-8.

Sternberg, R. J., & Sternberg, K. (2012). *Cognition* (6th ed.). United States: Wadsworth Cengage Learning.

Stewart, S., & Dempsey, L. (2005). A longitudinal study of baccalaureate nursing students' critical thinking dispositions. *Journal of Nursing Education, 44*(2), 81-84.

Suliman, W., & Halabi, J. (2007). Critical thinking, self esteem, and state anxiety of nursing students. *Nurse Education Today, 27*, 162 -168.

Suliman, W. A. (2006). Critical thinking and learning styles of students in conventional and accelerated programmes. *International Nursing Review, 53*, 73-79.

Tanner, C. A. (2000). Critical thinking: Beyond nursing process. *Jounal of Nursing Education, 39*(8), 338-339.

Tashakkori, A., & Teddlie, C. (1998). *Mixed Methodology: Combining Qualitative and Quantitative Approaches*. Thousand Oaks, California: Sage

Teays, W. (1996). Second Thoughts: Critical Thinking from a Multicultural Perspective. In: Reed Geertsen, H. (2003). Rethinking Thinking about Higher -Level Thinking. *Teaching Sociology, 31*(1), 1-19.

Teddlie, C., & Tashakkori, A. (2003). Major Issues and Controversies in the use of Mixed Methods in the Social and Behavioural Sciences. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of Mixed Methods in Social & Behavioural Research* (pp. 3-50). Thousand Oaks, California: Sage

Teddlie, C., & Tashakkori, A. (2009). *Foundations of Mixed Methods Research: Integrating Quantitative and Qualitative Approaches in the Social and Behavioural Sciences*. Thousand Oaks, California: Sage

Tiwari, A., Avery, A., & Lai, P. (2003). Critical thinking disposition of Hong Kong Chinese and Australian nursing students. *Journal of Advanced Nursing, 44*(3), 298-307.

Toon, T. (2000). *A Primer in Longitudinal Data Analysis*. London: Sage.

Turner, P. (2005). Critical thinking in nursing education and practice as defined in the literature. *Nursing Education Perspectives, 26*(5), 272-277.

Twibell, R., Ryan, M., & Hermiz, M. (2005). Faculty perceptions of critical thinking in student clinical experiences. *Journal of Nursing Education, 44*(2), 71-79.

Vaughan-Wrobel, B. C., O'Sullivan, P., & Smith, L. (1997). Evaluating critical thinking skills of baccalaureate nursing students. *Journal of Nursing Education, 36*(10), 485-488.

Venderly, A. (2007). An Investigation of the Relationships Among Academic performance, Clinical Performance, Critical Thinking and Success on the Physical Therapy Licensure Examination. *Journal of Allied Health, 36*(2), 108-123.

Videbeck, S. L. (1997a). Critical thinking: Prevailing practice in baccalaureate schools of nursing. *Journal of Nursing Education, 36*(1), 5-10.

Walthew, P. J. (2004). Conceptions of critical thinking held by nurse educators. *Journal of Nursing Education, 43*(9), 408-411.

Watson, G., & Glaser, E. (1964). Critical thinking appraisal manual: In: Videbeck, Sheila, L. (1997a) Critical thinking: Prevailing practice in baccalaureate schools on nursing. . *Jounal of Nursing Education, 36*(1), 5-10.

Watson, G., & Glaser, M. (1957). *Watson Glaser Tests of Critical Thinking: Manual of Directions*. London: George, G. Harp & Company.

Wilkinson, J. M. (2007). *Nursing Process and Critical Thinking* (4th ed.). New Jersey: Pearson, Prentice Hall.

Woodside, A. G. (2010). *Case Study Research: Theory, Methods, Practice*. Bingley: Emerald.

Yin, R. K. (2003). *Case Study Research: Design and Methods* (3rd ed.). Thousand Oaks, California: Sage

Yin, R. K. (2009). *Case Study Research: Design and Methods* (4th ed.). Thousand Oaks, California: Sage

Yin, R. K. (2014). *Case Study Research: Design and Methods* (5th ed.). Thousand Oaks, California: Sage

Youssef, F. A., & Goodrich, N. (1996). Accelerated versus traditional nursing students: a comparison of stress, critical thinking ability and performance. *International Journal of Nursing Studies., 33*(1), 76-82.

Appendices

Appendix 1 Theoretical and clinical components of the undergraduate nursing degree course

An Bord Altranais Requirements	General Nursing	Children's & General Nursing Integrated
Theoretical Instruction (to include self-directed study, exams)	58 weeks	70 weeks
Clinical instruction (supernumerary clinical placement)	40 weeks	54 weeks
Internship (39 hours per week, inclusive of annual leave)	36 weeks	36 weeks
Other		
Total Minimum	10 weeks	10 weeks
	144 weeks	170 weeks
Clinical Practice in General Nursing	**Minimum Weeks**	**Minimum Weeks**
General and specialist medicine	18 weeks	28 weeks
General and specialist surgery	18 weeks	28 weeks
Specialist placements (minimum 2 weeks placement in each specialty) 18 weeks • A/E • Childcare and paediatrics • Mental health and psychiatry • Care of the older person • Home nursing/Community • Operating Theatre • Maternity Care	20 weeks	14 weeks
Remaining regulated placements (can be core/specialist clinical areas)	5weeks	5 weeks
Discretionary		

Theoretical and Clinical Requirements of the Pre-Registration Honours Degree in Nursing. Source: An Bord Altranais (2013), Nursing/Midwifery a career for you. Nursing Careers Centre. Dublin: An Bord Altranais.

Appendix 2 Critical thinking skills

Critical Thinking Skills

Distinguishing between verifiable facts and value claims

Distinguishing relevant from irrelevant information, claims, or reasons

Determining the factual accuracy of a statement

Determining the credibility of a source

Identifying ambiguous claims or arguments

Identifying unstated assumptions

Detecting bias

Identifying logical fallacies

Recognizing logical inconsistencies in a line of reasoning

Determining the strength of an argument or a claim

Beyer, B. K. (1987), Practical Strategies for the Teaching of Thinking. Boston: Allyn and Bacon. (p. 27).

Appendix 3 Critical thinking dispositions and abilities

Critical thinking dispositions

1) Seek a clear statement of the thesis or question
2) Seek reasons
3) Try to be well informed
4) Use credible sources and mention them
5) Take into account the total situation
6) Try to remain relevant to the main point
7) Keep in mind the original and/or basic concern
8) Look for alternatives
9) Be open-minded: a) consider seriously other points of view than one's own (dialogical thinking) b) Reason from premises from which one disagrees- without letting the disagreement interfere with one's reasoning (suppositional thinking) c) withhold judgment when the evidence and reasons are insufficient to do so.
10) Take a position (and change a position) when the evidence and reasons are sufficient to do so)
11) Seek as much precision as the subject permits.
12) Deal in an orderly manner with the parts of a complex whole.
13) Be sensitive to the feelings, level of knowledge, and degree of sophistication of others.

Critical thinking abilities

1) Focusing on a question
2) Aanalyzing arguments
3) Clarifying
4) Judging the credibility of a source
5) Observing and judging observation reports; criteria
6) Deducing and judging deductions
7) Inducing and judging deductions
8) Making and judging value judgments
9) Defining terms and judging definitions
10) Identifying assumptions
11) Deciding on action
12) Interacting with others

Critical thinking dispositions and abilities. Ennis (1985, 46)

Appendix 4 Critical thinking tests

Test	Development	Attributes Measured
California Critical Thinking Disposition Inventory- CCTDI	Facione & Facione 1992	Truth-seeking Openminded Analyticity Systematicity CT Self-confidence Inquisitiveness Maturity of judgment
California Critical Thinking Skills Test - CCTST **Health Sciences Reasoning Test- HSRT**	Facione & Facione 1990 & 1992	Analysis Inference Evaluation Inductive reasoning Deductive reasoning Measures same attributes as the CCTST specifically focused on health science students
Watson Glaser Critical Thinking Appraisal- (WGCTA) (Gadzella et al., 2005)	Watson & Glaser 1940 Watson & Glaser 1980	Inference Recognition of Assumptions Deduction Interpretation Evaluation
Ennis-Wier Critical Thinking Essay Test	Ennis & Weir 1985	Getting the point Seeing reasons and assumptions Stating one's point Offering good reasons Seeing other possibilities Responding to and avoiding equivocation Irrelevance Circularity Reversal of and if-then relationship Overgeneralization Credibility problems Use of emotive language to persudae
American College Testing- College Outcome Measures Programme (ACT-COMP) (Rane-Szostak & Fisher-Robertson, 1996)	American College Testing programme 1987	Tests general college outcomes

Cornell Critical Thinking Test (CCTT) – Level Z (Ennis, 1993) (Lauder & James, 2001)	Ennis & Millman 1985	Induction Credibility Prediction Experimental planning Fallacies Deduction Definition Assumption identification
Halpern Critical Thinking Assessment (HCTA) Butler et al., (2012)	Halpern	Verbal reasoning skills Argument analysis skills Skills in thinking as hypothesis testing Using likelihood and uncertainty Decision-making and problem-solving skills
Critical Thinking Assessment (CTA) Jones & Morris (2007)	Assessment Technologies Institute 2001	Analysis Evaluation Explanation Inference Interpretation Self-regulation
Scale of Judgemental Ability in Nursing (SJAN) (Youssef & Goodrich, 1996)	Seidl & Sauter 1990	Professional judgment in: Legal ethical Problem-solving & Decision-making Communication & Leadership Team functioning

Appendix 5 Sample items for measuring thinking attributes

The sample 'agree-disagree' style items on this page are illustrative of statements that could appear on a college or adult level measure of critical thinking habits of mind. However, the topics and reading levels of statements used on attribute measures intended for use with children or with professional groups are aligned with the common interests and the educational levels of those populations.

Consider the following statements about beliefs, values, and preferences. Decide whether you agree or disagree with each one. Remember that since you are being asked about your own beliefs, opinions, values, and preferences, there really is no 'right' or 'wrong' response. The answer is whatever you say it is for you.

Use the following choices to express your view.

6 = Agree strongly

5 = Agree

4= Agree marginally

3 = Disagree marginally

2 = Disagree

1 = Disagree strongly

I hate talk-radio hosts because they shout out their views without really listening to the other side

I won't let what scientists might say weaken my core beliefs

I prefer jobs where the supervisor says exactly what to do, and exactly when and how to do it.

It's important to me to figure out what people really mean by what they say.

Don't kid yourself, changing your mind is a sign of weakness

I always do better in jobs where I'm expected to think things out for myself.

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Appendix 6 Sample thinking skills items

The sample skills test questions on this page are intended to illustrate the types of questions which might appear on a generic adult level reasoning skills test. However, the topics, reading levels, and degree of difficulty of the questions used on actual tests match the educational level and / or professional interests of the population for which a given test is designed. Some versions of these tests include a greater proportion of items which call for numeracy, as illustrated in item 6.

Instructions:

Form a reflective and reasoned judgment with regard to which choice is the best from those offered.

Sample test items 1-3

For sample items 1, 2, and 3, please consider this information: A scientific study compared two matched groups of college women. The women in both groups were presented with information about a healthy diet and regular exercise. The women in one group were paired up with one another and encouraged to work as two-person teams to help each other stick with the recommended healthy regimen of smart eating and regular vigorous exercise. The women in the other group were recommended to use the same recommended regimen, but they were also advised to work at it individually, rather than with a partner or team mate. After 50 days the physical health and the well-being of all the women in both groups were evaluated. On average the women in the first group (with teammates) showed a 26 point improvement in measures of cardiopulmonary capacity, body strength, body fat reduction, and sense of well-being. On average the women in the other group (encouraged to work as individuals) showed a 17 point improvement on those same measures. Using statistical analyses the researchers determined that the probability that a difference of this size had occurred by chance was less than one in 1000.

Sample item 1

If true, these research findings would tend to support which of the following assertions?

A = A college woman cannot achieve optimal health functioning without a teammate?

B = Universities should require all students living in campus residence halls to participate in a health regimen of smart eating and regular vigorous exercise

C = A healthy diet will cause one to have better mental health and physical strength.

D = This research study was funded by a corporation that makes exercise apparel.

E = A regimen of smart eating and regular exercise is related to better health.

Sample item 2

If the information given in the case above were true, which of the following hypotheses would not need to be ruled out in order to confidently claim that for the majority of young adults a regimen of smart eating and regular vigorous exercise will result in significant improvements in one's overall health.

A = This study was about women, the findings cannot be generalized to include men.

B = Since the study began to solicit willing participants before the Research Ethics Review Committee of the college gave the research project its formal approval to gather data, the findings are invalid.

C = some women in the study over-reported their compliance with the eating and exercise regimen, which led the researchers to underestimate the full impact of the regimen.

D = Since many of those studies described themselves as overweight or out of shape when the study began, a similar regimen will not benefit people who are healthier to start with.

E = The performance tests used to evaluate the health and well-being of females may not be appropriate for evaluating the health and well-being of males.

Sample item 3

Consider the claim, 'women with a teammate or partners on a health regimen is better than working individually.' Which of the following additional pieces of information would not weaken the claim?

A = Most of the women in the group that was encouraged to work individually actually worked with friends and partners who were not part of the study

B = Most of the parings and the teams created in the first group (with teammates) fell apart after a few days and the women in that group worked individually.

C = There was something about the women in the first group (with teammates) that the researchers overlooked, thus invalidating the intended matching of the two groups.

D = Men are more likely to work alone, so any recommendation that men find a teammate or partner to support them in sticking with the regimen will be ignored.

E = The study was undertaken when there were no exams or major projects due, thus the results about working with a teammate do not apply to more stressful times of the year.

Sample item 4

Three graduate school friends, Anna, Barbara, and Carol, graduated successfully. Being in the same program, the three often worked as a team on group assignments. Anna earned the special recognition of 'pass with distinction' when she graduated. Carol and Barbara, although receiving their degrees, did not earn this special honour. A fourth student in the same graduate program, Deirdre, often said that the graduate program was poorly designed and not difficult at all. Deirdre did not graduate, instead she was advised by the faculty to withdraw from the program because her work was below acceptable standards. Given this information only, it follows that:

A = Carol and Barbara deserved to receive 'pass with distinction' like Anna.

B= Barbara's work in the program was superior to Carol's

C= Barbara was jealous of the academic success of her friend, Anna, enjoyed

D= Deirdre's work in the program was below the quality of Carol's work

E= Anna, being successful, will decide to enrol in another advanced graduate program.

Sample item 5

'I've heard many reasons why our nation should reduce its reliance on petroleum vehicle fuels. One is that relying on imported oil makes our economy dependent on the political whims of foreign rulers. Another is that other energy sources, like the possibility of hydrogen based fuels are less harmful to the environment. And a third is that petroleum is not a renewable resource so when we've used it all up, it will be gone! But I don't think we're likely to use it all up for at least another fifty years. And by then we'll have invented newer and better fuels and more fuel-efficient vehicles too. So that argument doesn't worry me. And I don't really believe the stuff about how foreign leaders can force our nation to change its policies by simply decreasing their oil production. Oil companies like Exxon have made record profits precisely in those times when the supply of foreign oil was reduced. I don't see the big oil companies being very interested in policy change when the money is rolling in. And for another, our nation has demonstrated that it is willing to wage war rather than to permit foreign leaders to push us around. So this whole thing about how we have to reduce our reliance on petroleum based gasoline, diesel, and jet fuel is bogus.' The speaker's reasoning is best evaluated as:

A = strong. It shows the arguments for reducing petroleum vehicle fuels are weak.

B = strong. The speaker is very clear about what he believes and why he believes it.

C = weak. The speaker probably owns stock in Exxon or some other oil company.

D = weak. The speaker ignored the environmental argument entirely.

Sample item 6

Using the phone at her desk, Sylvia in Corporate Sales consistently generates a very steady $1,500 per hour in gross revenue from her firm. After all of her firm's costs have been subtracted, Sylvia's sales amount to $100 in bottom line (net) profits every 15 minutes. At 10:00 a.m. one day the desk phone Sylvia uses to make her sales calls breaks. Without the phone Sylvia cannot make any sales. Assume that Sylvia's regular schedule is to begin making sales calls at 8:00a.m. Assume she works the phone for four hours, takes a one hour lunch exactly at noon, and then returns promptly to her desk for four more hours of afternoon sales. Sylvia loves her work and the broken phone is keeping her from it. If necessary she will try to repair the phone herself. Which of the following options would be in the best interest of Sylvia's firm to remedy the broken phone problem.

A = Use Ed's phone repair shop down the street. Ed can replace Sylvia's phone by 10:30 a.m. Ed will charge the firm $500.

B = Assign Sylvia to a different project until her phone can be replaced with one from the firm's current inventory. Replacing the phone is handled by the night shift.

C = Authorize Sylvia to buy a new phone during her lunch hour for $75 knowing she can plug it in and have it working within a few minutes after she gets back to her desk at 1:00 p.m.

D = Ask Sylvia to try to repair the phone herself. She will probably complete the repair by 2:00 p.m.; or maybe later.

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Appendix 7 Demographic information

1) Student Identification Number ☐

2) Is your course

General Nursing..... ☐
General/Paediatric..... ☐
Intellectual Disability..... ☐
Midwifery..... ☐
Psychiatry..... ☐

3) What is your course level?

First Year ..... ☐
Second Year..... ☐
Third Year..... ☐
Fourth Year..... ☐

4) What is your gender?

Male ☐ Female ☐

5) What is your age? ☐

6) What is your ethnic background?

Irish ☐ Other ☐

7) Do you hold any of the following academic qualifications?

Diploma ☐ Degree ☐ Master Degree ☐

PhD or Doctorate ☐ None ☐ Other ☐

8) Have you ever undertaken a course to improve your thinking skills?

Yes ☐ No ☐

Appendix 8 Percentiles for critical thinking skills

Health Science Reasoning Test -HSRT
2012 Norms

	New	Updated	
Raw	Nursing Undergraduate	Undergraduate Health Sciences	Categorical Interpretation
0	1	1	
1	1	1	
2	1	1	
3	1	1	
4	1	1	
5	1	1	Overall skill in critical thinking not manifested. Result also consistent with possible insufficient test-taker effort, cognitive fatigue, or possible reading comprehension issues
6	1	1	
7	1	1	
8	1	1	
9	1	2	
10	2	2	
11	3	3	
12	4	5	
13	6	7	
14	13	9	
15	15	15	
16	21	20	Moderate overall skill in critical thinking indicating potential for skills related challenges when engaged in the reflective problem solving and reflective decision making associated with learning or employee development
17	29	27	
18	39	34	
19	48	41	
20	57	53	
21	65	60	
22	73	68	Strong overall critical thinking skill, consistent with the potential for academic success and career development
23	81	74	
24	87	80	
25	93	85	
26	95	90	
27	97	93	
28	98	95	Overall critical thinking skill that is superior to the vast majority of undergraduate and graduate test takers. Skills at the superior level are consistent with the potential for more advanced learning and leadership
29	99	97	
30	99	98	
31	99	99	
32	99	99	
33	99	99	

California Academic Press. (2012). Health Science Reasoning Test (HSRT) 2012 Norms. Milbrae, California: Insight Assessment.

Appendix 9 Ethics confirmation

School of Education,
Rm 3078, Arts Building, Trinity College Dublin Tel. 8962433 soervs@tcd.ie

20/01/2009

To whom is may concern

Mr. Tom Noone, School of Nursing and Midwifery, Trinity College Dublin submitted a research project proposal to the Ethics Committee of the School of Education, Trinity College. He identified the issues of ethics and risk involved and the steps that will be undertaken to address these.

The Ethics Committee is satisfied that the ethical and risk issues have been adequately addressed.

For the Ethics Committee,

Dr. Andrew Loxley
Director of Research

UNIVERSITY OF DUBLIN
SCHOOL OF EDUCATION
TRINITY COLLEGE

Appendix 10 Ethics confirmation

THE UNIVERSITY OF DUBLIN
TRINITY COLLEGE

SCHOOL OF MEDICINE
FACULTY OF HEALTH SCIENCES

Mr. Tom Noone

Wednesday, 18th November, 2009

Study: "Critical Thinking in Undergraduate General Nursing Students"

Dear Mr Noone,

Further to a meeting of the Faculty of Health Sciences Ethics Committee – January 2009, we are pleased to inform you that the above project has been approved without further audit.

Yours sincerely

Dr. Orla Sheils
Chairperson
Faculty of Health Sciences Ethics Committee

cc Dr Aidan Seery, School of Education Trinity College Dublin

Appendix 11 Ethics confirmation

22nd September 2009

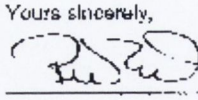
Mr Tom Noone
c/o Dr Aidan Seery

Re: LS-09-109-Noone-Seery: *Critical Thinking In Undergraduate General Nursing Students*

Dear Mr Noone

Thank you for your response to the Human Research Ethics Committee –Sciences (21/09/09). **The Decision of the Committee is to grant approval for this application.**

Yours sincerely,



Appendix 12 Recruitment letter for undergraduate nursing students

Dear...

I am undertaking research on critical thinking in undergraduate general nursing students for my PhD study. I am very interested in your views about this topic. I take this opportunity to inform you about the study and invite you to participate.

Participation is entirely of your own free will and you may withdraw from the study at any time and your right to do so will be respected. If you decide not to participate your right to do so will also be respected.

I have enclosed an information sheet about the study. Once you have read the information about the study and if you volunteer to participate please complete and return the enclosed interview recruitment form as well as the consent form in the next seven days.

If you would like further details please contact me at ... .

With Regards,

Yours Faithfully,

Signed:

Assistant Professor in General Nursing.

Appendix 13 Information for undergraduate nursing students

Title of study: Critical thinking in undergraduate general nursing students.

Introduction: The purpose of this study is to collect information from you in relation to your critical thinking. What is required is that you complete two questionnaires, one taking 20 minutes and one taking 50 minutes. You are also invited to participate in a semi-structured interview of approximately forty five minutes duration. The interview will be with the researcher (Name) and will take place in the School of Nursing and Midwifery at a time and place convenient for you. You do not require any specific knowledge to participate in the study.

Procedures: Information for this study will be collected from all general nursing students who participate in the study. Male and female nursing students are invited to participate in the study.

Benefits for you: Participation in this study will evaluate your critical thinking ability. For those of you who participate in an interview it will allow you provide further information about critical thinking and in doing so the information you provide will help our understanding of critical thinking and how this might be influenced in the nursing course. This will also develop your own insight and understanding of critical thinking which can be of benefit to your own learning on the course.

Risks: There are no risks associated with this study.

Confidentiality: Your name will not be disclosed or published as a result of participation in this study. All information you provide will be kept in the strictest confidence and only the researcher will have access to the information collected. Your name will not be used on the questionnaires and identification numbers will be used instead. If you volunteer to participate in an interview your name will not be used in the transcribed data or in the research study.

Voluntary participation: If you decide to volunteer to participate in this study, you may withdraw at any time. If you decide not to participate, or if you withdraw, you will not be penalized and your right not to participate or withdraw at any stage will be respected.

Permission: This study has been approved by the research ethics committee of your university. I will ask you to sign a consent form when data collection takes place.

Further information: If you would like further information about this study you may contact:

Appendix 14 Interview recruitment form for undergraduate nursing students

If you wish to volunteer for an interview please provide your contact details.

NAME:

EMAIL ADDRESS:
PHONE NUMBER:

THE INTERVIEW

You do not require any special knowledge to participate in the interview. The interview will explore your views on critical thinking in relation to aspects such as what you believe about it, its use, benefits, barriers, how you use critical thinking. The interview will be with (Name). The duration of the interview will be forty five minutes. The interview will be in the School of Nursing and Midwifery or a venue at a time convenient for you. All the information will remain confidential and no other person will have access to the recorded data or the transcription. You will have access to the transcription of your own interview if you wish.

I look forward to hearing your views on this topic.

If you would like further information you may contact:

Appendix 15 Informed consent form for undergraduate nursing students

PROJECT TITLE: Critical thinking in undergraduate general nursing students.

PRINCIPAL INVESTIGATOR: Tom Noone

BACKGROUND
The purpose of this study is to collect information in relation to your critical thinking ability. Your participation in this study will involve the completion of two questionnaires, one taking 20 minutes and one taking 50 minutes. You are invited to participate in one semi-structured interview of approximately forty five minutes duration. You will have access to the transcription of your interview if you wish. I assure you all information will be confidential and your name will not be published in the study. Data will be stored for five years after the completion of the study and accessible only to the researcher. Permission will be sought for any future use of the data.

DECLARATION:
I have read, or had read to me, the information leaflet for this project and I fully understand the contents. I have had the opportunity to ask questions and all my questions have been answered to my satisfaction. I freely and voluntarily agree to be part of this research study, though without prejudice to my legal and ethical rights. I understand that I may withdraw from the study at any time and that my withdrawl will not affect my course of study. I will receive a copy of this agreement.

PARTICIPANT'S NAME: .....

CONTACT DETAILS: .....

PARTICIPANT'S SIGNATURE: .....**Date:** .....

INVESTIGATOR'S SIGNATURE: ..... **Date:** .....

Appendix 16 Recruitment letter for lecturers in nursing

Re: PhD Study and Critical Thinking

Dear.....

I am ..... Assistant Professor in general nursing in the School of Nursing and Midwifery in ... . I am undertaking research on critical thinking in undergraduate general nursing students for my PhD study. I am exploring this topic with undergraduate general nursing students and I am also interested in your views about this topic as a lecturer teaching the undergraduate nursing students.

I take this opportunity to inform you about the study and invite you to participate. Participation is entirely of your own free will and you may withdraw from the study at any time and your right to do so will be respected. If you decide not to participate your right to do so will also be respected.

I have enclosed an information sheet about the study. Once you have read the information about the study and if you volunteer to participate please complete and return the enclosed interview recruitment form and consent form by or after seven days.

If you would like further details please contact me at ... .

With Regards,

Yours Faithfully,

Signed

Assistant Professor in General Nursing.

Appendix 17 Information for nurse lecturers

Title of study: Critical thinking in undergraduate general nursing students.

Introduction: The purpose of this study is to collect information from you in relation to your views about critical thinking in undergraduate general nursing. You are invited to participate in a semi-structured interview of approximately sixty minutes duration. The interview will be with (Name) and will take place in the School of Nursing and Midwifery. Privacy and confidentiality is assured.

Procedures: Information will be collected from lecturers who volunteer to participate for an interview. You do not require any special preparation or knowledge to participate in an interview. The interview will be with (Name). The interviews will be in a place and time of convenience for you. The interview will be recorded and you will have access to a transcription of your own interview if you wish.

Benefits for you: Participation in an interview will allow you discuss your views on critical thinking in undergraduate general nursing students. This information will provide insights from nurse lecturers about critical thinking in undergraduate general nursing which will be useful in relation to the development of critical thinking in undergraduate general nursing students.

Risks: There are no risks associated with this study.

Confidentiality: Your name will remain confidential and will not be disclosed or published as a result of participation in this study. All information you provide will be kept in the strictest confidence and only the researcher will have access to the information collected. Pseudonyms or alphabetic codes will be used in the transcriptions of the data.

Voluntary participation: If you decide to volunteer to participate in this study, you may withdraw at any time. If you decide not to participate, or if you withdraw, you will not be penalized and your right not to participate or withdraw at any stage will be respected.

Permission: This study has been approved by a research ethics committee of the university. I will ask you to sign a consent form if you decide to participate in an interview.

Further information: If you would like further information about this study you may contact:

Appendix 18 Interview recruitment form for nurse lecturers

The interview will explore your views on critical thinking in relation to aspects such as your understanding of critical thinking in relation to what you believe about it, its use, benefits, barriers, how you use critical thinking. You do not require any special knowledge to participate in the interview. The duration of the interview will be up to sixty minutes to explore all the topics. The interview will be at a time and place convenient for you. The interview will be recorded and later transcribed for analysis. All the data will remain confidential and no other person will have access to the recorded data or the transcription other than the researcher. You will have access to read the transcription of your own interview if you wish.

If you wish to volunteer to be recruited for an interview please provide your contact details and I will contact you.

NAME

CONTACT DETAILS: Email Phone

If you would like further information please contact

Yours Faithfully

Signed

Assistant Professor in General Nursing

Appendix 19 Informed consent form for nurse lecturers

PROJECT TITLE: Critical thinking in undergraduate general nursing students.

PRINCIPAL INVESTIGATOR:

BACKGROUND
The purpose of this study is to collect information in relation to your views about critical thinking in undergraduate general nursing students. You are invited to participate in one semi-structured interview of approximately sixty minutes duration. The interview will be recorded and you will have access to the transcription of your interview if you wish. I assure you all information will be confidential and your name will not be published in the study. Data will be stored for five years after the completion of the study and accessible only to the researcher. Permission will be sought for any future use of the data.

DECLARATION:
I have read, or had read to me, the information leaflet for this project and I fully understand the contents. I have had the opportunity to ask questions and all my questions have been answered to my satisfaction. I freely and voluntarily agree to be part of this research study, though without prejudice to my legal and ethical rights. I understand that I may withdraw from the study at any time and I have received a copy of this agreement.

PARTICIPANT'S NAME:.....

CONTACT DETAILS:.....

PARTICIPANT'S SIGNATURE:.....

Date:.....

Appendix 20 Topic guide for undergraduate nursing students

Introduction

Welcome the participant.
Acknowledge the value of their time and contribution.
Outline the format of the interview and expected completion time.
Nature of the conversation is to explore your views, opinions and thoughts about aspects of critical thinking.
Audio –recording.
Confidentiality and anonymity.
Consent form.

Topics explored

1) Knowledge of Critical thinking
2) Critical thinking and ordinary thinking
3) Beliefs and values about critical thinking
4) Critical thinking dispositions
5) Critical thinking skills
6) Strengths in critical thinking
7) Weaknesses in critical thinking
8) Development of critical thinking skills and dispositions
9) Characteristics of a critical thinker
10) Expectations about critical thinking
11) Classroom expectations about critical thinking
12) Lecturers expectations about critical thinking
13) Stimulus to critical thinking
14) Impact on your critical thinking
15) Use of critical thinking
16) Need for critical thinking
17) Influence of nursing course on their critical thinking
18) How critical thinking could be developed on the nursing course
19) Challenge of critical thinking

Conclusion

Review the topics explored in the interview.
Ask informants if there is anything they would like to discuss further or add to what they already discussed which they feel is important regarding critical thinking.
Re-assure informants about confidentiality and anonymity.
Acknowledge the value of their contribution to the research study.
Thank the participant.

Appendix 21 Topic guide for lecturers

Introduction

Greet the informant.
Outline the format of the interview and expected completion time.
Nature of the conversation is to explore your views, opinions and thoughts about aspects of critical thinking in undergraduate nursing curriculum.
Focus of the interview is to explore your views about aspects of critical thinking in undergraduate general nursing curriculum.
The conversation is audio-recorded.
Confidentiality and anonymity is guaranteed.

Topics explored

1) Meaning of critical thinking
2) Beliefs about critical thinking in the undergraduate nursing curriculum?
3) Characteristics of a critical thinker
4) Skills of critical thinking
5) Critical thinking in the nursing curriculum.
6) Evidence of critical thinking in the nursing curriculum.
7) Enhancement of critical thinking.
8) Expectations about critical thinking.
9) Teaching and critical thinking.
10) Assessment and critical thinking.
11) Competence and critical thinking.

Conclusion

Review the topics explored in the interview.
Ask informants if there is anything they would like to discuss further or add to what was already discussed which they feel is important regarding critical thinking in the undergraduate nursing curriculum.
Re-assure about confidentiality and anonymity.
Acknowledge the value of their contribution to the research study
Thank the participant.

Appendix 22 Sample of field notes

Field note undergraduate nursing student's interview

Interview with an undergraduate nursing student: Interview 1; Year 3, 09/10/2010; from 11:00-12:50; Field Note at 12:00: The interview took place in… . It commenced at 11 am and was completed at 11:40 with a wind up review of issues discussed which took five minutes. The interview commenced with an introduction and was a rather informal discussion guided by the topic guide. All of the topics were addressed in the interview. The range of topics provided a focus on critical thinking and allowed scope for deeper exploration of topics explored. The conversation was free flowing and the informant was allowed to focus on the topics identified. Open questions were used. The atmosphere was relaxed and the informant was allowed to speak and there was very little interruption to the flow of the conversation. There was no technical jargon and the informant understood all of the questions asked and was allowed to think and was not pressured for an answer. The dialogue was clear and the informant appeared relaxed as she sat back into the chair and was comfortable with the topics and thought about her responses. At the end of the interview the informant said she had covered a lot and had forgotten what she had mentioned earlier on in the interview as it progressed. At the end of the interview I restated the topic we had covered. I allowed time for the informant to think and to add any further comments or clarify and point needed.

I felt that the interview was good in that I approached it in an informal way. I used a relaxed posture which was open and supportive and encouraged the informant to be relaxed. I felt the informant was relaxed as she communicated clearly. She spoke clearly about what at times were abstract issues. I felt there were times in the interview when the informant was challenged by the topics and had thought of them for the first time. At other times I could sense the enthusiasm of the informant as she used exclamations such as, 'oh yes' and really got to grips with the topic of discussion.

I felt the interview went well and I felt that I was connected with the informant and the topic. I was very happy with the interview and I feel the informant also got a lot from the interview.
I think my topics were fine in that they were broad enough to provide as much scope and opportunity to explore critical thinking. My questions were open and I did not lead the informant down any roads that were mine (outsider) versus the informants views (insider). I fell the informant had the opportunity to think and address the questions I asked. I got the impressions the informant was interested, motivated, willing, very comfortable to articulate her views. I also allowed time to sum up the discussion and allowed the informant time to rethink things over, add any additional views.

Field Note; Lecturers Interview

Interview 1: This interview took place on the 27th June 2011 from 2 – 3:10pm. The background to the study was outlined and the focus of the interview clarified. A consent form was signed. The respondent was lecturer in nursing with a PhD. The interview was in the lecturer's office and was without interruption. The interviewer used a digital recorder to capture all of the content of the interview. The environment was quiet and comfortable and very conducive to the interview and guided by a topic guide. The respondent was informed that it was his views that were important. All of the topics and questions on the guide were addressed to the full ability of the respondent. It was obvious during the interview that the respondent was stimulated to think and reflect on critical thinking in the nursing course. The informant provided very good insights related

to the topics and at the end of the interview felt that there was no further additions to add or topics that could be addressed. I felt the interview went well and remained focused on critical thinking. I was aware that the respondent might wander but this did not occur. I felt the respondent was very aware of the topic being discussed and was very willing to provide the information in a rich a form as possible. During the interview I listened and kept pace with the topic guide. I encouraged the respondent with affirmations – yes, good, etc which kept the flow of the conversation and was encouraging for the respondent. Overall this interview went well and I felt that rich information was provided.

Appendix 23 Halpern's six audit trail categories

Category 1) Raw data such as electronically recorded materials, field notes, documents, physical traces, and results.
Category 2) Data reduction and analysis products such as field notes, write up, memos, summaries, theoretical notes, concepts, haunches/ideas, hypothesis.
Category 3) Data reconstruction and synthesis products- structure of the categories, (themes, definitions, relationships; findings and conclusions (interpretations and inferences); and a final report, with connections to the existing literature and an integration of concepts, relationships and interpretations.
Category 4) Process notes – including methodological notes (procedures, designs, strategies, rationale); trustworthiness notes (relating to credibility, dependability, and confirmability); and audit trail notes.
Category 5) Materials relating to intentions and dispositions – the inquiry proposal; personal notes (reflexive notes and motivations); and expectations.
Category 6) Instrument development information – including pilot forms and preliminary schedules; observation formats; and surveys.

Halpern, E.S. (1983). Auditing Naturalistic Inquiries: The Development and Application of a Model. In Lincoln, Y.S. & Guba, E.G. (1985). Naturalsistic Inquiry. Newbury Park: Sage Publications

Appendix 24 Mixed methods pre-analysis decisions and case study strategies

Pre – analysis decisions	Application
1) Consider the purpose of the mixed method research.	In this case study the purpose was to explore critical thinking as the main case using a dominant quantitative approach and to expand the study using a less-dominant qualitative approach. A second purpose was to integrate the quantitative and qualitative data using data triangulation to seek complementarity and add a further dimension to the understanding of critical thinking. This first pre analysis decision related to Yin's (2004) two strategies of case description and the use of qualitative and quantitative data.
2) Decide if the analysis is variable or case oriented	The data was both variable and case oriented. The critical thinking tests measured a set of variables about critical thinking dispositions and skills. The analysis was also case oriented as the qualitative data provided evidence about the embedded units of analysis (i.e. nursing students and their lecturers) in relation to critical thinking. This second pre-analysis decision also related to Yin's (2004) strategy of using qualitative and quantitative data in analysis.
3) Decide if the study is either exploratory or confirmatory	The quantitative questions as 'what' questions while providing exploratory evidence also had a confirmatory dimension. The data analysis provided an exploration of critical thinking dispositions and skills and the application of statistical tests provided confirmation of findings related to variances in the dependent variables measured using the CCTDI and the HSRT. The qualitative data analysis while not strictly confirmatory provided for an exploration of respondents views about critical thinking and was complementary to the quantitative data analysis.

4) Consider the types of data to use in the analysis.	This was influenced by pre-analysis decisions one (purpose of the case study) and two (variable or case data). Both quantitative and qualitative data were used in the analysis phase of this case study. The use of both types of data related to Yin's (2004) strategies of case description and the use of qualitative and quantitative data.
5) Consider the relationship between the types of data	This decision was influenced by the purpose of the study (decision one) and types of data (decision two). According to Onwuegbuzie and Teddlie (2003) the analyst needs to decide first if the qualitative and quantitative approaches will be used equally – equivalent status design or whether one type of data should be dominant. As the mixed methods approach in this case study was dominant less-dominant the quantitative data analysis was dominant and supplemented by the less-dominant qualitative data. According to Onwuegbuzie and Teddlie (2003) the second decision concerns the extent to which the quantitative and qualitative data analyses inform each other during the data analysis process. Onwuegbuzie and Teddlie (2003, 366) suggest parallel mixed analysis may be used if the purpose of the mixed methods research is triangulation, complementarity, initiation, or expansion In this case study a parallel mixed analysis was used in which the quantitative data was dominant and the qualitative data was less-dominant.The purpose was to seek complementarity using data triangulation. This fifth pre-analysis decision in seeking complementarity by triangulation of the data related to Yin's (2004) strategies of case description and use of qualitative and quantitative data.
6) Consider assumptions about the data.	According to Onwuegbuzie and Teddlie (2003) the assumptions about the quantitative data are bounded by the general linear model assumptions, e.g. normality, independence, homogeneity of variance. These assumptions underpinned the statistical tests used in confirming the

	variances in the average scores on the dependent variables measured using the CCTDI and the HSRT. According to Onwuegbuzie and Teddlie (2003) there are fewer generally recognised assumptions for the qualitative data.
7) Consider the source of typology development.	According to Onwuegbuzie and Teddlie (2003) typology development involves the analysis of one data type that yields a set of substantive categories or themes (a typology) which can be applied to another type of data and the results of which could be used to refine or elaborate the typology. Typology development was not a feature of the data analysis in this case study.
8) Consider the source for the typology development.	This pre-analysis decision is applicable where there is more than one analyst and decisions need to be made on the sources and names to identify typologies. It may require some reconciliation between the analysts. This pre-analysis decision was not a concern in this case study as there was only one analyst dealing with the data analysis.
9) Verification source for the typology	Once a typology is developed its creation needs to be justified. This decision was not relevant in the data analysis.
10) Consider temporal designation for data analytic procedures.	The temporal characteristics of the data analysis process. The analyst decides whether typology development will occur, a posteriori (categories developed after all data collected), a priori (categories developed before data collected) and interatively (at different phases).
11) Consider the type of data analysis tools to use.	In this case study SPSS was used for the quantitative data and the qualitative data were analysed using Microsoft word.
12) Consider the process of legitimation.	The establishment of the trustworthiness or rigor of the qualitative data was through the criteria of credibility, dependability, confirmability and transferability. T

Appendix 25 Mixed methods model for data analysis in the case study approach

Step 1: Data reduction as the first step is important and the analyst must retain the context in which the data occur. Data reduction for the quantitative data involved the use of descriptive statistics to include measures of central tendency and dispersion. The average scores on the dependent variables of the CCTDI and HSRT were compared using t-tests. For the qualitative data coding was used from which categories and themes were constructed.
Step 2: The second step in the model involves the display and presentation of the data. For the quantitative data frequency tables, histograms, bar charts and pie charts were used. For the qualitative data the use of themes for their presentation was enhanced by the use of maps/ matrices to show themes and sub themes.
Step 3: The third step is data transformation which if used may involve quantitizing qualitative data and qualitizing quantitative data. This was not used in this study.
Step 4: The fourth step is data correlation and this involves a correlation of the data i.e. correlation of the quantitative data with the quantitized qualitative data. The ability to correlate the data exists if both types of data are collected for each sample member. If only one type of data is collected then the data transformation stage leads to the stage of data integration.
Step 5: The fifth step is data consolidation and is appropriate if the main purpose of the mixed methods research is development (Green et al., 1989)
Step 6: The sixth step in the data analysis model is data comparison. The data analyst might not be able to (or might choose not) to correlate or consolidate the two types of data. Instead the analyst might decide to compare these data. Compare data from different data sources. This may be used if the purpose is either, triangulation, initiation, or complememtarity (Green et al., 1989)
Step 7: The final and seventh step of the model is data integration. In this stage, all data are integrated into a coherent whole or two separate coherent wholes (quantitative and qualitative). Data integration leads to an initial interpretation (Onwuegbuzie and Teddlie, 2003): the nature of the implicit process of mixed methodology lies along at least four dimensions: the inferences assumed for the quantitative portion of the analysis, the inferences assumed for the qualitative portion of the analysis, the inferential relationship between the two, and the possibility for and *overall* pattern or type of inferential process when one is claiming to engage in doing mixed methods research (Miller, 1994). Data interpretation stage is then subjected to legitimation. Once the analyst believes that the interpretation represents the most plausible explanation of the underlying data (i.e. legitimation), conclusions are made and the final report is written. The chain is then completed via follow-up studies in which research questions are reformulated based on these conclusions (Onwuegbuzie and Teddlie, 2003, 378).

A seven step model as a stepwise approach to data analysis adopted from: Onwuegbuzie, A. J. & Teddlie, C (2003). A Framework for Analysing Data in Mixed Methods Research. In A. Tashakkori & C. Teddlie (Eds.), Handbook of Mixed Methods in Social and Behavioural Research (pp. 351-383). Thousand Oaks, California: Sage.

Appendix 26 Codes categories and themes

Coded segments of qualitative data for all interviews

Interview	First Years x 10	Third Years x10	Lecturers x 8
1	175	68	171
2	72	59	72
3	60	81	208
4	68	67	197
5	59	60	200
6	58	77	137
7	84	120	184
8	71	89	189
9	88	83	-
10	75	86	-
Totals of coded segments of qualitative data	810	790	1,358

Analytic categories and emergent themes for qualitative data sets

Data Set	Analytic Categories	Emergent Themes
First year undergraduate nursing students (N=10)	75	12
Third year undergraduate nursing students (N=10)	71	8
Nurse Lecturers (N=8)	54	9

Appendix 27 Sample of data coding

Raw data for two first year undergraduate nursing students showing open codes and data categorized for topic five of the interview schedule as an axial code to organize the coded data for perceptions about critical thinking skills

Sample of transcribed data for topic five: Critical thinking skills as an axial code	Open Codes	Categories
(Yr 1,Q5 Std 1) Do you think there are certain skills needed? I guess…. I guess patience is sometimes a good way cause sometimes if you… become…. so if you jump the gun every time like being…. taking you turn…. take your time wait for the other person …I guess … to get it wrong first and then say …listen this would be a better way — som etimes I guess…… I guess a cognitive or physical one would be not to kind of ….ammm …..aaa…. not to criticize the person take a….. if it's a small thing ….like …..I do a lot of cooking so if it's a small thing whether they burned the rice or something like that you don't think it's the end of the world… like… you know…. You're not going to run it through them and say …ok… you should have actually added a bit of oil in the water and you should have then boiled it a bit more --you just kinda get it over with and do it ……let's do it again and move on and that's a good skill …like…. acceptance I guess of a mistake or a failure –ok – even if you did it yourself and then you can just stop …ok …for example say it could be something simple as critical thinking …could be just not putting a dressing on wet skin and then you realise …oh… I should have dried it or something…. dried the skin before I did that or that part now it's falling off so start again. **Would you see any other kinds of cognitive skills?** Cognitive like… thinking using … ammm -- memory… I guess	**(Yr 1,Q5 Std 1)** Patience Not criticize the person – acceptance of a mistake	**(Yr 1,Q5 Std 1)** Patience Not criticize the person acceptance of a mistake

…remembering for the last time that you …from past experience kind a thing –I guess imagination kinda thing around things like being more creative with your imagination I guess like thinking …ok…. what will it look like afterwords sort of thing and hopefully. **Do you think that the nursing course so far has influenced your critical thinking skills?** I find the classroom is way too oversized for a start …. I find it's to many in a single group during a lecture so your very much -it goes away…. it doesn't exist …. your kinda become ….your sat there…. your just taking notes and you don't really ….maybe at the end of the lecture –ya—you might question but depending on how much the lecture will engage –ok--- you don't want to ask to many questions because there are other students you have to respect that like –ok—your critical thinking is much limited … I guess ….depending on the classroom size. **Tell me about the practice setting then?** The practice setting it's about… ok….. if your working one to one with someone it's like a tutorial I guess cause you have the handover thing and you can really just ask away like kind of …ok…. what does TPN mean….. what does this mean …..what does that mean and then they'll just tell you straight away… I guess sometimes you could ask them… oh whatever…. this syndrome …isn't that where the mouth is slightly deformed or whatever…. you know ….they'll explain and you say… you might remember for the last time through…. I guess it's cognitive….. I guess in ways it's not memory through repetition….. it's memory through ….aaammm…. you kinda hear it again the same words …I guess it helps you -- that you would have heard –ya--- in the classroom setting - not really through the classroom but just even in a few days of	Memory – remembering Imagination - Creativity CT In the Classroom Classroom oversized – your Ct goes away – depends on how much the lecturer engages you – might question Your Ct is limited in the classroom Ct in Practice setting Working one to one in practice like a tutorial – you can question You hear things over again – memory through hearing things over again	Memory – remembering Imagination - Creativity Influence of the classroom on Ct

placement …you know…. it's like learning a new language ….you know it's…. it's ….you learn a few things and then the next day you might not remember them five seconds after… but you might not remember the exact word but I remember things …like… the description of what it was or it's like it does this… this… this symptoms and then maybe the next day after four days of hearing the same symptom or the actual …..phrase or the term—or the term for it ….whatever…. I should remember that word then …you know….. that's good critical thinking I guess ….kind of. What would be the striking things…. the striking skills that you would be using in clinical? In the classroom sometimes …you know…. if it's an hour class like your gona tune ….. you know ….. after a while… I guess in the clinical area sometimes because your constantly on the move …your walking around…. your not going to tune out yet….. you can just walk to different people your assessing …… your taking notes and kind stuff like that And in the clinical area then…. what would be the striking thing? I guess seeing…. it's in the flesh and not having it on a power point presentation sometimes makes it a lot easier to actual see something … you know ..when it's three D… this is a leg ulcer not this whole you not looking at a table your looking at a actual persons leg ---your looking at the true visual. (Yr 1,Q5 Std 1)	Difference in skills in Classroom Vs Clinical Tune out in classroom Clinical not tune out – you're on the move – seeing it in the flesh – it's true visual	
Yr1;Q5;Std2 Q5 Do you think there are skills in critical thinking? Ammm ….. ya.. …I'm sure there are if I can think what they are … ammm …..I think there is because…… I think you can definitely achieve… aamm ..a lot by being critical thinkers and there probably are skills but…. I think there's also some kind of natural.. ammm.. tendencies that people just	**Yr1;Q5;Std2** I think there are skills – you can achieve a lot by CT Inquisitive – Curious	**Yr1;Q5;Std2** Inquisitive – Curious

have to be inquisitive and be.. amm.. curious about things disposition that mightn't necessary have skills involved with it but you can probably hone in on skills to make yourself even more Say a little more about those skills…. what do you think?.... would there be any skill that would come to mind? Maybe just good communications ammm…. and being inquisitive without being you know nosey or without being intrusive And then…. Ya….. in the academic setting then maybe actually just knowing how to condense information and how to…. to ammm …..to use… a… to kinda pinpoint specific things within information to be able to then search for more .	Hone Skills to make you more CT Good Communications Inquisitiveness In Academic Know how to condense information	 Good Communications Inquisitiveness In Academic Know how to condense information
Would you say that you use different critical thinking skills when you are in the classroom or in the academic setting and when you are out in the clinical practice? Ya……. I think so ….. I think because when you are in the clinical setting…. I think critical thinking is more to do with patients and.. ammm…. How you would maybe communicate with patients and communicate with staff --ok –and ask kinda more questions or….. or about…. you know in a… in a kind a diplomatic way –right – you know with staff ….but ….in an academic setting its much more…. it's not really about communication its more about your just finding information and analysing Yr1;Q5;Std2	Ct in Clinical To do with patients – ask more questions Classroom it's more about finding information and analysing	Ct skills in clinical Ct skills in classroom

Appendix 28 Emergent categories from interviews with first year nursing students

Seven emergent analytic categories and their structure with identification codes to show the prevalence of views derived from the perceptions of ten first year undergraduate nursing students in response to topic five of the interview schedule which explored critical thinking skills.

Categories

Category 1: Cognitive skills (Std.1)
Category 2; Skills for critical thinking (Std. 1, 2, 3, 4, 6, 7, 8, 10)
Category 3: Academic Setting & Ct / Process of Ct (Std. 2, 3, 4, 5, 6, 7, 8, 9, 10)
Category 4: Unaware of the skills of critical thinking (Std. 4, 5, 6, 7, 8)
Category 5: Clinical (Std. 2, 3, 4, 5, 6, 7, 8, 9)
Category 6: Requirements for critical thinking (Std. 3, 7, 9, 10)
Category 7: Other (Std. 9, 10)

Category 1: Cognitive skills (Informant 1)

Yr 1, Q5 Std. 1 Memory – remembering
Yr 1, Q5 Std. 1 Imagination – Creativity

Category 2: Skills for critical thinking (Informants 1, 2, 3, 4, 6, 7, 8, 10)

Yr 1, Q5 Std. 1 Patience/Not criticize the person – acceptance of a mistake
Yr1; Q5; Std.2 Inquisitive – Curious
Yr 1; Q5; Std 2 Inquisitiveness
Yr1; Q5; Std.3 Be a logical person/ Organise your thoughts
Yr1; Q5; Std.3 Clear headed & Calm and focus
Yr1; Q5; Std.4 Open minded
Yr1; Q5: Std. 6 Confidence
Yr1; Q5: Std. 6 Quick thinking
Yr1; Q5: Std. 6 Efficiency
Yr1; Q5; Std.7 Awareness, consciousness
Yr1; Q5; Std. 10 Rational
Yr1; Q5; Std. 2 Good Communications
Yr1:Q5; Std8. Communication

Category 3: Academic Setting & Ct / Process of Ct (Informants 2,3,4,5,67,8,9,10)

Yr1; Q5;Std3 No time limit in classroom/ Yr1;Q5;Std3 Quick in clinical/ Yr1;Q5;Std3 Ct skills in classroom slower process
Yr1; Q5; Std4 Classroom not thinking
/YR1; Q5: Std6 Don't think I Ct in classroom/ YR1; Q5: Std 6 Some lecturers good and some bad at ct
Yr1; Q5; Std.7 You don't Ct in classroom/ Yr1; Q5; Std 7 Ct does not happen in Lecture
Yr1:Q5; Std.8 Different in classroom Vs ward
Yr1; Q5; Std. 9 Thinking is variable/Classroom –No, the same challenge as in the ward/
Yr1; Q5; Std 2 Ct skills in classroom
Yr1; Q5; Std.2 In Academic Know how to condense information
Yr1; Q5; Std. 5 In college, Ct is reading more
Yr1:Q5; Std.8 Studying- reading- writing
Yr1; Q5; Std 10 More time to Ct in classroom than ward/

Yr1; Q5; Std 10 Ct hypothetical in classroom
Yr1; Q5;Std 10 Clinical makes you CT/ Yr1; Q5;Std 10 Get ct in clinical

Category 4: Unaware of the skills of critical thinking (Informants 4, 5, 6,7, 8)
Yr1; Q5; Std4 Don't know skills
Yr1; Q5; Std5 Never thought about Ct skills/ Yr1;Q5;Std5 think of any mental skills
Yr1; Q5: Std6 Don't know any other skills
Yr1:Q5; Std8 Can't think
Yr1; Q5; Std 7 Hard to point out what it is

Category 5: Clinical (Informants 2, 3, 4, 5, 6, 7, 8, 9)
Yr1; Q5; Std3 Need to be quick in clinical
Yr1; Q5; Std4 Think differently in clinical
Yr1; Q5; Std5 Nursing handover is CT/ Yr1;Q5;Std5 Ct resource in the ward is nursing
Yr1; Q5: Std6 Confidence and quick thinking evident in nurses on ward
Yr1; Q5; Std 7 More inclined to Ct in clinical/
Yr1:Q5; Std8 Ct happens in clinical/ YR1:Q5; Std8 Am more a critical thinker on the ward
Yr1; Q5; Std 9 More need in clinical – more important
Yr1; Q5; Std2 Ct skills in clinical

Category 6: Requirements for critical thinking (Informants 3, 7, 9, 10)
Yr1; Q5; Std3 Ct takes practice
Yr1; Q5; Std 7 Knowledge helpful to assess a situation/ Yr1;Q5;Std 7 Assessment
Yr1; Q5; Std 7 You ct in an emergency
Yr1; Q5; Std 9 Ct develops as you go on
Yr1; Q5; Std 10 Need knowledge

Category 7: Other (Informants 9, 10)
Yr1; Q5; Std 9 Ct stands back and thinks/ YR1; Q5; Std 9 Methodical
Yr1; Q5;Std 10 Unconscious CT/ Yr1; Q5;Std 10 Only in infancy of my Ct Yr1; Q5;Std 10 I think differently now/ Yr1; Q5; Std 10 Think through in classroom

Appendix 29 Emergent themes and their structure for first year nursing students

Theme One: Knowledge of critical thinking
CT a way of thinking (Std.1,3, 4,6,7,8, 9,10)
Ordinary Thinking Q2- 2.1 (OT) ;2.2 (Std 1.2.3.4.5.7.8.9. 10)
Critical Thinking Q2- (CT) ;2.2 (Std 1.2.5.6.8,10)
Ideal Ct (Q9-9.1) Ideal Ct (Std 1.2.3.4.6.8.9.10)
Characteristics of a CT (Q9 -9.2) (Std, 2,3,4,5,6,7,8,9,10)

Theme Two: Awareness of critical thinking
Q1-1.2 Lack of Clarity & Knowledge of CT (Std1,2,3,4,5, 6,7,8,10)
Q3- 3.5Belief it happens without awareness (Std 6,7)
Q14-14.2 Lack of awareness (Std 4,5,6,10)
Q5- 5.1 Unaware of the skills of CT (Std 4,5,7)

Theme Three: Critical thinking disposition/Inclination
Acting out critical thinking/Evidence of critical thinking (Std 2,3,5,7,9)
Influenced by situation (Std 1,3,4,5,6,8,9)
Disposition can be negative/positive (Std 1,4)

Theme Four: Critical Thinking Skills
Q1, 1.3 Approach /Skills (Std 2,4,5,7,8,10)
Q4, 4.2 Acting out CT/Evidence of CT (Std 2,~~3~~,5,7,8,9,~~10~~)
Q5,5.1 Unaware of the skills of CT/ Limited knowledge of CT Skills (Std 4,5,6,7,8)
Q5,5.2 Cognitive Skills (Std 1)
Q5,5.3 Skills (Std1, 2, 3, 4, 6, 7, 8, 10)
Q8,8.1 Developed Skills (Std1,~~3,~~5,7,8,)

Theme Five: Influences/Stimulus/Impact
Q1-1.4; Influences (Std 2,5,7,9,10)
Q1-1.5 Encouraged (Std 2,8,7,)
Q3-3.4 Belief it influences decisions (Std5,8)
Q4-4.3 Ct Influenced By Situation
10a.2 Influences on CT (Std1,2,8,9,10)
Q16- 16.1; Preparation for Ct (Std2,3,4,5,6,10)
Q16-16.2; Academic/Classroom (Std3,4,6,7,9, 10)
Q16-16.3 (Std x one only Clinical)
Q11- 11.1 Teaching approaches as stimulus (Std1,2,5,8,9)
Q11- 11.2 Patient (Std 2,7)
Q11- 11.3 Clinical (Std 3,4,5,7,10)
Q 11-11.4) Classroom (Std 3,4,5,7,910)
Q 12-12.1) Clinical (Std1,4,6,9)
Q 12-12.2) Influence of other people as Impact on Ct (Std 1,2,4,8,10)
Q 12-12.3) Academic (Std 2,4,6,8)
Q12- 12.4) Nursing Course (Std 9,10)

Theme Six: Challenge of critical thinking
Q3- 3.6Demanding (Std 1,4,10)
Q10c-10c.5 Ct a Challenge (Std 1,~~3~~)
Q18- Q18.1; Challenges you to Ct (Std1,4,7,8,9,10)
Q18-Q18.2; Challenge in achievement (Std 2,3,5,6)

Q18-Q18.3 Academic (Std 1,2,5,9)

Theme Seven: Development of critical thinking
Q8- Q8.1) Developed Skills (Std 1,3,5,6,7,8,)
Q8- 8.2) Developed CT (Std 1,2,3,4,5,6,8,9,10)
Q8-8.3) Clinical Practice (Std 2,5,7,8,9)
Q8-8.4) Questioning (Std 2,4,)
Q8-8.5) Academic (1,7,9,10)
Q8-8.7) To Further Develop Ct (1,2,3,8,10)
Q17- 17.1) Development of Ct (3No data),4(No Data),5,6,7(No Data),9,10(No Data)
Q17-17.2) Academic methods to develop Ct (1,2,8)

Theme Eight: Strengths in critical thinking
Q6- 6.2Strengths (1,2,3,4,6,9)

Theme Nine: Weakness in critical thinking
Q7- 7.1) Thinking/Not thinking (2,3-No Data) (Std ,4,5,67,8)
Q7-7.2) Lack of academic skills (Std 1,5,10)

Theme Ten: Expectations about critical thinking
10.1) Expectations (Std 1,2,3,4,5,6,7,8,9,10)
10.2) Influences on Ct (Std 1.2.8.9,10)
10.3) Academic Influences on Ct (Std 2,9)
10.1) Classroom expectations (Std 1,4,6,7,9,)
11.2) Learning (Std 1,2,3,4)
11.3) Clinical Expectations (Std 5,9)
12.1) Lecturer expectation (Std 1,2,3,4,5,7,8,9,10)
12.2) Student expectation (Std 1,3,4,5,6,8,10)
12.3) Develop Ct (Std 1,8)
12.4) Assignments (Std 6,9)
12.5) Ct a Challenge (Std 1,4)

Theme Eleven: Use of critical thinking
14.1) Clinical (Std 3,4,6,8,9,10)
14.2) Lack of awareness (Std4,5,6,10)
14.3) Academic/Classroom (Std 4,7,9)
14.4) Everyday life (Std 1)

Theme Twelve: Use of critical thinking

15.1) Enhance work (Std1,2,3,5,9)
15.2) Academic (Std 2,9,10)
15.3 Reasoning (Std 6,7,8,10)

Appendix 30 Emergent categories for first year nursing students

Emergent categories for topics 1 to 8 of the topic guide (Appendix 20) explored with the first year undergraduate nursing student's

Topic as Axial Code	Emergent Categories	Prevalence of Category	Interpretation
1) Knowledge of critical thinking	1.1) A way of thinking/Thinking from perspectives (1,3, 4,6,7,8, 9,10)	Strong	Students perceive critical thinking as thinking from different perspectives.
	1.2) Lack of Clarity & Knowledge of CT (1,2,3,4,5, 6,7,8,10)	Strong	They described their lack of awareness about critical thinking.
	1.3) Approach /Skills (2,4,5,7,8,10)	Strong	They described their knowledge of critical thinking in terms of skills such as analysis, ability to prioritise care and make decisions.
	1.4) Influences (2,5,7,9,10)	Strong Weak	
	1.5) Encouraged (2,8,7,)		They described influences on their critical thinking such as their upbringing, the university, lecturers, knowledge from text books and assessment.
	1.6)Clinical practice (7,9)	Weak	Clinical practice also influenced their critical thinking
	1.7) Other (6,7,10)		
2)Critical thinking and ordinary thinking	2.1) Ordinary thinking (Everyday Thinking) (1,2,3,4,5,7,8,9,10)	Strong	Critical thinking was perceived as a deeper form of thinking compared to ordinary thinking which was described as every-day thinking, mundane, passive and going along with things.
	2.2) Critical Thinking (Deeper/Deciding/Perspectives) (1,2,5,6,8,10) Other (3,4,9,7)	Strong	

			Critical thinking was perceived as deeper, more analytic, involved in decision making and provided perspectives about a situation.
3)Beliefs & Values about CT	3.1) Belief Ct is Important (1,6,7,9) 3.2) Belief CT gives perspectives (1,8,10) 3.3) Belief it leads to better care (2,3,9,8) 3.4) Belief it influences decisions (5,8) 3.5) Belief it happens without awareness (6,7) 3.6) Demanding (1,4,10) 3.7) Other (1,3,6,7,)	Strong Strong Strong Weak Strong	In relation to their beliefs and values Critical thinking was perceived as important and provided perspectives. It leads to enhanced care and influences decisions. Respondents perceived critical thinking can happen without awareness and was also perceived as demanding.
4) CT Dispositions	4.1) Difference in the inclined Vs not inclined (2,3,6,7,8,9) 4.2) Acting out CT/Evidence of CT (2,3,5,7,8,9,10)	Strong Strong	People inclined towards critical thinking are different to those not inclined to critical thinking. A Critical thiking is dedicated, includes everything in thinking, are conscious thinkers, quick in their thinking and show evidence in the care they give. The person who is not inclined is more laidback, does not think, is stuck in their ways are slow in thought and they make mistakes. The respondents themselves demonstrate their own critical thinkingthrough questioning, analysing information, providing a rationale, seeking out further information.

	4.3) Influenced by a situation (1,3,4,5,6,8,10) 4.4) Disposition can be negative / Positive (1,4) 4.5) Other (15,78,9,10)	Strong	Ct is influenced by situations.
5) CT Skills	5.1) Unaware of the skills of CT (4,5,6,7,8) 5.2) Cognitive skills (1) 5.3) Skills for Critical Thinking (1,2,3,4,6,7,8,10) 5.4) Academic Setting & Ct / Process of Ct (2,3,4,5,67,8,9,10) 5.5) Clinical (2,3,4,5,6,7,8,9) 5.6) Requirements for CT (3,7,9,10)	Strong Strong Strong Strong	When asked about critical thinking skills respondents were unaware of critical thinking skills but managed to describe what they perceived as critical thinking skills. The skills of critical thinking identified were cognitive skills of memory, creativity, and inquisitiveness. A critical thinker was seen as open-minded, patient, clear headed, logical, rational, methodical, confident, quick thinking efficient and aware. In terms of the respondents perceptions about critical thinking in the academic and clinical settings it was perceived as not happening in the classroom and less challenging than the clinical setting. Critical thinking was perceived as happening in the clinical setting and was more important and different form of thinking. It was also perceived as being more evident in the staff in the clinical setting.

	5.7) Other (9,10)		Respondents also reported that critical thinking required knowledge and that it requires time and practice to develop.
6) Strengths in CT	6.1) Unaware of Strengths (5,10) 6.2) Strengths (1,2,3,4,6,9) 6.3) Other (7,8,9)	Weak Strong	There was an unawareness of the strengths of critical thinking. The strengths identified were cognitive skills of memory and language. Academic strengths in writing and questioning Strengths of courage " not afraid to ask" . Being organised and sociable and open minded were strengths described.
7) Weaknesses in CT	7.1) Thinking/Not thinking (2,3,4,5,67,8) 7.2) Lack of academic skills (1,5,10)	Strong Strong	A strong emergent theme in relation to weaknesses about critical thinking was related to thinking. Not thinking, lack of awareness of thinking and having to think more was considered a weakness. Also being lazy or panicking in a situation. A lack of academic skills such as reading, writing and lack of knowledge were weaknesses in critical thinking.
8) Development of CT skills & Dispositions	8.1) Developed Skills (1,3,5,7,8,)	Strong	First year students perceived their critical thinking developed on entry to the course as well as over the course of the first year. They reported being older and the time span of the first year were influential in

			the development of their critical thinking. More knowledge contributed to critical thinking and being able to think outside the box.
	8.2) Developed CT (1,2,3,4,5,6,8,9,10)	Strong	An emergent theme was also the development of skills which they perceived as critical thinking assessment, analysis, decision making and a more organise approach to care. Initiative and self-confidence developed and understanding the rational for things. Learning not to be judgmental.
	8.3) Clinical Practice (2,5,7,8,9)	Strong	Another theme which emerged was the influence of Clinical practice in the development of critical thinking.
	8.4) Questioning (2,4,)	Weak	
	8.5) Academic (1,7,9,10)	Strong	From an academic perspective the foundation of critical thinking was set in the classroom with the benefit of tutorials and better ability to plan essays.
	8.6) Other (1,4,7,9)		
	8.7) To Further Develop Ct (1,2,3,8,10)	Strong	In relation to the further development of critical thinking. Knowledge development was perceived as needed for critical thinking with the use of questioning and probing by lecturers and the use of tutorials. The nature of subjects was seen as

			influential in developing critical thinking. More practice and time was perceived as influential to further develop critical thinking yet the need for factual content in nursing was acknowledged.

Appendix 31 Emergent themes and sub-themes for third year nursing students

Eight emergent themes and their sub themes for tThird year undergraduate nursing student's perceptions of critical thinking

Theme One: Knowledge of critical thinking

Thinking (Std1,2,6,4,9)
Critical Thinking (Std 1,2,4,8,10)
Ordinary Thinking (2,3,4,6,7,9,10)
Characteristics - Open (3,9,7) /Knowledgeable (1,5,7)/Communication (6,10)/Approach (1,3,4,9)/ Clinical (5,8,9,10)/Ideal (1,4,8,6,9,10)

Theme Two: Awareness of critical thinking

Awareness of Ct (2,3,8,10)
Unaware of Ct skills (1,2,4,5,6,7,8,9)
Lack of Awareness of Ct (1,2,4,5,6,8,9,10)

Theme Three: Critical thinking dispositions/inclination

Not inclined (1,7,9,10)
Inclined (4,6,7,8,9)
Benefit of Ct (3,6)
Requirements (2, 5,8,9,10)

Theme Four: Critical thinking skills

Skills (1,3,4,8,9)
Unaware of Ct skills (1,2,4,5,6,7,8,9)
Communication (1,4,6,7,8)
Academic skills (2)
Cognitive skills (1,3,4,7,8,9,10)

Theme Five: Influence/Stimulus/Impacts

Influences on Ct (1,3,5,6,8,9,10)

Theme six: Challenges of critical thinking

Challenges (2,3,6,7,8, 9,10)

Theme Seven: Expectations about critical thinking

Student expectations of CT (Std;1,2,3,4,5,8,9,10)
Student expectation about what lecturers expect in relation to Ct (in assignments) (Std;1,2,3,5,6,7)
Student expectations about what lecturers expect in relation to Ct on the course(Std;2,6,7,8,9,10)
Expectations about the Influence on clinical practice on CT (Std;3,4,5,6,7,9,10)
Academic/Classroom Influence on expectations (Std;3,5,7,10)

Theme Eight: Use of critical thinking

Clinical use (3,7,8)
Academic use (4,5,6,7,8,9)

Appendix 32 Emergent themes and sub-themes for lecturers

Nine themes and their sub-themes for lecturers views about critical thinking in the undergraduate nursing curriculum

Themes
Theme 1: A Form of thinking
Theme 2: Skills for critical thinking
Theme 3: Characteristics of a critical thinker
Theme 4: Curriculum and critical thinking
Theme 5: Enhancement and development of critical thinking in curriculum
Theme 6: Expectations about critical thinking in curriculum
Theme 7: Teaching and critical thinking
Theme 8: Competence and critical thinking
Theme 9: Assessment and critical thinking

Theme1: A Form of thinking

Q1 A Form of Thinking (L3, 8, 1, 5)
Q2 CT as a form of thinking (L8, 4, 7)
Q3 Ct has an approach to thinking (L4, 3, 1, 8)

Theme 2: Skills for critical thinking

Q1 Cognitive Skills (L6, 2, 3, 4)
Ct is skills in analysis, decision making, problem solving and provide rationale (L 6 P1 6.8)
Ct is to look at things from various angles- analysis synthesis and evaluation (L2/P1/Q1-1.6)
Ct is analysis, synthesis and move to a higher level (L3/P2/Q1/1.6)
Ct means to analyse and evaluate (dig deeper) (L4/P1/Q1/1.10)

Q2 Skills for CT (L6, 5)
Lecturers provide skills in CT (L6 Q2, 4.0)
We develop a questioning culture in education/ Difficult to implement questioning in practice setting (L5 Q2 1.0)

Q3 CT uses cognitive skills in thinking (L8, 7, 3, 6, 2)
Analyse/ Flexible viewpoint/ Ct less rigid open to all sources of information (L8 Q3, 1.0)
Assess/ Evaluate/Question/ Seek information & analyse and apply it/Synthesise/ Use IP skills to effect change management (L7 Q3 1.9)
Transfer Knowledge/ Apply Knowledge (L3 Q3, 1.7)
Reflective/ Good IP Skills/ Ability to step back/ Self awareness/ Discuss argue/ A good communicator/ Able to engage in a process/ (L6 Q3- 1.4)
Assimilate knowledge/ Reflect/ Intellectual engagement (L2 Q3, 1.5)

Q4 Thinking/Cognitive Skills (L 1, 4, 7, 2, 5)
Thinking outside the box (L1, Q4, 1.2)
Represent your thinking in communication medium L4, Q4, 1.2)

Thinking, reflection/ Linked with skill of effective change management/ Assertiveness (L7, Q4, 1.2)
Analyse (L2, Q4, 1.8)
Skill to Read (L3, Q4, 4.1
Skill to read and interrogate what you read/ Skill to analyse text and dig below facts L4, Q4 ,4.1
Skill to question/ read and write/ Know how to critique articles (L5, Q4, 4.1)

Q4 IP Skills (L3, 6, 5)
Knowledge of yourself and self- awareness (L3 Q4, 3.1)
Social interaction and self- awareness (L3 Q4, 3.2)
Self- awareness / Reflection (L3 Q4, 1.6)
Communicate/ Work as team member (L6 Q4, 1.6
Understand and know in clinical practice (L5 Q4, 1.7

Theme 3: Characteristics

Q2 Characteristics/Elements of a CT (L6)
Q3 Ct uses questioning (L4, 5) +L3, 5

Theme 4: Curriculum and critical thinking

Q5 Curriculum Outcome (L1,4) (Could tie this in with theme on EVIDENCE in curriculum)
Ct an outcome of curriculum/ We have not harnessed Ct in the last 8-9 years but should have grappled with it more/ Not happening in academic/ we talk about it/ Uncertainty about CT (L1-Q5-1.0)
Ct taken as implicit in curriculum/ Ct represented in module structure and Learning outcomes / Ct probably represented in clinical competence (L4 Q5-1.1)

Q5 Implicit in Curriculum (L1,4,3,5)
Implicit in curriculum/ Ct developed in reflective time in clinical (L1-Q5-1.1)
Ct taken as implicit in curriculum/ Ct represented in module structure and Learning outcomes / Ct probably represented in clinical competence (L4 Q5-1.1)
We underplay CT at expense of scientific content L3 Q5 -6.;1.~~3~~)
Needs to be addressed more directly in the curriculum (L5 Q5 -1.12)

Q5 Evident in curriculum (L7,1,6,8)
Evidence of Ct in curriculum terminology/ Evident in how students taught and assessed / Evident in the reflective practice L7 Q5- 1.2)
Ct Evident in assessment (L1 Q5 – 1.4
Ct evident in Discourse of educators / Ct evident in clinical competencies (L4 Q5-1.10
Ct is a buzzword/ Sowing seeds in first year/ Modularisation has disadvantaged CT (L6-Q5-1.19
Ct an outcome of curriculum/ We have not harnessed Ct in the last 8-9 years but should have grappled with it more/ Not happening in academic/ we talk about it (L1-Q5-1.0;
Curriculum enhances the Ct over the course/ We put critically discuss in learning outcomes (L8 Q5-1.18
Evidence of Ct in curriculum terminology/ Evident in how students taught and assessed / Evident in the reflective practice L7 Q5- 1.2)

Q5 Lack of Facilitation in Curriculum (L1, 5, 3, 4, 8, 6)
Ct an outcome of curriculum/ We have not harnessed Ct in the last 8-9 years but should have grappled with it more/ Not happening in academic/ we talk about it (L1-Q5-1.0;
Some people think Ct is the difference between a level 8 & 9 course/ Ct not well represented (L5 Q5 -1.16
Ct expected in graduate attributes/ Lack of support for CT/ Integrated in curriculum but never facilitated/ You expect CT in assignment but don't tell them how to get there/ Did we facilitate CT or give them content L3 Q5 -1.0
Bemoan lack of ct in everyday discourse/ Need descriptive knowledge for ct L4 Q5-1.1
Curriculum enhances the Ct over the course/ We put critically discuss in learning outcomes (L8 Q5-1.18
Ct is a buzzword/ Sowing seeds in first year/ Modularisation has disadvantaged CT (L6-Q5-1.19

Q5 Clinical (L1,3,4)
CT accommodated in clinical (L1-Q5-1.1)
Not sure it happens in academic as skills concerned with throughput and time/ Happens in clinical (L1-Q5-10.1
Clinical skills better for CT as reflection built into end of class (L3 Q5 -5.2
Implicit in curriculum/ Ct developed in reflective time in clinical Q Right. (L1-Q5-1.1
Ct evident in Discourse of educators / Ct evident in clinical competencies (L4 Q5-1.10)

Q2 CT in the Curriculum (6, 1, 7, 4)
Large lecture not conducive to CT (L6 Q2 -2.2
Ct more implicit than explicit (Implicit/Explicit L1 Q2 (5.4).
A gap between theoretically becoming a CT and an actual CT (L1 Q2 4.1
Ct not really evident/ We expect student to become a Ct (L1 Q2-2.7
Reflective practice allows students apply Ct (L7 Q2)
No scope in teaching to develop Ct (L7 Q2)
Evidence of Ct in grades awarded but we not clear about CT (L4 Q2 -2.6)

Q5 Expected (L6, 5, 1, 3)
Can't expect a first year to be a Ct/ We expect too much Ct in first year (L6-Q5 –2.6
Ct is a buzzword/ Sowing seeds in first year/ Modularisation has disadvantaged CT (L6-Q5-1.19
More likely to see Ct in fourth year/ You can see Ct in assessments (L5 Q5 -3.5
Not sure student a critical thinker as we go along the course/ Unrealistic to expect all the group to be at same level of Ct in fourth year (L1-Q5-3.6
Ct expected in graduate attributes/ Lack of support for CT/ Integrated in curriculum but never facilitated/ You expect CT in assignment but don't tell them how to get there/ Did we facilitate CT or give them content L3 Q5 -1.0

Theme 5: Enhancement and development in the curriculum

Q7 Approach to CT (L5, 1, 8, 4, 7, 6)
Q7 Teaching Methods and CT (L5, 6, 3, 4, 8)
Q7 Enhancement of CT in Curriculum
Q7 Terminology (L6)
Q7 Clinical (L1, 5, 7)
Q2: Beliefs: critical thinking and clinical (Std 7, 1, 4)

Theme 6: Expectations about critical thinking in the curriculum

Q8 Curriculum Expectations (L5, 1, 4, 6)
Q8 Ct expected outcome by 4th year (L5, 1, 4, 3, 7, 8)
Q8 Expectations at different stages of course (L7, 5, 3)
Q8 Clinical expectations (L5, 6, 7, 8, 1)
Q8 Expectations about the student & CT (L1, 3, 5, 7, 2)

Theme 7: Teaching and critical thinking

Q9 Small Group Teaching (L4, 5, 7, 8)
Q9 Resources a problem (L3, 8, 7)

Theme 8: Competence and critical thinking

Q11 CT & Competence unrelated (L3, 1, 7, 6)

Theme 9: Assessment and critical thinking

Q10 Assessment (L, 1, 3, 4, 5, 6, 7)
Q10 Nature of the assignment (L3, 4)
Q10 Assessment limits (L3)
Q10 Terminology
Q10 Clinical (L3)
Q10 Perspective (L1)

Appendix 33 Frequency tables showing percentage proportions for critical thinking dispositions of first year nursing students

The percentage proportions were not rounded to whole percentages and the reason for this was that SPSS rounds values less than 0.5 downwards and values 0.5 and greater upwards. This tended to give a slight distortion in which cumulative percentages were slightly above and slightly below 100% in some cases. In some instances percentages were whole percentages

	Frequency	Percent	Valid Percent	Cumulative Percent
Negative	51	21.5	21.5	21.5
Ambivalent	135	57.0	57.0	78.5
Positive	47	19.8	19.8	98.3
High	4	1.7	1.7	100.0
Total	237	100.0	100.0	

First year nursing students: Truth-seeking

	Frequency	Percent	Valid Percent	Cumulative Percent
Negative	4	1.7	1.7	1.7
Ambivalent	77	32.5	32.5	34.2
Positive	143	60.3	60.3	94.5
High	13	5.5	5.5	100.0
Total	237	100.0	100.0	

First year nursing students: Open-minded

	Frequency	Percent	Valid Percent	Cumulative Percent
Negative	7	3.0	3.0	3.0
Ambivalent	82	34.6	34.6	37.6
Positive	132	55.7	55.7	93.2
High	16	6.8	6.8	100.0
Total	237	100.0	100.0	

First year nursing students: Analyticity

	Frequency	Percent	Valid Percent	Cumulative Percent
Negative	32	13.5	13.5	13.5
Ambivalent	117	49.4	49.4	62.9
Positive	80	33.8	33.8	96.6
High	8	3.4	3.4	100.0
Total	237	100.0	100.0	

First year nursing students: Systematicity

	Frequency	Percent	Valid Percent	Cumulative Percent
Negative	17	7.2	7.2	7.2
Ambivalent	99	41.8	41.8	48.9
Positive	93	39.2	39.2	88.2
High	28	11.8	11.8	100.0
Total	237	100.0	100.0	

First year nursing students: Critical thinking self-confidence

	Frequency	Percent	Valid Percent	Cumulative Percent
Negative	6	2.5	2.5	2.5
Ambivalent	44	18.6	18.6	21.1
Positive	112	47.3	47.3	68.4
High	75	31.6	31.6	100.0
Total	237	100.0	100.0	

First year nursing students: Inquisitiveness

	Frequency	Percent	Valid Percent	Cumulative Percent
Negative	13	5.5	5.5	5.5
Ambivalent	73	30.8	30.8	36.3
Positive	119	50.2	50.2	86.5
High	32	13.5	13.5	100.0
Total	237	100.0	100.0	

First year nursing students: Maturity of judgment

	Frequency	Percent	Valid Percent	Cumulative Percent
Negative	1	.4	.4	.4
Ambivalent	120	50.6	50.6	51.1
Positive	114	48.1	48.1	99.2
High	2	.8	.8	100.0
Total	237	100.0	100.0	

First year nursing students: Total CCTDI scores

Appendix 34 Frequency tables showing percentage proportions for critical thinking skills of the first year nursing students

The percentage proportions were not rounded to whole percentages and the reason for this was that SPSS rounds values less than 0.5 downwards and values 0.5 and greater upwards. This tended to give a slight distortion in which cumulative percentages were slightly above and slightly below 100% in some cases. In some instances percentages were whole percentages

	Frequency	Percent	Valid Percent	Cumulative Percent
Not Manifested (0-14)	40	31.5	31.5	31.5
Moderate (15-20)	55	43.3	43.3	74.8
Strong (21-25)	29	22.8	22.8	97.6
Superior (26+)	3	2.4	2.4	100.0
Total	127	100.0	100.0	

First year nursing students: Total HSRT Score

	Frequency	Percent	Valid Percent	Cumulative Percent
Not Manifested (0-2)	37	29.1	29.1	29.1
Moderate (3-4)	64	50.4	50.4	79.5
Strong (5+)	26	20.5	20.5	100.0
Total	127	100.0	100.0	

First year nursing students: Analysis

	Frequency	Percent	Valid Percent	Cumulative Percent
Not Manifested (0-2)	44	35	35	35
Moderate (3-4)	74	58	58	93
Strong (5+)	9	7	7	100
Total	127	100	100	

First year nursing students: Inference

	Frequency	Percent	Valid Percent	Cumulative Percent
Not Manifested (0-2)	21	16.5	16.5	16.5
Moderate (3-4)	53	41.7	41.7	58.3
Strong (5+)	53	41.7	41.7	100.0
Total	127	100.0	100.0	

First year nursing students: Evaluation

	Frequency	Percent	Valid Percent	Cumulative Percent
Not Manifested (0-4)	23	18	18	18
Moderate (5-7)	61	48	48	66
Strong (8+)	43	34	34	100
Total	127	100	100	

First year nursing students: Inductive Reasoning

	Frequency	Percent	Valid Percent	Cumulative Percent
Not Manifested (0-4)	67	53	53	53
Moderate (5-7)	47	37	37	90
Strong (8+)	13	10	10	100
Total	127	100	100	

First year nursing students: Deductive Reasoning

Appendix 35 Frequency tables showing percentage proportions for critical thinking dispositions of third year nursing students

Note: The percentage proportions were not rounded to whole percentages and the reason for this was that SPSS rounds values < 0.5 downwards and values 0.5 and greater upwards. This tended to give a slight distortion in which cumulative percentages were slightly above 100% and slightly below 100% in some cases. In some instances percentages were whole percentages

	Frequency	Percent	Valid Percent	Cumulative Percent
Negative	34	15.8	15.8	15.8
Ambivalent	134	62.3	62.3	78.1
Positive	44	20.5	20.5	98.6
High	3	1.4	1.4	100.0
Total	215	100.0	100.0	

Third year nursing students: Truth-seeking

	Frequency	Percent	Valid Percent	Cumulative Percent
Negative	4	1.9	1.9	1.9
Ambivalent	70	32.6	32.6	34.4
Positive	132	61.4	61.4	95.8
High	9	4.2	4.2	100.0
Total	215	100.0	100.0	

Third year nursing students: Open-minded

	Frequency	Percent	Valid Percent	Cumulative Percent
Negative	3	1.4	1.4	1.4
Ambivalent	83	38.6	38.6	40.0
Positive	115	53.5	53.5	93.5
High	14	6.5	6.5	100.0
Total	215	100.0	100.0	

Third year nursing students: Analyticity

	Frequency	Percent	Valid Percent	Cumulative Percent
Negative	30	14.0	14.0	14.0
Ambivalent	107	49.8	49.8	63.7
Positive	72	33.5	33.5	97.2
High	6	2.8	2.8	100.0
Total	215	100.0	100.0	

Third year nursing students: Systematicity

	Frequency	Percent	Valid Percent	Cumulative Percent
Negative	19	8.8	8.8	8.8
Ambivalent	96	44.7	44.7	53.5
Positive	84	39.1	39.1	92.6
High	16	7.4	7.4	100.0
Total	215	100.0	100.0	

Third year nursing students: Critical thinking self-confidence

	Frequency	Percent	Valid Percent	Cumulative Percent
Negative	8	3.7	3.7	3.7
Ambivalent	44	20.5	20.5	24.2
Positive	119	55.3	55.3	79.5
High	44	20.5	20.5	100.0
Total	215	100.0	100.0	

Third year nursing students: Inquisitiveness

	Frequency	Percent	Valid Percent	Cumulative Percent
Negative	12	5.6	5.6	5.6
Ambivalent	56	26.0	26.0	31.6
Positive	117	54.4	54.4	86.0
High	30	14.0	14.0	100.0
Total	215	100.0	100.0	

Third year nursing students: Maturity of judgment

	Frequency	Percent	Valid Percent	Cumulative Percent
Negative	3	1.4	1.4	1.4
Ambivalent	108	50.2	50.2	51.6
Positive	100	46.5	46.5	98.1
High	4	1.9	1.9	100.0
Total	215	100.0	100.0	

Third year nursing students: Total CCTDI

Appendix 36 Frequency tables showing percentage proportions for critical thinking skills of the third year nursing students

Note: The percentage proportions were not rounded to whole percentages and the reason for this was that SPSS rounds values < 0.5 downwards and values 0.5 and greater upwards. This tended to give a slight distortion in which cumulative percentages were slightly above 100% and slightly below 100% in some cases. In some instances percentages were whole percentages

	Frequency	Percent	Valid Percent	Cumulative Percent
Not Manifested	16	10	10	10
Moderate	98	59	59	69
Strong	48	29	29	98
Superior	4	2	2	100
Total	166	100	100	

Third year nursing students: Total HSRT Score

	Frequency	Percent	Valid Percent	Cumulative Percent
Not Manifested	30	18	18	18
Moderate	85	51	51	69
Strong	51	31	31	100
Total	166	100	100	

Third year nursing students: Analysis

	Frequency	Percent	Valid Percent	Cumulative Percent
Not Manifested	63	38	38	38
Moderate	92	55	55	93
Strong	11	7	7	100
Total	166	100	100	

Third year nursing students: Inference

	Frequency	Percent	Valid Percent	Cumulative Percent
Not Manifested	6	3.6	3.6	3.6
Moderate	71	42.8	42.8	46.4
Strong	89	53.6	53.6	100.0
Total	166	100.0	100.0	

First year nursing students: Evaluation

	Frequency	Percent	Valid Percent	Cumulative Percent
Not Manifested	4	2	2	2
Moderate	91	55	55	57
Strong	71	43	43	100
Total	166	100	100	

Third year nursing students: Inductive Reasoning

	Frequency	Percent	Valid Percent	Cumulative Percent
Not Manifested	66	40	40	40
Moderate	80	48	48	88
Strong	20	12	12	100
Total	166	100	100	

Third year nursing students: Deductive Reasoning

END