

Gaeilge Gaming: Using Technology to Learn Irish in the Primary School

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Declaration

I hereby declare that this thesis, submitted in candidature for the degree of Doctor of Philosophy at Trinity College, Dublin, has not previously been submitted for a degree at this or any other university.

The thesis is entirely my own work, and any assistance is acknowledged.

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Buíochas le Dia na glóire.

AMDG

Abstract

This thesis presents the development and evaluation of an Irish language learning computer game for primary school children. Recent research demonstrates significant challenges for Irish at school, with a sharp decline in proficiency levels in English-medium primary schools (Harris, Forde, Archer, Nic Fhearaile, & O’Gorman, 2006), and widespread disengagement with the language (Devitt, Condon, Dalton, O’Connell, & Ní Dhuinn, 2016). The research reported here aims to address these challenges through coupling technology with best practice in language teaching. In recent years, researchers have been using immersive games and virtual worlds as platforms for language teaching with promising results (Cornillie, Thorne, & Desmet, 2012; Peterson, 2011b; Sykes, Oskoz, & Thorne, 2008). For this project, a three-dimensional virtual environment (3D VE) was developed using a task-based language teaching approach (TBLT). Development took the form of an iterative design cycle, the first iteration comprising a half-day pilot with 25 children (aged 10 years), followed by a user consultation process with 15 of these children (Dalton & Devitt, 2016). The second iteration comprised a five-week intervention using a mystery game in a 3D VE with 17 children (aged 10 years), the children working in groups to complete a range of missions through Irish. The results of this intervention were very positive with reports of increased motivation to use the language, reduced anxiety and increased confidence, language gains, appreciation of the language and a strong experience of meaningful language community. The findings give a profound insight into the various factors impacting on children’s positive and negative learning experiences with Irish. The in-depth qualitative assessment of children’s experience presented in this thesis offers important insight for language educators in the primary sector in Ireland and beyond.

Summary

This thesis presents the development and evaluation of an Irish language learning computer game for primary school children. In the 2011 census almost one in three Irish teenagers claimed to be unable to speak Irish (Central Statistics Office, Ireland, 2012), despite the language being taught daily in primary and secondary school. Research on Irish in primary schools shows considerable success for the Gaelscoil movement, but a sharp decline in standards of Irish in other schools (Harris et al., 2006). Furthermore, primary school children show an excess disengagement with Irish when compared to Maths and English (Devitt et al., 2016). The research reported here attempts to address some of these challenges through adopting a novel approach to teaching Irish using technology. A 3D Virtual Environment (3D VE) was developed as a platform for an Irish language learning intervention based on a Task-Based Language Teaching approach (Nunan, 2004). There has been much interest in the CALL field in recent years in using 3D VEs such as virtual worlds and immersive games for language learning (Cornillie et al., 2012; Peterson, 2011b; Sykes et al., 2008). There are many proposed affordances of these environments for language learning, particularly focusing on promoting target language interaction and fostering student motivation (Reinders & Wattana, 2014; Wehner, Gump, & Downey, 2011). Given the challenging current context of Irish in the primary school, this project aimed to leverage these potential affordances for Irish.

Development took the form of an iterative design cycle, according to the model of Design-Based Research (Wang & Hannafin, 2005). The first iteration was a pilot study which comprised a half-day intervention with 25 children aged 10 years. 15 of these children then took part in a user consultation process, carried out in line with Student Voice methodology (Rudduck, 2007). The findings from the pilot and the children's recommendations from the user consultation both shaped the development of a mystery game in a 3D VE for the second iteration (Dalton & Devitt, 2016). The language learning intervention was trialled by 17 children in 4th class (aged 10) over a five-week period, the children working together in mixed

ability groups to complete a range of missions through Irish. Data collection included questionnaires, language assessments, focus group interviews and the recordings of game interactions. The data was analysed both quantitatively and qualitatively through descriptive statistics and thematic analysis. Most children demonstrated a willingness to communicate through Irish, and reported a reduction in anxiety while speaking Irish as a result of the intervention. Thematic analysis of these game interactions, along with the focus group interviews gives a deep insight into the various factors impacting on the positive and negative experiences the children had with the game and with Irish. The most frequently reported positive factors in promoting a positive experience with Irish were the experience of rewards and the supportive experience of the team. Further positive motivators were active learning and the correct level of challenge. Perhaps the most important negative factor was the low perception that some children had of their Irish language ability, which seemed to prevent them from fully engaging with the game. These factors align with the Self-Determination ARC framework, where Autonomy, Relatedness and Competence are necessary for motivation (Ryan & Deci, 2012). The in-depth qualitative assessment of children's experience presented in this thesis offers an important insight for language educators in the primary sector in Ireland and beyond. These findings can contribute to future planning and policy for the Irish language at primary level. Recommendations are offered for how to leverage the findings of this thesis to support broader efforts to renew Irish language education at primary level and secure a future for the language as a living and vibrant means of communication.

Table of Contents

Gaeilge Gaming: Using Technology to Learn Irish in the Primary School.....	i
Declaration	ii
Acknowledgements.....	iii
Abstract	iv
Summary	v
Table of Contents	vii
List of Figures	xi
List of Tables	xii
1 Introduction.....	1
1.1 Introduction.....	1
1.2 The Irish language context.....	1
1.3 Thesis Aims	4
1.4 Study Overview	5
1.5 Thesis Outline.....	6
2 Conceptual Framework: Towards an Ecology of Second Language Acquisition	9
2.1 Introduction.....	9
2.2 A cognitive revolution - breaking free from the bondage of behaviourism	9
2.3 Socially-informed SLA	11
2.4 The aftermath of Firth and Wagner: A field divided	16
2.5 Ecology as a metaphor for SLA	19
2.6 The Sociocognitive Approach	23
2.7 Rationale for an Ecological Paradigm	28
2.8 Conclusion.....	30
3 Three-dimensional virtual environments for language learning	32
3.1 Introduction.....	32
3.2 Computer Assisted Language Learning – an overview	32
3.3 Three-Dimensional Virtual Environments.....	37
3.3.1 Defining characteristics.....	37
3.3.2 Types of 3D VE	38
3.3.3 In search of an inclusive taxonomy	42
3.4 3D VE Affordances for Language Learning.....	44
3.4.1 What is an ‘affordance’?	44
3.4.2 Conditions for SLA.....	46
3.4.3 Affordances of 3D VEs	52
3.4.4 Constraints and limitations of 3D VEs.....	62
3.4.5 Effectiveness of 3D VEs for language learning	64
3.4.6 Limitations in the 3D VE literature.....	71
3.5 Conclusion.....	72
4 Design of Study	74
4.1 Introduction.....	74
4.2 Research Questions	74

4.3	Overview of Study.....	75
4.4	Philosophical Approach - Pragmatism	76
4.5	Mixed Methods	80
4.5.1	Rationale for Mixed Methods for this study	81
4.5.2	Quantitative Research	82
4.5.3	Qualitative Research	84
4.5.4	Advantages of mixed methods.....	86
4.6	Methodological Approach	87
4.6.1	Introduction.....	87
4.6.2	Design-Based Research.....	87
4.6.3	Student Voice	96
4.6.4	Summary	98
4.7	Research Instruments.....	98
4.7.1	Focus Group Interviews	99
4.7.2	Recordings of children's interactions.....	102
4.7.3	Questionnaires	103
4.7.4	Language Assessments.....	107
4.7.5	Summary	110
4.8	Data Analysis.....	110
4.8.1	Thematic analysis	110
4.8.2	Questionnaires and language assessments.....	113
4.8.3	Triangulation.....	114
4.9	Ethics.....	115
4.10	Limitations	116
4.11	Conclusion.....	118
5	The Design Process.....	119
5.1	Introduction.....	119
5.2	Iterative Design Cycle	119
5.3	Design Objectives.....	120
5.4	Pedagogical Approach.....	121
5.4.1	Task-based language teaching	121
5.4.2	Focus on form.....	123
5.5	Technological Approach	123
5.5.1	3D VE selection for Pilot Study	126
5.6	First Iteration: Pilot Study.....	126
5.6.1	Pilot study procedures	127
5.6.2	Response to the Pilot.....	129
5.7	User Consultation Process	134
5.7.1	Procedures	134
5.7.2	Findings.....	135
5.8	Theoretical contribution from first iteration and user consultation.....	136
5.9	Conclusion.....	139
6	Second Iteration.....	140
6.1	Introduction.....	140

6.2	Pedagogical considerations	140
6.3	Technological considerations.....	143
6.4	Intervention affordances	147
6.5	School Selection.....	150
6.6	Duration.....	153
6.7	Quasi-experimental element	154
6.8	Data collection and analysis	157
6.9	Conclusion.....	158
7	Results	160
7.1	Introduction.....	160
7.2	Questionnaires	160
7.2.1	AMTB	160
7.2.2	Exit questionnaire results.....	168
7.2.3	Language Assessments	176
7.3	Game interactions.....	180
7.3.1	Introduction.....	180
7.3.2	Language	181
7.3.3	Experience of the game	198
7.3.4	Conclusion.....	204
7.4	Focus group interviews	204
7.4.1	Attitudes to Irish.....	205
7.4.2	Experience of the game	207
7.4.3	Outcomes from the game	216
7.4.4	Summary	221
7.5	Conclusion.....	222
8	Discussion	223
8.1	Introduction.....	223
8.2	Attitudes to Irish.....	223
8.2.1	Introduction.....	223
8.2.2	Overall attitude to Irish.....	224
8.2.3	Reduction in Irish lesson anxiety.....	226
8.2.4	Irish language community	230
8.2.5	Summary	231
8.3	Irish language use	232
8.3.1	Introduction.....	232
8.3.2	Pushed output	232
8.3.3	Willingness to communicate	234
8.3.4	Codemixing	235
8.3.5	Cognitive load.....	237
8.3.6	Summary	238
8.4	Language gains	238
8.4.1	Introduction.....	238
8.4.2	Self-reported general language gains	238
8.4.3	Evidence of vocabulary gains	240

8.4.4	No evidence of acquisition of copula.....	241
8.4.5	Summary	243
8.5	Impact of affordances	244
8.5.1	Introduction.....	244
8.5.2	Interactional affordances.....	244
8.5.3	Motivational affordances	248
8.5.4	Summary	257
8.6	Conclusion.....	258
9	Conclusion.....	259
9.1	Introduction.....	259
9.2	Thesis Contributions	260
9.3	Recommendations for policy and practice.....	261
9.4	Future Work.....	262
9.5	Conclusion.....	264
10	References.....	265

List of Figures

Figure 4.1 Example of experimental design.	83
Figure 4.2 The Engineering Design Process (University of Toronto, n.d.)	89
Figure 4.3. The DBR process (adapted from Amiel & Reeves, 2008, p. 34).....	90
Figure 5.1 The design cycle of this research project	120
Figure 5.2. The 3D VE used in the pilot study	128
Figure 5.3. A subsection of the 3D VE where the children searched for clues.....	128
Figure 5.4. Another subsection of the environment where children searched for clues.	129
Figure 5.5. Feedback from the children on what they enjoyed about the pilot	130
Figure 5.6 Overall frequency of themes in User Consultation process	135
Figure 6.1. A comparison of a game quiz activity with and without focus on form	143
Figure 7.1. Group by group breakdown of game experience subthemes.....	199

List of Tables

Table 2.1. Cognitivist and Social Views of SLA Contrasted (Larsen-Freeman, 2007, p. 780)	17
Table 2.2. The role of cognition and social factors according to theoretical position on SLA	25
Table 3.1 The three stages of call (Warschauer 2004, p. 22)	34
Table 3.2. Interactional and Motivational Affordances of 3D VEs	53
Table 4.1 Overview of study	77
Table 4.2 Four worldviews taken from p. 6, Creswell, 2003	78
Table 4.3. Characteristics of Design Based Research (Wang & Hannafin, 2005, p. 8)	91
Table 4.4. Mapping the research instruments to the research questions	100
Table 4.5 Comparison of original AMTB for Irish (Harris and Murtagh, 1999) and the adapted version in this study	106
Table 4.6. Bachman and Palmer's philosophy of language testing	108
Table 5.1 Comparison and evaluation of 3D VE platforms according to project constraints	1266
Table 5.2. The pilot study procedures	1277
Table 5.3 Review of Sim-on-a-stick platform after pilot study	1311
Table 5.4 Review of 3D VEs for main study following the pilot	1322
Table 5.5 Advantages of Open Wonderland platform and how it addresses problems with SOAS	1333
Table 5.6. 3DVE Fuzzy Taxonomy	13939
Table 6.1. The main zones in the customised OWL 3D VE	1444
Table 6.2 Summary of schools invited to participate, those interested and those suitable	1522
Table 6.3. Quasi-experimental design to assess language gains: groups and their purpose	1566
Table 6.4. Quasi-experimental design to assess language gains	1566
Table 6.5. Transcriptions retrieved for each group	1588
Table 7.1 Attitude to Learning Irish	1611
Table 7.2 Motivational Intensity to Learn Irish	1622
Table 7.3 Desire to Learn Irish	1633
Table 7.4 Irish Lesson Anxiety	1644
Table 7.5 Irish Ability Self-Concept	1655
Table 7.6 Integrative Orientation	16565
Table 7.7 Attitude to Irish Speakers	16666
Table 7.8 Instrumental Orientation	16666
Table 7.9 Parental Encouragement	16767
Table 7.10. What helped the children to have fun in the game	1700
Table 7.11. Where in the game they had fun	1711
Table 7.12. What motivated the children to work harder	1722
Table 7.13. What elements of the mission the children liked	1722

Table 7.14. Problem solving strategies	1733
Table 7.15. What brought confidence speaking Irish.....	1733
Table 7.16. Exit questionnaire: Children’s responses to the project and game.....	1744
Table 7.17. The open ended questions on the exit questionnaire	1744
Table 7.18. Experimental group types of sentence	177
Table 7.19. Control group 1 (in-experiment, no FonF): types of sentence	178
Table 7.20. Control group 2: types of sentence.....	178
Table 7.21. Examples of shift in sentence structure from pre to post and delayed post-tests	179
Table 7.22. Overview of relative frequencies of coded references for Language and Experience of the game.	1800
Table 7.23. Relative frequencies of Speaking about Irish subthemes.	181
Table 7.24. Children's perceived lack of competence in Irish	183
Table 7.25. The most frequently occurring Irish words in the interaction corpus.....	186
Table 7.26. The percentage Irish used in interactions per group	187
Table 7.27. Most frequently used classroom phrases	188
Table 7.28. Comparison of All Irish utterances by team	189
Table 7.29. Relative frequencies of comments about the game experience across groups	199
Table 7.30. Comparing references to rewards by team.....	201
Table 7.31 Overall prevalence of themes in focus group interviews	205
Table 7.32 Experience of the game - distribution of subthemes	208
Table 7.33. Relative frequencies of comments about outcomes from the game.....	217
Table 7.34. Relative frequencies of perceived positive impact of game subthemes ..	217

1 Introduction

1.1 Introduction

This thesis details a project to use a purpose-built, Irish-language computer game with children learning Irish in primary school to improve language learning and motivation. There are significant challenges facing the Irish language in schools at present. This thesis explores the use of technology as one way of making a positive contribution towards Irish as a living language in the primary classroom. This introductory chapter will give a brief outline of the current context of the teaching and learning of the Irish, before presenting the aims of the thesis, and summarising the research study. Finally, an outline will be given of the content of the dissertation.

1.2 The Irish language context

The Irish language, Gaeilge, is the first official language of the Republic of Ireland. While the majority of people in Ireland speak English as a first language, it is spoken as a household or community language by approximately 3% of the population of the island of Ireland. The vast majority of the population (89%) remains positively disposed to the language (MORI Ireland, 2005), but only one in 20 of the population uses Irish on a daily basis outside the school system, while the census reports that 42% of the population can speak Irish (CSO, 2011). In the 2011 census, almost one in three teenagers described themselves as unable to speak Irish (CSO, 2011), despite that Irish is a compulsory subject at school, and children have daily Irish lessons from the age of five to 18.

Since the 1930s, the maintenance and growth of the language across the country has been largely reliant on the education system (Harris, 2007a), and the school system is the principal means by which people in Ireland come into contact with the Irish language (Murtagh, 2007a). The majority of Irish schools are English-medium, with Irish taught as a discrete language lesson every day. Irish is a compulsory subject in Irish schools with pupils

at primary and secondary level spending between three and four hours per week studying the language.

Harris and Murtagh's Twenty-Class Study (Harris & Murtagh, 1999) is perhaps the most comprehensive body of research to date on primary school children's attitudes towards the Irish language in English-medium primary schools. This was a nationally representative study of 20 sixth classes. The results showed that approximately half of the children demonstrated a positive attitude to Irish and that children with a more positive attitude demonstrated higher proficiency in Irish. Furthermore, the authors found a statistically significant correlation between a communicative teaching approach and positive attitudes towards the language. This was confirmed by the NCCA review of the 1999 communicative language curriculum, published in 2008 which indicated positive attitudes to the new communicative teaching approach (National Council for Curriculum and Assessment, 2008). However, some commentators believe that the communicative rehearsal scenarios used are more suitable for modern foreign languages and are unrealistic in the context of a minority language (Ó Laoire, 2005).

Irish was one of several areas that McCoy *et al* explored in a review of school related data in the nationally representative longitudinal Growing Up in Ireland study. They found that the children's attitudes were least positive to Irish relative to Reading and Mathematics, with only a fifth of children always liking it (McCoy, Smyth, & Banks, 2012). Boys were more disengaged than girls, with approximately one third of boys never liking Irish compared to approximately a quarter of girls. Devitt *et al* explored the GUI data for Irish in more detail, focusing on the factors which contribute to excess disengagement with Irish (Devitt *et al.*, 2016). As expected, children with less exposure to spoken Irish in school or at home are more likely to show excess disengagement with the language. Literacy activity, special education needs and school patronage are also found to be related to excess disengagement. In further analysis using Random Effects, significant random effects indicate the importance of the

individual teacher and school in the development of pupil engagement with Irish. The implications of these findings echo Harris' previous assertion that the role of the teacher and the school is crucial in the Irish language context: "Irish depends on the attitudes, efforts and commitment of individual schools and teachers in a way that other subjects do not" (Harris, 2007b, pp. 37–38).

While the attitudinal research highlights some issues with Irish engagement at primary level, the research on proficiency gives further cause for concern. A sharp decline in the standard of Irish among primary school children has been observed since the 1980s. For example, in general comprehension of speech, the percentage of children attaining mastery fell from 48% in 1985 to 8% in 2002 and listening vocabulary fell from 42% attaining mastery to a mere 6% (Harris et al., 2006). There are many suggested reasons for this decline including curricular factors, parental involvement, teacher attitudes, and reduction in the time given for teaching (Harris et al, 2006). This period encompasses the implementation of the 1999 New Curriculum in Irish, which embraced the communicative approach to language learning. Why this new approach failed to prevent the continued decline in children's communicative competence has been a source of much discussion (Harris & Ó Duibhir, 2011) and has fed into the NCCA's new integrated language curriculum under development which focuses on meta-linguistic and cross-language skills development (Ó Duibhir & Cummins, 2012). In this context of decline in Irish proficiency in English-medium schools, there has been a growing demand for Irish-medium education in recent years, and the Gaelscoil sector has seen rapid expansion since the 1980s. According to Harris *et al's* longitudinal study on levels of attainment in Irish, the Gaelscoileanna are maintaining standards of Irish with much greater success than English-medium schools (Harris et al., 2006).

Outside of the Irish-medium education sector, the decline in attainment is a major source of concern for educators and Irish language stakeholders. New methods are needed to reverse this downward trend if the Irish language is to retain relevance as a vibrant language

for communication among the broader Irish population. The challenges associated with teaching and learning Irish in primary school were among the most important motivating factors for this research study. The next section will detail the aims of this thesis.

1.3 Thesis Aims

Given the complex nature of the challenges facing Irish as a living and relevant language in schools, this thesis aims to make a contribution to the Irish language education sector through exploring the use of technology to facilitate language learning in new ways. The overall aims of this research were:

- To develop and evaluate a language learning intervention using a three-dimensional virtual environment (3D VE) to support children learning Irish as a second language in primary school.
- To explore how current best practice in language teaching could be coupled with the latest technological advances in order to reverse the downward trend in achievement of Irish fluency in primary school.
- To contribute to broader policy and practice in school-based language learning and minority languages.

The theoretical, methodological and design approaches taken were all selected to best serve these aims. Specifically, the thesis sets out to examine the following research questions:

1. What are the children's attitudes to Irish, and does the intervention have any impact on these attitudes?
2. What were the characteristics of children's use of Irish during the intervention?
3. Is there evidence of language learning after participation in an intervention using the 3D VE tool? Does an additional element of focus-on-form in the 3D VE contribute to language gains?
4. What impact did the projected affordances have on the learning experience?

Given these specific aims and research questions, the next section will give an overview of how this research study was structured to achieve these aims and address the research questions.

1.4 Study Overview

This thesis details an iterative design cycle which aimed to develop and optimise a three-dimensional virtual environment platform for language learning, and to use this platform in a language learning intervention with children learning Irish as a second language in primary school.

There has been growing interest in the use of virtual worlds and games for language learning in recent years. In this study, the term “three-dimensional virtual environment” or 3D VE is used to encompass a broad range of these environment types. These 3D VEs are purported to facilitate language learning through a variety of affordances such as immersion, interaction, rewards, goals, challenge, experiential learning. This research study aimed to leverage these affordances through applying a task-based language teaching approach to a language learning intervention based in a 3D VE. A Design-Based Research approach was taken to the design process so that the platform and intervention could be iteratively optimised through piloting and through user feedback.

The first iteration was an exploratory pilot study, which had the dual goal of exploring the potential for basing a language learning intervention in a 3D VE and of piloting research instruments to assess language gains and affective response to the intervention. This pilot study took place in April 2013 in Bridge 21 – an innovative learning space in Trinity College Dublin. A group of 25 4th class children of mixed gender took part in the three hour intervention, and data was collected using questionnaires and language tests.

Five months later, the same 25 children were invited to take part in a user consultation process about children’s experiences of games and virtual environments, and their priorities in accessing a 3D VE to learn Irish. These children were now in 5th class, and a subgroup of 15

volunteered to participate in focus group interviews. These interviews were analysed thematically to discover the children's viewpoints on important and motivating elements in a 3D VE for learning language.

Based on the findings from the exploratory pilot and the user consultation process, a second iteration was arranged. This comprised a 3D VE language learning intervention in a school setting, over a four to five week period. This took place in May-June 2015, with 17 participants in a 4th class co-educational school in a rural area. The goal of this second iteration was to address the research questions of this thesis through an exploratory study with a quasi-experimental sub element relating to language gains. Data collection comprised questionnaires, language assessments, audio recording of game interactions and focus group interviews.

The next section will describe how the research study is reported in this thesis, giving an outline of the content of each chapter.

1.5 Thesis Outline

There are nine chapters in this thesis. This current chapter aims to situate this thesis within the broader context of the role of the Irish educational system to effectively teach Irish as a first or second language and within the context of current challenges in this area, in addition to giving an overview of the different phases of the research study.

Chapter 2 presents the conceptual framework for this research in the field of Second Language Acquisition. It begins by outlining the evolution of Second Language Acquisition theory from behaviourism to cognitivism, and from cognitivism to a new call for a more socially informed SLA. The emergent metaphor of ecology for language learning is explored and a rationale for using this as a research paradigm for this thesis is developed.

Chapter 3 focuses on the specific SLA field of Computer Assisted Language Learning which is relevant to this thesis, and more specifically to the use of Three-dimensional virtual environments for language learning. The chapter describes these environments and the

affordances which they purport to provide as fora for language learning within the broader context of SLA and CALL research. The research literature on 3D VEs is then critically evaluated to assess the efficacy of the proposed affordances for language learning.

As previously mentioned, the overall aim of this research was to develop and evaluate a 3D VE for children learning Irish. Having presented the theoretical and research bases for this project, Chapters 4, 5 and 6 outline the methodology, research design and implementation. Chapter 4 aims to give a high level overview of the study design, presenting the research questions and the methodological approach used. A pragmatic philosophical approach and mixed methods research were selected to align with the ecological conceptual framework outlined in Chapter 2. Chapter 4 then moves on to explore the rationale for the Design-Based Research approach taken in the research study, which in this study comprises a first iteration, a user consultation and a second iteration. The research instruments and the data analysis methods employed in the research are also discussed here. Chapter 4 concludes with the ethical considerations of the project, and a brief summary of the limitations involved.

Chapter 5 then presents the design process, setting out the first iteration of the design process from conceptualisation, exploring the technology and pedagogy design decisions, to the first implementation and review through a user consultation process. Brief findings from both are presented, and their impact on the design of the 3D VE and language learning intervention used in the second iteration, which was the phase of the research that was specifically used to address the research questions of the thesis. Chapter 5 concludes by describing the theoretical contribution arising from the pilot and user consultation.

In Chapter 6, the procedures taken in the second iteration are outlined, including the pedagogical considerations, technological considerations, the proposed affordances of the intervention and the practical details around experimental design and data collection.

The results of the second iteration are detailed in Chapter 7. The chapter is structured around the various research instruments used, and the findings for each instrument are

examined. The key findings are synthesised and discussed in Chapter 8, which takes each research question in turn and critiques the findings with reference to the research literature for each one. Chapter 8 concludes by summarising the broad findings in the thesis and their contribution to knowledge.

Chapter 9 is the final chapter in the thesis. It sets out the main contributions of the thesis, before providing some recommendations for policy and practice and identifying key areas for future work.

2 Conceptual Framework: Towards an Ecology of Second Language Acquisition

2.1 Introduction

This chapter sets out to frame this thesis within an ecological and sociocognitive paradigm. Second Language Acquisition is a broad and complex field of endeavour. This chapter sets out to outline the evolution of the SLA field from behaviourism to cognitivism, and then to a more socially-aware SLA. The chapter goes on to explore the theoretical divide between cognitive and social SLA theory, before setting out the potential advantages of an ecological paradigm for this thesis. Sociocognitivism will be evaluated according to the requirements of this research as a means of bringing together both social and cognitive perspectives on SLA in order to draw insight from both.

2.2 A cognitive revolution - breaking free from the bondage of behaviourism

In the 1950s, language learning was predominantly understood as habit formation (Fries, 1945; Lado, 1957; Skinner, 1957). It was Chomsky's hugely influential review of Skinner's *Verbal Behaviour* in 1959 (Chomsky, 1959) that began the process of "liberation... from the bondage of behaviourism" for the study of first and second language learning. (Larsen-Freeman, 2007, p. 774). Chomsky's area of interest was first language acquisition, and he criticised Skinner's attempt to place linguistics within a behaviourist framework, claiming that this approach was too limiting, and would result in verbal behaviour remaining a mystery. The theory formulated by Chomsky takes the following premise: the human facility to learn language is innate and that no matter what the language, the learning is based on the same universal underlying principles. While behaviourism prioritised the environment as the source of language for the child, Chomsky proposed that the environment is not the primary driver for language acquisition but rather that children are biologically programmed to acquire the grammar of a language. Chomsky commented that "the fact that all normal children acquire essentially comparable grammars of great complexity with remarkable

rapidity suggests that human beings are somehow specially designed to do this.” (Chomsky, 1959, p. 60)

Chomsky used the term ‘Language Acquisition Device’ (LAD) to refer to the theorised mental tool which children have to facilitate language learning. Chomsky was responsible for redirecting the study of language learning, initiating a “cognitive revolution” in linguistics (Larsen-Freeman, 2007, p. 774). This shift was also felt in the second language learning field, with a seminal article published by Corder highlighting the significance of learner errors (Corder, 1967), and claiming that L2 learners “were actively involved in constructing a system out of the linguistic input to which they had been exposed” and that “learners’ language was a linguistic system in its own right, replete with forms that indicated the learners were applying cognitive strategies to the language learning task.” (Larsen-Freeman, 2007, p. 774) Corder called this system “idiosyncratic dialect” (Corder, 1971), before Selinker coined the term “interlanguage”, (Selinker, 1972), which has remained in use up to the present day. As Larsen Freeman pointed out:

Seeing learner language from this perspective led to an appreciation of the cognitive powers of language learners, an appreciation that was not present when language acquisition was seen to be a product of habit formation, as the behaviourists had been claiming in the years preceding the publication of Corder’s article. (Larsen-Freeman, 2007, p. 774)

These developments through the 1960s and 70s very clearly placed cognitivism at the forefront of linguistics, focusing research on the cognition of individual language learners and how they acquire ever more complex linguistic structures. A cognitivist view of language learning has predominated in the field of L2 theory and research ever since, as demonstrated by Doughty and Long’s categorisation of SLA as “a branch of cognitive science” (C. Doughty & Long, 2003, p. 4). The cognitivist frame of the SLA field was largely left unchallenged until the 1990s, and it has only been in the past two decades that a different viewpoint has begun to jostle for position.

2.3 Socially-informed SLA

Sociocultural theory (SCT), first formulated by Russian psychologist Lev Vygotsky (Vygotsky, 1962, 1978), has been growing in momentum as a theoretical framework for SLA research since the 1980s. There was increasing dissatisfaction with the failure of mainstream SLA to take the social context of language learning into account (Breen, 1985), and SCT emerged as a potential framework to situate language learning in a social context. Lantolf was an early proponent of SCT in SLA (Frawley & Lantolf, 1985; Lantolf, 1994; Lantolf & Appel, 1994), but as Block pointed out: “Until the mid-1990s, explicit calls for an interdisciplinary, socially informed SLA were notable by their absence” (Block, 2003, p.3). A growing number of researchers began to call for a change to the status quo, a change that would acknowledge the central role of the social and cultural aspects of language acquisition. In reflecting on the development of SLA as a cognitive discipline, Davis points out the cognitive emphasis of SLA: “in adopting psychological models for explaining how language is acquired, theorists and researchers tend to view SLA as a mental process, that is, to believe that language acquisition resides mostly, if not solely, in the mind” (Davis, 1995, pp. 427–428).

She also highlighted how the social and cultural aspects of language learning were seen as less important than, and separate from the cognitive processes of learning, and called for more qualitative research in the field to expand this mentalist attitude towards language acquisition.

However, it wasn't until 1997 that advocates of a more socially situated SLA found a compelling voice in Firth and Wagner's controversial article in *The Modern Language Journal* (Firth & Wagner, 1997). Their critique of the “cognitive bias” in mainstream SLA and call for more emphasis on the social dimension drew the attention of the whole field and sparked a heated and vigorous debate about the purpose and scope of SLA research. One of the major criticisms that Firth and Wagner made of mainstream SLA was that it was “myopic vis-à-vis language learning as social practice and language as social phenomenon” (Firth &

Wagner, 2007, pp. 801–802). Their viewpoint was that mainstream SLA was “fundamentally flawed owing to its individual cognitive focus” (Larsen-Freeman, 2007, p. 776), and as they reflected a decade later:

it was the individual’s disembodied cognition - cognition – more specifically, his or her autonomous language processing – that was in the ascendancy, to the detriment of what we might call social cognition, that is, what people do, think, demonstrate, achieve, manipulate, modify, acquire, and learn, together, in concerted social interaction (Firth & Wagner, 2007, pp. 801-802)

This point had previously been raised by Lantolf and Appel, who criticised how the language learner was perceived in mainstream SLA “as a solipsistic biological organism whose cognitive powers simply unfold or ripen with the passage of time, rather than as someone who experiences productive participation in joint activity” (Lantolf & Appel, 1994, p. 11).

Atkinson echoed this critique, claiming that mainstream SLA is “lopsidedly cognitivist” and that “the language learner in mainstream SLA is something like an automaton, interesting only in the sense that it houses a discrete language learning system” (Atkinson, 2002, p. 535).

In order to redress this perceived imbalance in the field, Firth and Wagner’s 1997 paper called for:

- a) A significantly enhanced awareness of the contextual and interactional dimensions of language use,
- (b) An increased emic (i.e., participant-relevant) sensitivity towards fundamental concepts, and
- (c) The broadening of the traditional SLA data base. (Firth & Wagner, 1997, p. 286)

They also rejected the traditional constructs of interlanguage, non-native speaker and learner, and critiqued mainstream SLA’s focus on acquisition over language use.

This paper was the focal point for a contentious debate that played out on the platform of *The Modern Language Journal*. It was interpreted in multiple ways; some saw it as a much needed attempt to redress the balance between the cognitive and social aspects of SLA without disturbing the status quo of the field; others saw it as a radical call to redefine the whole field.

Many commentators took the measured view that Firth and Wagner had a valuable point about the social aspect of SLA having been marginalised, and recognised that it would be beneficial to expand the field of SLA to find a better balance and incorporate a more socially informed, contextual viewpoint. As Atkinson points out:

Obviously but nontrivially, language is social—a social practice, a social accomplishment, a social tool. People use language to act in and on their social worlds: to convey, construct, and perform, among other things, ideas, feelings, actions, identities, and simple (but crucial) passing acknowledgments of the existence of other human beings. None of these activities makes sense apart from a fundamentally social environment—all language is language in use, to paraphrase M.A.K. Halliday. (Atkinson, 2002, p. 526)

Common sense indicated that language acquisition had a social dimension, and for some, Firth and Wagner’s article served as a timely reminder to bear that in mind. Even the most established cognitivist SLA researchers acknowledged this, Long stating “in my view, F&W are perfectly justified, and probably right, in arguing that a broader, context-sensitive, participant-sensitive, generally sociolinguistic orientation might prove beneficial for SLA research” (Long, 1997, p. 322).

Poullisse also accepted that Firth and Wagner had a point, however she demonstrates that she sees this as a potential contribution only in the context of staying strongly situated in the cognitivist tradition:

It is obvious that F&W have a point when they plea for "an enhanced awareness of the contextual and interactional dimensions of language use" and a more positive view of the NNS's attempts to interact in the L2. It is clear that there is room for a more sociolinguistically oriented approach toward SLA. Let us not, however, throw away the baby with the bathwater. There is also a continued need for good, methodologically sound, psycholinguistically oriented research. (Poullisse, 1997, p. 327)

If the debate had stopped here, the “SLA paradigm wars” (Ortega, 2005, p. 318) may not have ensued, but there was a more fundamental issue at stake - the very definition of the field of SLA.

Rampton joined in the discussion on the side of Firth and Wagner, claiming that mainstream SLA did not have the “right conceptual kit” (Rampton, 1997, p. 330) for L2

research and criticising SLA for its “assumptions about, or overly hasty pursuit of, universals, referential above indexical meaning, disembodied cognition, value-free inquiry, progress as a natural condition, and assimilation to the norms of an idealised monolingual U.K. or U.S. national.” (Rampton, 1997, p. 330)

Liddicoat also came out in support of Firth and Wagner’s call, claiming that “In order to understand language as communication, actual instances of language cannot be extracted from the linguistic and non-linguistic context in which they occur” (Liddicoat, 1997, p. 313). And furthermore that the “preoccupation with ... the subject as a learner of a grammatical system, has led to the actual use of language being relegated to a secondary place behind the identification of the processes involved in the activity” (Liddicoat, 1997, p. 314).

It is evident that the SCT challengers of the mainstream cognitivist position have conflicting viewpoints of the very nature of the field of enquiry of SLA. One of the main sources of contention between researchers adopting cognitive or SCT approaches is the nature of how acquisition occurs. Cognitivists view this “as in large part an internal, mental process” (Long, 1997, p. 319), while SCT proponents adopt Vygotsky’s position of learning happening first in the social plane and subsequently transferring to the mental. Ellis explains how SLA hasn’t typically considered the social element of acquisition:

SLA in general has paid little attention to the social context of L2 acquisition, particularly where context is viewed non-deterministically (i.e., as something learners construct for themselves). SLA has been essentially a psycholinguistic enterprise, dominated by the computational metaphor of acquisition (R. Ellis, 1997, p. 87).

Hall stresses how a SCT approach differs from this predominant thrust of mainstream SLA:

From the sociocultural perspective, the process of acquisition is turned on its head and it is posited, instead, that the process originates in our socially constituted communicative practices. The varied ways in which the symbolic tools of these events are used define not only what gets learned by an individual, but the very process of learning itself. (Hall, 1997, p. 303)

Undoubtedly, the SCT theory of language acquisition is in stark contrast to the mainstream SLA view “that language acquisition resides mostly, if not solely, in the mind” (Davis, 1995, pp. 427–428). The SCT view of SLA radically diverges from the cognitive, and this has been a major source of debate and even controversy in the field. Vygotsky theorised that language originates on the social plane before becoming internalised – “any higher mental function was external because it was social at some point before becoming an internal, truly mental function” (Vygotsky, 1981, p. 162). This is echoed more recently by Lantolf:

Internalization is in essence the process through which higher forms of mentation come to be. Internalization then assumes that the [original] source of consciousness resides outside of the head and is in fact anchored in social activity. At first the activity of individuals is organized and regulated (i.e., mediated) by others, but eventually, in normal development, we come to organize and regulate our own mental and physical activity through the appropriation of the regulatory means employed by others. At this point psychological functioning comes under the voluntary control of the person. (Lantolf, 2000, pp. 13–14)

This is entirely contrary to Chomsky’s understanding of the LAD, as according to Lantolf and other SCT theorists, no such device exists, and in fact the acquisition of language occurs external to the individual before it can be internalised. The implications of this reasoning are huge for theory and practice. If SLA is a social activity before it is a cognitive, then looking at cognitive processes is at best secondary in studying language learning. Therefore, for the first time since the cognitive revolution of the 1960s and 70s, the SLA field was thrown into a theoretical debate which questioned the very foundation of the whole discipline and the very nature of language acquisition.

Another focal point of controversy was the question of *acquisition* vs *use*. Firth and Wagner challenged the preoccupation of SLA researchers with acquisition, and urged for more research on language use, claiming that “what constitutes “acquisition” is essentially unclear; we cannot be sure where “use” ends and “acquisition” begins.” (Firth & Wagner, 1998, p. 91) Kasper criticises their position because they have “very little to say about L2 acquisition” (Kasper, 1997, p. 310), but instead focus on language use, which Kasper considers as a separate field of enquiry. Firth and Wagner justified their position by asserting

that “acquisition will not occur without use.” (Firth & Wagner, 1998, p. 93), making language use a relevant subject of enquiry within SLA. However, Michael Long takes issue with this position, stating that “the major problem I have with F&W’s polemic remains my scepticism as to whether greater insights into SL use will necessarily have much to say about SL acquisition” (Long, 1997, p. 322). There is a parallel here between the competence/performance distinction made by Chomsky, where competence refers to the knowledge of language and performance refers to its use. Long’s position is that while he acknowledges that language acquisition takes place in particular social and cultural contexts, he believes that SLA is the study of *acquisition* and he doubts the relevance of the context to actual acquisition, and that language performance is only relevant in so far as it can be used to demonstrate competence. As he and Doughty explained: “understanding underlying competence, not the external verbal behaviour that depends on that competence, is the ultimate goal.” (Doughty & Long, 2003, p. 4) This demonstrates what Atkinson refers to as “Chomsky’s radical severing of competence from performance” (Atkinson, 2010, p. 600) that can be seen in cognitivist SLA.

Firth and Wagner on the other hand, propose a break from the Chomskyan heritage in SLA and they hold that the study of language *use* means that “learning can be explicated and tracked as it happens” (Firth & Wagner, 2007, p.802), and they claim that the “dichotomy of language *use* and *acquisition* cannot defensibly be maintained” (Firth & Wagner, 2007, p. 800). Larsen-Freeman also supports a more unified view of language use and acquisition, positing that “it is not that you learn something and then use it; neither is it that you use something and then learn it. Instead, it is in the using that you learn – they are inseparable.” (Larsen-Freeman, 2007, p. 783)

2.4 The aftermath of Firth and Wagner: A field divided

Ever since the social awakening in SLA for which Firth and Wagner acted as catalysts, there have been two parallel streams of research within the discipline. Mainstream SLA has

remained predominantly cognitivist, but social SLA had significant input in the field. These contrasting views of SLA have co-existed without much overlap, setting their own research agendas and publishing their work without attempting to reconcile opposing points of view: “views of SLA as a basic science that investigates an aspect of human cognition without regard for knowledge use... co-exist with views of SLA as inquiry about human capacities that are socially and politically embedded.” (Ortega, 2005, pp. 318–319)

Larsen-Freeman summarised the contrast between them in the following table:

Table 2.1. Cognitivist and Social Views of SLA Contrasted (Larsen-Freeman, 2007, p. 780)

	Cognitivist SLA (Mainstream)	Social SLA (Challenger)
1. Role of Context	Social context is the site in which L2 acquisition takes place; however, if you change the context, the acquisition process remains the same. The goal is to search for universals that transcend individual contexts.	Social context influences performance. Social factors are related to systematic variation in learner language. Each context is unique although certain generalizations, such as turn-taking principles or observations about repair, can be made
2. Nature of Language	Language is a mental construct.	Language is a social construct.
3. Nature of Learning	Change in mental state	Change in social participation
4. Primary Research Focus	The primary focus is on language acquisition (how people learn a language, not how they use it). Given this focus, what is important are cognitive factors of knowledge representation, processing, and recall.	The primary focus is on language use. Language use and acquisition cannot be easily separated. Therefore, what is important are social/interactional factors and their effect on the language used.
5. Objects of Inquiry in Language-Focused Research	What is of interest is the aggregation and increasing complexity and control of linguistic structures by learners.	What is of interest are discursive routines of communication processes. There is also a need to look at the purpose of talk; a functional perspective to language is most helpful.
6. Identity of Research Participants	The salient identity of the participant in a research study is that of a learner.	The identity that the research participant adopts makes a huge difference, and it may not be that of learner. For example, in the moment, a learner may not “perform his or her competence” because he or she might want to align socially with another less competent peer
7. Perspective on Evaluating Learners’ Progress	Progress is measured by where along the route toward target proficiency the learner is as indicated by the learner’s linguistic performance.	What is at issue is what the learner does with the resources that are available. Look at what the learner does to get his or her message across, not what the learner cannot do.

Continued...	Cognitivist SLA (Mainstream)	Social SLA (Challenger)
8. End State	The end state occurs when learner language and target language are congruent or where learner language is stabilized/fossilized.	There is no end state.
9. Philosophical Orientation	Scientific, value-free inquiry Modernist	A critical view Postmodernist
10. Research Site	Varied, sometimes natural environments, sometimes experimental, where data are elicited	Varied contexts where language is used naturally and heterogeneously
11. Primary Level of Research Conceptualizations	<i>Macrolevel</i> idealizations, in other words, native speaker, learner	<i>Microlevel</i> social relationships that are being achieved through talk in progress
12. Attitudes Toward Acceptance of SLA Theories	One theory will prevail; empiricism will determine which. Positivist	Multiple theories are welcome, even necessary. Relativist; pluralist

Clearly there are epistemological and ontological differences between the two positions, however in recent years there have been calls to “bridge the gap” between them. A major step in this direction was the publication in 2014 of a collaborative article including nine single authored sections reflecting the views of a variety of researchers in both paradigms, all looking at identifying potential gaps in their own theoretical positions and how their own research could be enriched by building bridges between the cognitive and social streams of research (Hulstijn et al., 2014). In his article, Ellis argues that “partitioning the field into social and cognitive theories stands in the way of creating an integrative picture of language learning and use over different levels of granularity and timescale” (Hulstijn et al., 2014, p. 364). This illustrates the growing demand for new paradigms to replace the social/cognitive dichotomy with a more flexible and inclusive system, as the authors point out, the differences between the social and cognitive perspectives are not “an imminent disciplinary demise but ... a compelling invitation to travel many bridges” (Hulstijn et al.,

2014, p. 414). The next section takes a look at one option for building bridges between the cognitive and the social aspects of SLA – an ecological paradigm.

2.5 Ecology as a metaphor for SLA

A promising framework has emerged in recent years; one that aims to be holistic in orientation - an ecological approach to language learning. The source of this breakthrough is in the biological sciences, whereby the metaphor of ecology has yielded a potential lens through which to view the various aspects of language learning explored by the cognitivist and social SLA researchers. Ecology refers to “the totality of relationships of an organism with all other organisms with which it comes into contact” (Van Lier, 2004, p. 3). The ecological metaphor has been seen in the field of psychology most notably with Gibson’s theory of visual perception (Gibson, 1979) and Bronfenbrenner’s theory of child development (Bronfenbrenner, 1979). An ecological approach to linguistics was proposed as far back as the 1950s (Trim, 1959), with subsequent publications demonstrating a growing awareness of the usefulness of this metaphor for a more comprehensive and context-sensitive exploration of language learning (Haugen, 1972; Makkai, 1993). In more recent years, a broadening influence of ecological principles has been seen in the field of linguistics and language learning (Halliday, 1994; Lamb, 1999; Yngve, 1996).

One powerful advantage of the ecological approach is that it may provide a possible framework to look at both cognitive and social elements of SLA in an inclusive way, without the polemics of the cognitivist/SCT divide. An ecological perspective of linguistics is integrated and holistic, and aims to look at “the relations between language use and the world within which language is used.” (Van Lier, 2004, p. 44) As Lam and Kramsch point out, “the recent metaphor of ecology attempts to capture the interconnectedness of psychological, social and environmental processes in SLA” (Lam & Kramsch, 2003, p. 144) This provides a sharp contrast to the historic, compartmentalised view of SLA, and an exciting way forward for researchers interesting in gaining a more complete picture of how learners learn language.

Rogoff further expands on how individual cognition and social activity are interconnected and cannot be meaningfully separated from each other, positing that “individual effort and sociocultural activity are mutually embedded” and “the aim is to recognize the essential and inseparable roles of societal heritage, social engagement, and individual efforts” (Rogoff, 1990, p. 25) .

The key points from Lafford’s outline of the basic tenets of this new approach to language learning are as follows:

1. Language must be studied as a phenomenon situated in context.
2. An ecological linguistic analysis uses an emic approach.
3. Language mediates relationships between people and the world (Van Lier, 2004).
4. Learners acquire language by taking advantage of various affordances.
5. Language use is contingent on the communicative needs of the participants in particular speech situations.
6. Second language acquisition research and language learning activities... should reflect real-world tasks that learners will encounter outside the classroom (Bronfenbrenner, 1977, 1979)
7. An ecological perspective on language, language learning, and education is value-laden and potentially interventionist.(adapted from Lafford, 2009, pp. 674-675)

The term “ecological approach” is not limited to one particular theory or methodology. As Kramsch outlines how using a metaphor of ecology supports the “realisation that learning is a nonlinear, relational human activity, co-constructed between humans and their environment, contingent upon their position in space and history” (Kramsch, 2003, p. 5). Lafford points out that there is significant overlap between an ecological model of language learning and either SCT or Chaos/ Complexity theory (Lafford, 2009), but an ecological framework is not in itself a model of SLA, just a metaphor to help encompass a more comprehensive view of the language learning process in context. This connects with a growing shift towards a more pluralistic attitude to SLA theories. Ortega describes the SLA

field as looking “promisingly pluralistic”(Ortega, 2005, p. 323) and Lantolf calls for this plurality as essential to prevent against absolutism:

An important way of guarding against the dangers inherent in the absolutist world view in any sphere of human endeavour, including science, is to let all the flowers bloom, not just a chosen few. You never know which ones will catch the eye to become tomorrow’s realities. ((Lantolf, 1996, p. 739)

This is what the ecological framework can offer, however, not all SLA researchers are happy with this approach. There are varying opinions as to whether or not multiple theories in the field of SLA are desirable or even acceptable. Even before the emergence of an ecological paradigm, there was considerable debate about whether or not the field should be open to multiple theories. In the 1990s, taking a positivist outlook, Long stated that “culling” would be necessary in the field of SLA at some stage:

There are numerous theories of second language acquisition (SLA), many of them oppositional. Whether or not this is inevitable now, culling will eventually be necessary if researchers are to meet their social responsibilities or if SLA is to be explained and a stage of normal science achieved. (Long, 1993, p. 225)

Long sees the goal of theory development within SLA as to achieve a state when researchers can be “at peace with themselves and each other over basic issues in the philosophy of science” (Long, 1993, p. 230). This reductionism is not the goal of more socially oriented researchers, who are typically more comfortable with a multiplicity of theories, nor does it align with an ecological framework, which allows for a more complex and all-encompassing investigation of SLA. More recently, Hulstijn takes a contrasting view when he differentiates between epistemological stances and the social/cognitive distinction in SLA research. He posits that while the viewpoints of a relativist and a critical rationalist are in fact incommensurable, this epistemological divide does not have to separate social and cognitive approaches to SLA (Hulstijn et al., 2014). In the same collaborative article, Lantolf takes a more radical view, asserting that in fact there is no gap between the social and cognitive, which he justifies by presenting how Vygotsky eliminated the gap between idealist and materialist notions of psychology by developing a theory of psychology grounded in

dialectical materialism (Lantolf in Hulstijn et al., 2014)

As far back as the 1980s there was a call for a more complete study of SLA through including the social context in the field of enquiry. In 1985 Breen pointed out that when SLA research is limited to the individual learner's cognitive processing, the picture of language learning that we obtain is incomplete:

The priority given to linguistic and mentalistic variables in terms of the efficient processing of knowledge as input leads inevitably to a partial account of the language learning process. The social context of learning and the social forces within it will always shape what is made available to be learned and the interaction of individual mind with external linguistic or communicative knowledge. (Breen, 1985, pp. 138–139)

The ecological approach can provide this more all-encompassing study of SLA, but this necessitates an openness to multiple theories. More recently, Atkinson reiterates the point that each individual theory in itself is insufficient to explain SLA:

All the SLA theories we have, all the approaches to SLA you and I know, support, and possibly even cherish, are WRONG. They're wrong in THIS sense – no single theory can do justice to the dizzyingly complex and multifaceted phenomenon we call SLA. As a result, each theory provides at best a PIECE of a larger and much more complex puzzle. (Atkinson, 2014, p. 467)

Given Atkinson's claim that each theory only provides part of the puzzle, the issue remains – how can the pieces be put together? How can valuable insight be drawn from both cognitive and social perspectives when they come from opposing ontologies and epistemologies? Some researchers have suggested broadening the scope of SLA to encompass both outlooks – as Larsen-Freeman points out: “The solution the SLA field has perennially adopted when there are conflicting views is to seek a larger frame, one that acknowledges the contributions of each perspective” (Larsen-Freeman, 2007, p.773). Larsen Freeman recognises the potential benefits to SLA of being able to draw insight from different perspectives. Ellis points out that “we need theoretical integration, too. Cognition; consciousness; experience; embodiment; brain; self; and human interaction, society, culture,

and history are all inextricably intertwined in rich, complex, and dynamic ways in language” (Ellis in Hulstijn et al., 2014, pp. 401–402)

A framework that can encompass research from both social and cognitive perspectives would help to provide a more complete and comprehensive picture of the language learning process. This can be achieved through the ecological paradigm. Lafford also proposes a unified approach to SLA in order to allow “scholarship from both traditions to inform what we know about the dynamic interplay of multiple factors that affect an individual’s acquisition of a second language (L2) in various contexts of learning” (Lafford, 2009, p.673).

While traditionally the cognitive and SCT approaches to SLA have been established in opposition to each other, an ecological framework removes the need for such a stark delineation of difference between the two approaches. Gass was one of the staunchest critics of Firth and Wagner’s 1997 paper, and strongly defended the cognitive tradition of SLA. However, even she recognised that there is no need to set up the social and cognitive perspectives to SLA in opposition to each other, that in fact they are looking at different aspects of language learning and as such, both can contribute to SLA and she claims that “the establishment of a rigid dichotomy... is perhaps misguided” (Gass, 1998, p.88)

One approach to encompass both the social and cognitive aspects of SLA in a more ecological way is to take a sociocognitive approach. This will be outlined and critiqued below.

2.6 The Sociocognitive Approach

Atkinson’s sociocognitive approach to SLA does not attempt to separate the cognitive from the social, but aims to view both as part of a broader ecology of language learning. He uses striking imagery to illustrate how he views this approach in contrast to the historic, mainstream, cognitivist approach to SLA. He compares the language learner in mainstream SLA to a “lonely cactus”, surrounded by desert and waiting for a raincloud of input to pass

overhead and trigger the language learning. In contrast to this, he presents an alternative, ecological image for language learning situated in context:

This is the image of a tropical rainforest, so densely packed and thick with underbrush that it would be hard to move through. This forest is constantly wet with humidity and teeming with life, sounds, growth, and decay—a lush ecology in which every organism operates in complex relationship with every other organism. Each tree grows in and as a result of this fundamentally integrated world, developing continuously and being sustained through its involvement in the whole ecology. And this image satisfies me at a deeper level, because it corresponds to how I (and others) believe language acquisition “really works.” (Atkinson, 2002, pp. 525–526)

The comparison of the lonely cactus with the image of the rainforest elucidates how an ecological approach to SLA can lead to a richer, more in-depth understanding of the wide range of interdependent processes at play in learning language. Atkinson describes the sociocognitive perspective as “a view of language and language acquisition as simultaneously occurring and interactively constructed both “in the head” and “in the world.”” (Atkinson, 2002, p. 525) In this way, he provides a basis for the study of both cognitive and social elements of SLA in the same framework. He goes on to state: “I consider the social and cognitive aspects of language to have co-evolved from the beginning, and therefore to function interdependently – if not inseparably.” (Atkinson, 2002, p. 530)

Atkinson’s sociocognitive approach can focus on where the social and the cognitive meet, through theorising both cognitive and social processes in new ways. Atkinson’s understanding of cognition is different from that of the cognitivists, and likewise, his explanation of the role of social factors diverges from that of Vygotsky. These will be treated in turn in order to shed light on why sociocognitivism could be an appropriate ecological framework through which to explore the jungle of SLA without encountering jarring ontologies.

The understanding of the concepts of cognition, the social role in learning and learning itself are widely different depending on the theoretical position taken. The positions taken by cognitivism, SCT and sociocognitivism on each of these three notions are contrasted in Table

2.2. The differences between them will be discussed below, with the goal of elucidating and critiquing the specific claims of the sociocognitive position.

Table 2.2. The role of cognition and social factors according to theoretical position on SLA

	Cognitivism	SCT	Sociocognitivism
Cognition	Focus on the individual Cognition is an internal mental process	Individual cognition cannot be separated from social factors	Cognition is extended and embodied
Social Factors	Context has a role, but learning processes are not dictated by social factors or context	Learning begins on the social plane, then is internalised by the individual	Learning is connected both to social and the individual cognitive plane at the same time, the two factors are inseparable

Given the long-term cognitive emphasis in the SLA field, the dominant understanding of cognition has been to emphasise the individual’s mental processing. In the cognitivist tradition, this has been the focus of mainstream SLA research, and many proponents of this stance consider it to be the only relevant field of inquiry.

In contrast to this, those who espouse Vygotskian theory for SLA contend that it is impossible to isolate the individual’s mental processes from the social environment and context, and that in fact ‘cognition’ is more than the brain’s computational processing as proposed by the cognitivists. As Lantolf explains: “cognition is historically and contextually co-constituted *in combination with*, not merely derived from, neurobiological factors” (Lantolf, 2000, p. 221).

The importance of the connection between individual cognition and the environment is also recognised by sociocognitivism, which takes a slightly different view. In sociocognitivism, cognition is not limited to self-contained mental processes, but it is both extended and embodied. As Atkinson explains: “extended cognition conceptualises mind/brain as inextricably tied to the external environment, while embodied cognition views cognitive activity as grounded in bodily states and action. These two approaches are related because bodies link minds to the world” (Atkinson, 2010, p. 599). These concepts of

extension and embodiment are built on what Clark posited: “Much of what we identify as our cognitive capacities may... turn out to be properties of the wider, environmentally extended systems of which brains are just one (important) part.” (Clark, 1997, p. 214)

This is critical to the understanding of how Atkinson’s and Clark’s concept of cognition breaks away from that of the cognitivist tradition in SLA. It also demonstrates how sociocognitivism provides a biological metaphor for understanding how the individual’s cognitive processing relates to the environment, and should be studied in context. When cognition is understood more in a biological way than as computer processing, there is no need to separate competence from performance as human cognition is in-world for real-life purposes. “Rather than having evolved to address the abstract, logic-like problems of cognitivism, cognition is first and foremost flexible, on-line adaptive intelligence” (Atkinson, 2010, p. 601). Furthermore, this adaptive intelligence functions in the environment, which can provide support structures – through which our cognition is extended. Therefore it is impractical to separate cognition to something isolated in the brain, when as humans we continuously and consistently interact with the environment to support and apply our cognition.

The emergence of sociocognitivism as a paradigm for understanding language learning reflects the broader trend in the psychological sciences to a more biological rather than computational understanding of cognition and learning. What is novel about viewing cognition as adaptive intelligence is the shift from viewing the “mind as machine” (Boden, 2006), to appreciating the biological adaptivity of the mind in the world (see for example Barsalou, 2008). To summarise, “the unifying idea is that cognition is naked and amodal only when conceptualised abstractly. Studied biologically, cognition is embedded – both in body and in world.” (Atkinson, 2010, p. 606). This view of cognition clearly lends itself to integration with social factors, as cognition is seen as firmly embedded within the environmental and social context.

For cognitive SLA researchers, social factors are merely peripheral to what they claim to be the central goal of SLA research – to rigorously investigate language acquisition (C. Doughty & Long, 2003; Gass, 1998; Kasper, 1997). This was Smith’s standpoint when she described research on the social factors in SLA as the “icing on the cake” (Sharwood Smith in Zuengler & Miller, 2006) of the real SLA research – the cognitive processes involved in acquisition. One major issue in the ongoing “paradigm wars” has been the scope of inquiry of SLA. The SCT insistence on the centrality of studying language use in context has largely not been accepted by cognitivist researchers, who maintain that it is a separate research area – interesting, yes, but not necessarily relevant to SLA (see discussion in section 2.3). The reason for this division may be traced back to the Vygotskian understanding of the role of the social plane in learning. Vygotsky held that learning began on the social plane before being internalised: “any higher mental function was external because it was social at some point before becoming an internal, truly mental function” (L. S. Vygotsky, 1981, p. 162, see also Lantolf, 2000). Clearly, if SCT researchers in SLA assert that learning takes place primarily through social interaction, it is understandable that they would focus their research on these social interactions.

Sociocognitivism provides a means to bridge the stark delineation of the SCT emphasis on the social and the cognitivist emphasis on the individual’s mental processes through deconstructing “the division between the cognizing individual and the social (or socially-mediated) world.” (Atkinson, 2002, p. 528) In his proposition of a sociocognitive approach to SLA, Atkinson challenges both the cognitivist rejection of social factors, and the SCT claim that knowledge is transferred from the social to the individual’s mental processes and posits that language is “held jointly with the social world” (Atkinson, 2002, p. 528). He asserts that the language remains on the social plane while simultaneously being held by the individual cognitively.

my own argument... is that although language may perhaps be seen from some points of view as more or less internalized and self-regulated—as

the property of an individual, cognitive self—in actuality it always and everywhere exists in an integrated sociocognitive space... I would therefore argue that, contra [Vygotsky], language... never takes on an “internal, truly mental function” at all. Rather, it is always mutually, simultaneously, and co-constitutively in the head and in the world... if one end of language, so to speak, is embedded in cognitive space, the other end is just as strongly embedded in social space.” (Atkinson, 2002, p. 538)

This viewpoint aligns with another ecological framework for viewing language – Complex Adaptive Systems. In a CAS position paper, the 5 Graces group posit:

Language is shaped by human cognitive abilities such as categorization, sequential processing, and planning. However, it is more than their simple product. Such cognitive abilities do not require language; if we had only those abilities, we would not need to talk. Language is used for human social interaction, and so its origins and capacities are dependent on its role in our social life. (Beckner et al., 2009, p. 3)

In the sociocognitive approach, “individual mind and ecosocial world aren’t radically separated but rather functionally integrated”(Atkinson, 2014, p. 468) and this offers a frame for SLA which acknowledges the role and interplay of both cognitive and social factors.

The limitations of this sociocognitive approach relate to its limited application in research thus far, meaning that many of the important details and processes have not yet been clearly defined and delineated. At present it remains a largely theoretical construct and has not yet been clearly embedded in classroom SLA research. This is a challenge to effectively using this approach, however, the attempt to integrate and unify cognitive and social research is a necessary addition to the field of SLA and offers a valuable theoretical frame for this thesis.

2.7 Rationale for an Ecological Paradigm

The emergence of a metaphor of ecology as a frame for language learning was treated above. This section sets out the rationale for choosing an ecological conceptual framework as the most suitable paradigm for this research.

The traditional dichotomy between cognitive and social aspects of language learning has been discussed in section 2.4. Instead of positioning this research in one of these dichotomies, an ecological perspective was chosen to provide a framework broad enough to include both cognitive and social aspects of language learning, thus enabling a richer and

more in-depth engagement with the thesis aims (section 1.3) and the research questions (section 4.2). Sociocognitivism was selected as the most appropriate ecological approach due to its balanced emphasis on both cognitive and social factors in language learning. The methodological implications of this approach entail that a rich perspective must be gained on the environment, the inputs, outputs and outcomes of the learning experience for each child. Due to the range of environmental and affective variables which may impact a child's experience of learning Irish at school, and the unusual social context of 3D virtual environments, a focus on the learning context for the current study was necessary to fully explicate findings. The cognitive element was also necessary in order to explore the individual experiences and learning of each student and how well the intervention succeeded in supporting their learning. The school classroom may be understood as a type of jungle environment as described by Atkinson above, but this ecological viewpoint is even more necessary when a technological tool is introduced to the classroom, bringing another layer of complexity to the environment.

The research questions listed in chapter 1 necessitate a strong emphasis on emic research, and this is a central tenet of the ecological paradigm for SLA. The goal of this study was to develop a deep understanding of the child's experience of the language learning intervention and the learning outcomes and the emic focus of an ecological approach is very suitable to achieve this end through in-depth engagement with each child's reported and observed experience. Furthermore, the ecological viewpoint envisages language learning as participation in a community of practice, and emphasises the interconnectedness of language learners in the learning process. This was a very important foundational construct of this project, and necessitates that both social and personal aspects of learning are captured in the data collection process. According to the ecological paradigm, learning takes place when learners take advantages of the learning affordances in the environment. This study aimed to engineer an affordance-rich environment, and examine how the children leveraged these

affordances for learning. As the affordances were both implicit and explicit to the technological tool (some being inherent in the technology itself, others a result of the pedagogical approach taken), an ecological viewpoint was very helpful to view the total intervention affordances in an overarching way. In addition to this, through the lens of ecology, language use is seen to depend on communicative need. This is the basis of the pedagogical design of the technological tool, aiming to create a need for the learners to communicate in the target language.

The methodological implications of taking an ecological approach are as follows:

1. The children's language learning must be studied in an authentic context – i.e., the classroom
2. Both cognitive and social factors must be taken into account
3. The research must have an emic focus
4. A variety of research methods will be necessary to capture the richness and depth of the child's experience from multiple perspectives
5. The interventionist role of the researcher must be recognised

The methodological approach selected to align with these theoretical constraints will be detailed in Chapter 4.

2.8 Conclusion

This section traced the evolution of SLA theory from the behaviourist tradition through many decades of cognitivism to a broader ecological frame for SLA which situates the cognitive aspects of language learning within the social context. While the cognitive/social debate has been contentious and the fields remain quite divided, the ecological frame is a new way of broadening the frame to include a multitude of perspectives and give an authentic, learner-centred and rich account of the language learning process. This has been selected as the most suitable conceptual framework for this research, and will provide a much needed insight into language learning from the child's perspective within a

classroom context using technology. This has the potential to make an important contribution to the fields of child SLA, minority languages and CALL for primary age children.

Furthermore, in the local context, this approach provides the opportunity for a rich and detailed account of the factors at play in children's Irish language learning, and thus provide insight for new directions for language education at primary level in this country.

3 Three-dimensional virtual environments for language learning

3.1 Introduction

This study aims to exploit the potential of ICT technology, in particular 3D VEs for language learning in a specific context which has not been widely explored to date – with primary school children and with a minority language. This chapter will examine the findings to date for other contexts, populations and languages with a view to identifying pervasive themes and research findings in this field of research.

3.2 Computer Assisted Language Learning – an overview

This section will first explore CALL applications and approaches as they have developed over the years, before moving on to discuss the relevant research findings. Beatty describes CALL as “any process in which a learner uses a computer, and, as a result, improves his or her language”(Beatty, 2010, p. 7). Ever since the development of the first computers, researchers and educators alike have been interested in using the technology available for educational purposes. More and more, policy makers in educational systems around the world are recognising the huge potential of using technology and computers to teach and to facilitate learning, although this is not without its detractors and sceptics (Wurst, Smarkola, & Gaffney, 2008). The increased interest in applying technology in the classroom is reflected in the areas of SLA and L2 instruction, with language researchers and practitioners interested in using technology as a tool for language learning. The ubiquitous presence of technology has brought the issue of technology enhanced learning to the fore, as pointed out by Chun *et al*: “teachers must pay attention to technology not because it is either a boon or a threat, but because technology inevitably affects language use” (Chun, Smith, & Kern, 2016, p. 65)

The first Computer Assisted Language Learning (CALL) applications were designed for the mainframe computer, and as technology has developed and expanded over the years, so have the diverse range of CALL applications which are now available on personal

computers, tablets, phones and on the internet. Chun (2011) points out that “technology should be used in the service of language learning” (Chun, 2011, p.663) and that CALL should be studied as a subdiscipline of SLA. Her position is that CALL is not a teaching methodology, rather “it is an emerging field that studies how technology is used as one (of many) tool(s) for language learning” (Chun, 2011, p. 663).

There now exists a diverse and comprehensive body of research on the use of ICT to support and enhance language learning stretching back for more than 30 years (Chapelle, 2001, Chapelle, 2016, Chun, 2011, Levy and Stockwell, 2006). Approaches and applications of Computer-Assisted Language Learning (CALL) have moved in parallel with developments in teaching methodologies. Early applications included computer programmes that focused on grammar training and drills, with exercises designed to give students the opportunity to practise the language rules they had learned. Subsequent applications were informed by a socio-cultural theory of education and communicative language teaching methodologies, with a shift towards interaction and communication. This approach has really come into its own in the 21st century with the development of Web 2.0 and its unprecedented capacity for communication. Today there are a range of ICT resources and tools available to develop users’ language skills, from simple tools to practice vocabulary and grammar elements, to the provision of authentic materials, to computer-mediated communication platforms, to virtual world classroom environments.

Looking back at the history of how technology has developed as a tool for language teaching, Warschauer and Healey describe how in the early days the computer was seen as a “mechanical tutor” (Warschauer & Healey, 1998, p.57) and its role was mainly in the area of grammatical drills as part of a drill and practice approach to language teaching. This was informed by the behaviouristic language learning theory that was current at that time.

Table 3.1 The three stages of call (Warschauer 2004, p. 22)

The Three Stages of CALL			
Stage	1970s-1980s: Structural CALL	1980s-1990s: Communicative CALL	21st century: Integrative CALL
Technology	Mainframe	PCs	Multimedia and Internet
English teaching paradigm	Grammar translation and audiolingual	Communicative language teaching	Content-based, English for specific purposes (ESP)/English for academic purposes (EAP)
View of language	Structural (a formal structural system)	Cognitive (a mentally constructed system)	Sociocognitive (developed in social interaction)
Principal use of computers	Drill and practice	Communicative exercises	Authentic discourse
Principal objective	Accuracy	Fluency	Agency

Warschauer and Healey describe the evolution of CALL since the 1960s (Warschauer & Healey, 1998). They divide the history of all three main stages: behaviouristic CALL; communicative CALL; and integrative CALL – see Table 3.1. Behaviouristic CALL is described as part of the broader field of computer-assisted instruction, and influenced by a behaviouristic approach to learning. Repetitive language drills were a key feature of this phase of CALL. Grammar drills were the main focus of the learning, and originally this type of CALL was implemented on the mainframe. Subsequently, the evolution in SLA theory was reflected in a shift in CALL. Communicative language teaching emphasised meaning over form and prioritised use of the language over grammar drills. According to Warschauer and Healey (1998) a shift to a more communicative CALL was observed in the late 1970s and early 1980s, although they are quick to point out that the behaviouristic CALL by no means disappeared, and even now co-exists today with different CALL approaches.

The development of communicative CALL reflects the movement towards a communicative model of teaching which emphasises using language for meaning, with a shift away from grammar practice towards language use in context. This has further evolved in

Warschauer and Healey's paradigms to a more integrated approach which integrates language skills, task-based learning, and technology into the process of language learning. The influence of socio-cultural theory on learning was felt through a growing focus on using language in authentic contexts, and using task based and group work methodologies. This development is heralded by Warschauer and Healey as Integrative CALL, the most recent and current phase of CALL which is still in the process of unfolding. They highlight the integration of different language skills and the normalisation of technology use as key to this phase of CALL (Warschauer & Healey, 1998).

The authors, however, caution that the stages they have outlined do not correspond with distinct timelines and are merely indicative of the new trends that have emerged. They point out that all three phases of CALL can be in existence at the same time and that in fact while classrooms are moving towards an integrated stage III there are still instances of phase one being used alongside phases two and three in the language classroom.

The range of application of CALL has relied on the technology available. The age of Web 2.0 has provided CALL practitioners with a huge range of options for language teaching – from emails to blogs to wikis, then to virtual worlds and online gaming communities. The possibilities for CALL have never been so diverse, especially with the widespread availability of technology and the internet. In addition to developments in technology, advances in language learning theory are also reflected in the CALL discipline, with applications adopting a variety of theoretical approaches to CALL, namely psycholinguistic, interactionist, sociocultural and ecological.

In a critique of Warschauer's classification of CALL as Structural, Communicative and Integrative, Bax (2003) admits that this classification has been useful in conceptualising CALL over the years; however he asserts that a more historically accurate and more clearly defined model is needed. He sets out a model of CALL that is not set out according to time periods, but by the type of CALL available. He also sets forth three phases of CALL, but

names them Restricted, Open and Integrated CALL. Restricted CALL refers to the types of closed drills that were available in the early years, involved minimal interaction and was not integrated into the language syllabus. His category of Open CALL features an increase in interactivity through activities such as games and Computer Mediated Communication (CMC), but is still not integrated into the curriculum, but seen as an add-on. Finally, for Bax, Integrated CALL is when the technology has been integrated into the syllabus and normalised. Bax feels that we are currently still in the Open CALL phase, but should be moving towards Integrated CALL. This contrasts with Warschauer and Healey's claim that we have already moved into Integrative CALL (Warschauer & Healey, 1998), their parallel phase to Bax's Integrated CALL. In reality, there are probably aspects of all three phases of CALL in co-existence at present. With regard to the transforming influence of the internet on CALL, Chapelle claims "learners have access to what some would argue is the most important source of data for learning another language: a variety of spoken and written language... as well as opportunities to engage with other learners and speakers of the language" (Chapelle, 2016, p. 171). The question remains how to leverage this potential in the classroom.

The transition to integration of technology into the syllabus and the classroom is underway, albeit to varying degrees. This transition is dependent on multiple factors, including the availability of technology, the skill levels of both students and teachers and also the training available to help student and teachers access the learning affordances of the technology. This is a broader issue with ICT and education, and has been reported in the Irish context several times in recent years (Benini, 2015; Johnston, 2014).

While the education sector may be struggling to keep up with the new technological advances available to educators, research in the area of Computer Assisted Language Learning continues to explore what is possible with technology, and further validate the incorporation of technology in the classroom. In a more recent publication, Healey describes

each new development in technology over the years as a “wave” and claims that “each wave has left language teaching and learning better off than the previous wave. Teachers and learners do become proficient in the new affordances and better aware of the right tool for the job” (Healey, 2016, p. 20). One of the most recent “waves” of research in recent years has been the study of virtual worlds and immersive gaming platforms as tools for language teaching. The remainder of the chapter will focus on these environments and how they can facilitate language learning.

3.3 Three-Dimensional Virtual Environments

One of the most exciting emergent fields in CALL research is in the area of using three-dimensional virtual environments (3D VEs) for language learning. This section will first present the defining characteristics of 3D VEs, then describe the range of 3D VEs currently used for language learning, and how they can be categorised according to goal orientation. The key role of goal orientation will then be discussed, before evaluating the language learning potential of 3D VEs and their limitations.

3.3.1 Defining characteristics

The term “3D VE” is quite broad and encompasses a wide range of environments and divergent fields of research. Virtual worlds, massively multiplayer online role playing games (MMORPGs), commercial off-the-shelf (COTS) games and custom-built virtual environments for learning are all included under this umbrella term, provided they comprise an immersive, three-dimensional environment with which the user can interact through an avatar. Dalgarno *et al.* summarised the principal characteristic of 3D VEs as follows: “Three-dimensionality, smooth temporal changes and interactivity are the most important features that distinguish 3D learning environments from other types of virtual learning environments.” (Dalgarno, Hedberg, & Harper, 2002, p.149) While the various 3D VEs differ widely in their user-base, target audience and market, they have these key features in common. This definition does not make reference to whether or not the 3D VE is for single or multiple users.

For this reason, some researchers have specified multi-user environments as MUVes as a subcategory of 3D VEs, while others consider the multi-user component to be implicit, given the nature of modern immersive environments. Peterson identifies the key characteristics of MUVes as: immersive, 3D interfaces, multiple users, multiple modes of communication, use of avatars (Peterson, 2012a).

Based on these key definitions, in this thesis a 3D VE is taken to have the following characteristics:

- Immersive
- Three-dimensional interface
- Multiple user
- Interactive
- Use of Avatar

3.3.2 Types of 3D VE

Having looked at the defining characteristics of 3D VEs, this section aims to describe the different types of 3D VE and outline their main characteristics before giving a brief overview of some research literature pertinent to each type. The three main categories of 3D VE in this thesis are immersive games, virtual worlds and purpose-built immersive environments which may be more like a game or a virtual world depending on platform design.

The field of Digital Game-Based language learning (DGBLL) is far broader than immersive 3D games, however for the purposes of this literature review the discussion will be limited to immersive 3D games. These games have a clearly defined narrative and goal-oriented structure. In contrast to this, a virtual world is understood to comprise an immersive 3D space for social interaction, and traditionally these virtual worlds did not have clearly defined goals, but remained open-ended.

While the 3D VE platform of a game may now look quite similar to that of a virtual world, this synergy has only emerged in recent years. Digital games were developed with specific goals and did not always incorporate social interaction, while virtual worlds emerged as spaces for social interaction without goals (Squire, 2003; Warburton, 2009). Now, as games are immersive and multiplayer and virtual worlds can have goals, the distinction is blurred, and the two can at times be difficult to separate (Dickey, personal communication, 22nd October, 2014). De Freitas acknowledges the different development trajectories of virtual world and games, but highlights the educational potential in uniting them for learning: “The motivational capacities of game-play when brought together with the social interactions of virtual worlds may be a powerful teaching combination in the future” (De Freitas, 2014, p. 80). The goals inherent in a game have potential to engage and motivate students, while the social interactions possible in a virtual world provide a promising basis for interaction in the target language. A reflection of some of the challenges in applying a taxonomy to the overlapping types of 3D VE will be outlined in section 3.3.3.

3.3.2.1 Games

There are several types of game that come under the 3D VE umbrella. Massively Multiplayer Online Role Playing Games (MMORPGs) resemble virtual worlds, with added gaming goals and narrative, for example World of Warcraft (WoW) and Everquest. These games are usually limited to teenagers or adults (for example WoW is rated Teen). There are also a variety of Commercial-Off-the-Shelf (COTS) games in the 3D VE category, like Final Fantasy or the Sims. While these games were designed for the entertainment industry rather than for the purposes of language instruction, they can provide opportunities for language learning both in naturalistic ways and through adaptation by language teachers.

3.3.2.1.1 Research summary

A study by Rama *et al.*, (2012), looked at the learning experiences of university students playing World of Warcraft in Spanish. They claim that their results show the WoW

environment facilitated the creation of a safe, low-anxiety space for language learning, with an emphasis on communicative competence. They also point out the opportunities for interaction between experts and novices, with the possibility of target language immersion and contact with native speakers. However, they also report that competence in the game mechanics was necessary to engage with language learning.

Piirainen-Marsh and Tainio observed teenage boys playing the game Final Fantasy at home. They highlight repetition as a key factor in the game, and claim that this could be a resource for language learning, along with the opportunities for interaction afforded by game playing. They also report the players creating a hybrid language from their L1 and language drawn from the game (Piirainen-Marsh & Tainio, 2009b, Piirainen-Marsh & Tainio, 2009a). Turgut and Irgin, (2009) carried out a qualitative study of 10 children observed while playing online games in internet cafes. While this study was limited in its duration and analysis, the authors report that the online gaming promoted language learning, particularly learning vocabulary. Ranalli adapted the Sims game for university ESL learners by designing additional resources for the game to give to the students (Ranalli, 2008). His goal was to show how commercial off-the-shelf games can be exploited for language learning, and his results showed an increase in vocabulary score on the post tests. The participants, however, while enjoying playing the game, gave a mixed response to it as a language learning tool.

3.3.2.2 Virtual Worlds

Second Life is the most well-known and widely used virtual world. Since its launch in 2003, over 42 million accounts have been created, with an average of 900,000 active users a month (Voyager, 2015). The majority of users are motivated by personal reasons, however educators have attempted to leverage the enormous interest in virtual worlds through setting up virtual campuses in Second Life. Stevens claims that “Second Life promotes a spirit that proclaims that there is much scope in education for experimentation and enjoyment, and the result doesn’t have to look like ‘education’” (Stevens, 2006, p.4). Second Life is the virtual

world most commonly used in language learning research. This is probably due to its ubiquitous nature and its ease of access, however the age profile of the learners studied is limited, most of them being university students, as SL is not secure for use with children. Apart from SL, there are also instances of other virtual world platforms in the literature, for example Open Wonderland (Ibanez *et al.*, 2011); Active Worlds (Dickey, 2005; Peterson, 2006); and Quest Atlantis, a virtual world purposely designed for educational purposes (Barab, Thomas, Dodge, Carteaux, & Tuzun, 2005).

3.3.2.2.1 Research summary

The literature on educational research using SL demonstrates an almost exclusive focus on university students (see Wang & Burton, 2013). This is perhaps due to the higher level of security required for ethical research with children, and the security issues with the SL (see for example the issues raised in Cooke-Plagwitz, 2008; Peterson, 2011). However, it does reflect a wider research imbalance between university students and children, as highlighted by Wang and Vasquez, who reviewed 43 Web 2.0 language learning studies, of which 39 related to university students, four to K12 (which comprises primary and secondary education). Wehner and colleagues compared a group of 21 university students learning Spanish in SL with 21 learning Spanish in a traditional classroom. While the study did not test for language gains, the authors report significant affective gains for the SL group (Wehner *et al.*, 2011). Wang *et al* reported language gains in their study of Chinese university students learning English as a foreign language. 20 Chinese students were partnered with 20 US university students for an SL intervention, and the language gains were compared with a control group. After a five week intervention with one hour SL interaction per week, Wang and colleagues reported that the experimental group outperformed the control group in the language test, along with reporting increased motivation (Wang, Calandra, Hibbard, & Lefaiver, 2012).

3.3.2.3 Purpose built immersive environments

In addition to the adaptation of commercial and online games for language learning purposes, some CALL practitioners are engaged in development of custom built games for the language classroom. Sykes *et al.* refer to these custom-built 3D VEs as “synthetic immersive environments” and describes them as online immersive spaces designed to function as a social space while incorporating the beneficial attributes of MMORPG models. “SIEs carry significant potential in that they allow creators to target specific skills and educational objectives while creating a meaningful collaborative space in which learners themselves are at the centre of the learning.” (Sykes *et al.*, 2008, p.536) Sykes’ own example of this is Croquelandia, a custom-built SIE for learning Spanish pragmatics. It comprises a 3D social space based on various regions of the real Spanish-speaking world. Learners take part in game-like goal oriented activities which give users corrective feedback through interaction with non-player characters, native speakers and other participants.

3.3.2.3.1 Research Summary

In the example of Croquelandia as a custom-built 3D VE for learning, Sykes’ claims that the space is emotionally engaging while acting as a low-risk environment for learners to use the target language. She reports some initial encouraging results for this space, showing that the learner perceptions and learning outcomes are positive, showing that it is an effective tool for pragmatic development. Some further examples of these purpose-built tutorial-CALL games may be seen in the work of Shih & Yang, 2008, O’Brien & Levy, 2008, Anderson, Davidson, Morton, & Jack, 2008, Tolia, Exadaktylos, & Slattery, 2004 and Sykes *et al.*, 2008 and will be discussed in more detail below.

3.3.3 In search of an inclusive taxonomy

Finding an appropriate taxonomy to encompass the rapidly evolving area of 3D VEs for language learning has been difficult, as the field includes virtual worlds, massively multi-player online games, commercial off the shelf games and custom-built synthetic immersive

environments. Several years ago these were all included under the umbrella term “online virtual worlds” (Sykes et al., 2008), but more recently, goal orientation has emerged as a key criterion for comparing and classifying these 3D VEs (Cornillie et al., 2012). Cornillie and colleagues defined goal oriented virtual environments as part of the field of digital game-based language learning, and excluded non goal oriented virtual worlds. This reflects Prensky’s earlier work in classifying games, where he posited “if your game doesn’t have a goal but is something that can be just played with in many ways depending on your whim, you have what they refer to as a toy.” (Prensky, 2001, p.120)

This taxonomy effectively takes 3D VEs that look the same and have almost identical characteristics and applications, and splits them into two separate categories according to a binary variable. This is problematic, as goal orientation is not always binary, and this taxonomy results in an artificial separation of a research field which has significant overlap. It does not provide space for the emerging synergy between games and virtual worlds described above. Furthermore, with a split between the research fields, it is more challenging to coherently leverage the potential of both, as recommended by de Freitas (2014). In addition to this, the majority of language learning research using virtual worlds involves certain language learning tasks and goals set by the teacher, which while not implicit in the environment, undoubtedly challenge the concept of virtual worlds as entirely open-ended and goal-less.

As de Freitas’ suggestion (2014) was a foundational principle in the goals of this thesis, the binary categorisation of 3D VEs according to goal orientation will not be used in this thesis. In this literature review, the umbrella term of 3D VE will be used and the varying types of 3D VE will be discussed in turn and referred to as games, virtual worlds, synthetic immersive environments, without attaching value judgements on whether or not goal orientation is present (in reality, goal orientation is always present to some extent when these tools are used for language teaching).

This problem of categorisation demonstrates the complexity of the 3D VE field. Going forward, a more representative taxonomy of 3D VEs is required. A major contribution of this thesis is the flexible categorisation of 3D VEs developed as part of the Design Based Research process in this study, as discussed in section 5.8. This new taxonomy reflects both the literature and the input of users.

3.4 3D VE Affordances for Language Learning

This section will first explain the term ‘affordance’ as a way of identifying the language learning potential of certain features of a 3D VE, before turning to the literature to evaluate the proposed affordances of these learning environments. Then the constraints and limitations of 3D VEs will be outlined.

3.4.1 What is an ‘affordance’?

The term ‘affordance’ has become widely used in the 3D VE educational literature to refer to specific features of the environment that are proposed to provide learning opportunities, but the term did not originate in the educational field. It was first used by Gibson in 1979 in his work on the ecology of visual perception (as mentioned in Section 2.5):

The affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill. The verb to afford is found in the dictionary, but the noun affordance is not. I have made it up. I mean by it something that refers to both the environment and the animal in a way that no existing term does. It implies the complementarity of the animal and the environment. (Gibson, 1979, p. 127)

According to Gibson’s definition, the affordance exists in the interaction between the agent and the environment, it is not something abstract. Remaining in the field of psychology, Salomon defines affordance as: “the perceived and actual properties of a thing, primarily those functional properties that determine just how the thing could possibly be used” (Salomon, 1997, p. 51), for example a chair can be used for sitting, therefore a chair affords sitting. Moving to the field of technology for learning, Bower proposes: “consciously identifying the affordance requirements of a learning task” in order to correctly match this to the specific affordances of particular technologies (Bower, 2008, p. 15). Dalgarno and Lee

agree with Bower's proposal, but point out "the technologies themselves do not directly cause learning to occur but can afford certain learning tasks that themselves may result in learning or give rise to certain learning benefits" and they summarise affordances in 3D VEs as "contributions to learning that potentially arise from tasks afforded by such environment" (Dalgarno & Lee, 2010, p. 17). This is an important distinction from Dalgarno and Lee which asserts that it is not the environment itself that affords learning, but what you do with it. In this thesis, the term 'affordance' will be used to denote a potential opportunity for learning afforded by a certain feature of the environment, and leveraged through specifically designed learning tasks.

For educators wishing to avail of the various affordances of 3D VEs for learning, there are several routes available. The most straightforward is the repurposing of pre-existing 3D VEs and applying to the particular learning needs. Examples of this could be a teacher using a commercial game such as the Sims or Final Fantasy in the target language in order to provide an immersive and interactive learning experience for their students. Another option is to design and build a 3D VE specifically to address the learning needs of the students. There are advantages and disadvantages to both approaches. In repurposing, there may be a limit to how well the teacher can match the learning objectives of the language course with the gaming goals, nevertheless, this route is more accessible to a wider group of educators, as there is less expense and less technical expertise necessary to capitalise on the learning affordances of the environment. In contrast to this, when designing and building a customised 3D VE, it is possible to align the learning outcomes of the language course directly with the goals of the environment, however substantial financial costs may be incurred, along with the necessity of significant technical expertise. Research pertaining to each of these routes will be presented below, however the necessary conditions for effective SLA will first be treated.

3.4.2 Conditions for SLA

Within the field of SLA, the specific affordances of 3D VEs can facilitate and support the main conditions for language acquisition. It is beyond the scope of this current work to provide a critical review of SLA theories and their associated pedagogies (see VanPatten & Williams, 2014). For the purposes of this thesis the interaction approach is adopted as a theoretical paradigm to inform the pedagogical choices in this research project (Gass & Mackey, 2014). This section will discuss the interaction theory in terms of the necessary conditions for SLA – input, interaction (with others and with the language in written and spoken form) and output. Motivation is another foundational construct in SLA, and this will be discussed in section 3.4.2.2 before demonstrating how 3D VEs may be aligned with an interaction approach and support interactive aims and motivation in order to create favourable conditions for language learning.

3.4.2.1 The interaction approach: input, interaction and output

Language input is the first indispensable condition for language acquisition. In the absence of exposure to language (either in written or spoken form) no language learning can take place. This concept transcends differences in theoretical perspective on SLA as the language input provides the evidence from which learners can hypothesise about language formation. Given the centrality of input, educators have explored how to modify and tailor the input in order to support acquisition of various language features and forms. This begs the question what type of input is most successful at supporting SLA? Is second language instruction (L2 instruction) necessary? Or is natural exposure to the language just as effective as explicit language teaching? This question has been the subject of much debate. The current perspective is that while there is evidence of beneficial effects of instruction (see Long, 1983 for a very early and influential study demonstrating this), there are limits to the effects of instruction and what is taught is not necessarily learned (VanPatten & Williams, 2014a).

Nevertheless, exposure to language is not enough for successful progression through stages of language acquisition, and learners can fail make progress with certain linguistic forms in the absence of explicit teaching of those forms. Since Long's influential review paper in 1983, the research agenda in SLA largely changed from investigating whether or not instruction helped acquisition to exploring what types of instruction are effective. The structured language input which learners receive in the classroom can be classified according to Long's taxonomy of instruction:

1. Focus on meaning: language used as means of communication without formal teaching of L2 system. This input can be acquired incidentally.
2. Focus on forms (FonFS): individual L2 forms are taught sequentially, and separated from meaningful contexts.
3. Focus on form (FonF): in a broader context of meaningful language use, and in reaction to language features that may cause problems at the time, learners' attention is briefly drawn to specific L2 forms that arise.

This ties in with the debate about implicit and explicit forms of instruction. With implicit instruction, the language input is enriched with the target language features to be taught, but learners' attention is not drawn to the features. In contrast with this, explicit instruction entails modified input but includes explicitly drawing learners' attention to the features in question. The meta-analysis of research into the effectiveness of L2 instruction published by Norris and Ortega (2000) evaluated the effectiveness of both types of instruction. They carried out a comprehensive meta-analysis of findings from experimental and quasi-experimental research into the effectiveness of L2 instruction. Some of the most significant findings of this analysis were that explicit types of instruction were found to be more effective than implicit, and that both FonF and FonFS approaches were found to yield large effects. This study is hugely important in the design of language learning interventions.

While providing language input is clearly the first step towards language acquisition, input alone is not sufficient. The learner must *interact* with and through the language in order to learn it. It is in this context that learners can discover about the correct and incorrect use of language. Since the 1980s, the role of interaction with others and with the language in facilitating SLA has been a focal point for much research. The basis of the interaction approach to SLA is Long's *Interaction Hypothesis*, which was hugely influential in shaping the field of SLA interaction research (Long, 1985, 1996). It was Long who initially posited that "participation in conversation with native speakers, made possible through the modification of interaction, is the necessary and sufficient condition for SLA." (Long, 1981, p. 275). He claimed that interaction was beneficial to SLA as it provided access to comprehensible input, through negotiation: "when the flow of learner's interaction with interlocutors was restructured and modified by requests and responses regarding message comprehensibility." (Pica, 1996, p. 3) The theory was extended to interactions beyond those with native speakers in a later study when Long and Porter concluded that learner interactions also facilitated language acquisition through giving opportunities for language production and negotiation of meaning – that in fact the interaction itself is central to language acquisition, whether it is with native speakers or other learners (Long & Porter, 1985).

The concept of output is also central to the interaction approach – where learners have opportunities to use the language and produce their own language utterances to communicate meaning. In her "Output Hypothesis" Swain emphasised the importance of comprehensible output in interaction (Swain, 1985, 2005) – that as the learners are pushed to make themselves understood, they recognise where their language fall short and have to try to "impose syntactic structure on their utterances" (Gass, Mackey, & Pica, 1998, p. 301), thus promoting language acquisition. This indicates a development from comprehension to syntactic use of language. This theory emerged from Swain's work with children in immersive education contexts in Canada who were failing to achieve native-like proficiency in the L2 after years in

the system. Swain hypothesised that they weren't given enough opportunity to use the language and meaningfully communicate through it. She claimed that the shift from competence in comprehension to competence in use would only happen through the development in syntax and morphology brought about through language use. This theory has been very influential in L2 pedagogy in promoting "pushed output" – necessitating learners to produce language. However, as pointed out by Van Patten and Williams, while there is evidence that it supports language acquisition, there are constraints to its success (VanPatten & Williams, 2014a).

Interaction has come to be recognised as playing a key role in the acquisition of a second language, across a wide range of theoretical perspectives, even though different theorists would differ in their understanding of just how the learning occurs. Vygotsky's theory of language places great emphasis on interaction as the scene of learning. He viewed language as a semiotic tool, and claimed that language develops through social interaction (Vygotsky, 1962, 1978), meaning that the interactions that children have are vital in acquiring language. Although Vygotsky's theory did not extend to SLA, there has been a growing interest in applying his insights to the SLA field, as previously discussed in section 2.3. One such researcher is Lantolf, who uses Vygotskian theory to explore how L2 learners acquire language through interaction (Lantolf, 2000). Contrasting with this socio-cultural viewpoint which focuses on the social environment, Usage-based theories of language learning propose that interaction in and with the language leads to the individual's cognitive organisation of the language to produce grammar (Bybee, 2008). From the viewpoint, interaction is important as it provides the data the individual needs to build up understanding of language patterns (Beckner et al., 2009).

Regardless of theoretical standpoint, few would argue that interaction is not an important condition for language acquisition, although, as Gass *et al* caution "interaction should not be seen as a cause of acquisition; it can only set the scene for potential learning"

(Gass et al., 1998, p. 305). While research is ongoing into the individual factors involved in SLA during interactions, for language instructors setting the scene for L2 learning necessitates the creation of opportunities for interaction. However, if the learner has no motivation to learn an L2, this interactive approach will not succeed. The next section will discuss the role of motivation in SLA.

3.4.2.2 The role of motivation in SLA

In addition to the broader field of motivation in psychology, motivation is a foundational construct in L2 acquisition and instruction. Without motivation, the language learning process cannot begin or be sustained (Dörnyei, 1998).

L2 motivation research was shaped for several decades by Gardner and Lambert. They identified two categories of motivation - integrative and instrumental, where integrative refers to a desire to identify with the target culture and integrate with the language community, and instrumental refers to more practical aspects such as doing well in an exam or getting a job (Gardner & Lambert, 1972). A more recent framework for looking at motivation was provided by Williams and Burden, and separates the internal from the external factors that impact on a learner's motivation, internal factors including the intrinsic interest of the activity; the sense of agency; master, self-concept; attitude; and external factors including significant others, the learning environment and the broader context of the learning (Williams & Burden, 1997). The inclusion of internal factors in this framework reflects what Ushioda describes as “theoretical shift in focus to the internal domain of self and identity.” (Ushioda, 2011, p. 199). Ushioda identifies Dörnyei as the frontrunner in this new movement towards the self and identify in L2 motivation. Dörnyei's most recent contribution towards the L2 motivation field was his *L2 Motivational Self System* (Dörnyei, 2005), which comprises three components, presented below:

1. *Ideal L2 Self*, which is the L2-specific facet of one's ‘ideal self’: if the person we would like to become speaks an L2, the ‘*ideal L2 self*’ is a powerful motivator to learn the L2...

2. *Ought-to L2 Self*, which concerns the attributes that one believes one *ought to* possess to meet expectations and to *avoid* possible negative outcomes...
3. *L2 Learning Experience*, which concerns situated, ‘executive’ motives related to the immediate learning environment and experience. (adapted from Dörnyei, 2009, p. 29)

Self-determination theory is a contrasting motivational theory which can provide insight into how L2 learning can support the learners’ sense of self. Instead of focusing on the ideal and ought to self of Dörnyei, SDT identifies “three universal psychological needs – specifically, needs for competence, autonomy, and relatedness – that are essential for optimal development and functioning” (Ryan & Deci, 2012, p. 417). These three needs are defined as follows:

Competence: “refers to the feeling that one has the capacity to effectively carry out an action.” (Noels, 2009, p. 302)

Autonomy: “concerns the difference between behavioural engagement that is congruent and fitting with one’s values, interests and needs (i.e., with one’s self) versus alienated, passively compliant, or reactively defiant.” (Ryan & Deci, 2004, p. 450)

Relatedness: “refers to a sense of warmth, security, and connection between the learner and other people in that social context.” (Comanaru & Noels, 2009, p. 135)

SDT theory posits that teachers need to provide support for these three basic needs of their students in any attempt to promote the students’ motivation (Ryan & Deci, 2012).

While the motivational theories may differ and while there are difficulties in deriving universally applicable pedagogical guidelines for enhancing L2 learners’ motivation (Dörnyei & Ushioda, 2011), motivation is recognised as a key facilitating condition for successful language acquisition (Saville-Troike, 2006, p. 20). For this reason, optimising the motivation in a language learning intervention is a key part of creating favourable conditions for L2 learning.

3.4.3 Affordances of 3D VEs

Having explored the basis for highlighting interaction (including the input and output involved) and motivation as conditions for language learning, this section will now demonstrate how the affordances of 3D VEs align with the conditions of interaction and motivation. A selection of some of the key features of 3D VEs and what they afford for language learning is shown in Table 3.2. These features will subsequently be referred to as ‘affordances’, and may relate to one or more of the conditions for SLA. Each will be discussed in turn below, with evidence from the literature to illustrate the claimed benefits of the affordance. The literature on 3D VEs for language learning will be prioritised, but in many cases the broader field of 3D VEs for learning will be referenced due to a lack of relevant research in the language learning field. Furthermore, where research is available in the context of child SLA it will be discussed, however this research is quite limited. This is a gap in the literature that this thesis aims to address.

3.4.3.1 Immersion and Presence

The three-dimensional nature of the virtual environment, along with the use of an avatar in-world can facilitate immersion and a sense of presence in the virtual environment. When the virtual environment is established as a target language environment, this gives a unique opportunity for immersion in that language, only otherwise achieved by actually travelling to the country (Cooke-Plagwitz, 2008). The sense of presence afforded by the avatar is described by Cooke-Plagwitz as having the potential to enhance users’ sense of belonging and being part of a group, helping them to interact. In a study involving Active Worlds for EFL teaching in a university in Tokyo, Peterson mentions how using avatars can give learners a sense of belonging in the world. Out of 24 participants, 17 reported a feeling of presence, and 15 a feeling of co-presence with the other participants (Peterson, 2006).

Table 3.2. Interactional and Motivational Affordances of 3D VEs

Feature	What does it afford?
Immersion and Presence <i>Interaction</i>	▪ Sense of belonging ▪ Relationships/community ▪ Immersion in target language
Interaction <i>Interaction</i>	▪ Interaction in and through the target language ▪ Authenticity ▪ Relationships/community
Multi-user <i>Interaction</i>	▪ Teamwork ▪ Relationships/community ▪ Target language use
Experiential <i>Interaction</i>	▪ Active Learning ▪ Target language use ▪ Authenticity
Goals <i>Motivation</i> <i>Interaction</i>	▪ Motivation ▪ Target language use
Rewards <i>Motivation</i>	▪ Motivation
Fun <i>Motivation</i>	▪ Positive affective response
Challenge <i>Motivation</i>	▪ Motivation

Liou carried out an English language course in SL with university students in Taiwan, and in the post intervention questionnaires and interviews, the 25 participants confirmed that they experienced a sense of immersion in the virtual world that was beneficial to their

engagement with the target language (Liou, 2012). O'Brien and Levy describe how they used a purpose-built virtual world in a German language classroom with 43 university students. The virtual world was based on the city of Salzburg and the goal of the project was to give the participants an immersive experience of the culture. The authors report evidence for the students' experience of presence and immersion in the virtual world based on questionnaires completed by the students after participation:

Perhaps the best indication of a virtual presence comes in the form of the following responses: the city 'feels a lot older,' and the city 'seemed to have a much different ambiance to it.'... The students who participated in the experience became immersed in the virtual world and felt they were inside the environment. (O'Brien & Levy, 2008, p. 678)

This experience of immersion may not always be positive – for example the immersive experience of violence in a videogame can have detrimental effects (Konijn, Nijé Bijvank, & Bushman, 2007).

While these studies are not large in size and do not include control groups, presence is a consistent finding across studies of this kind, indicating that it is in fact a characteristic experienced by 3D VE users.

3.4.3.2 Interaction

Peterson claims that learner centred interactions in a 3D VE can both afford exposure to the target language and the opportunity to give language input through negotiation of meaning, which may facilitate second language acquisition (Peterson, 2011b). One of the great advantages of virtual worlds such as Second Life and MMORPGs like World of Warcraft is the widespread facility for interaction with native speakers, particularly for learning English as a foreign language, also for modern foreign languages such as Spanish or German. Canto *et al.* carried out a study where 36 first year university students learning Spanish in the Netherlands were partnered with 14 pre-service Spanish teachers (native Spanish speakers), and interacted with them through SL or through videoconferencing. In the post-intervention questionnaires, the participants reported the interaction with native speakers

as a hugely positive resource (Canto, Jauregi, & van den Bergh, 2013). The capacity to interact with native speakers is somewhat limited however for minority languages such as Irish. Often, researchers working with less common languages tend to develop their own 3D VE for that language – for example, Hellas Alive, developed for learning Greek language and culture (Tolias et al., 2004). Whether with native speakers in SL and online gaming, or with other learners in a purpose-built 3D VE, the interaction featured in 3D VEs can allow for authentic, meaningful communication through the target language. Peterson describes this in relation to MMORPGs for language learning – “In game play, learners are exposed to the TL in an authentic communication context that provides valuable practice in the four skills” (Peterson, 2010, p.431). In presenting their model of a 3D VE for EFL, Shih and Yang posit:

The most effective way to learn a language is to participate in a community in which the target language is used to communicate in a real context. In such an environment, the language learners are left with no place to hide. They are forced and encouraged to think, speak, and write in the target language. In other words, they become immersed in an input-rich, natural, and meaningful context in which the target language can be acquired spontaneously. (Shih & Yang, 2008, p. 56)

The majority of research in this area deals with adult learners, but in one study with Finnish children, Piirainen-Marsh and Tainio recorded the video of two 13 year old boys playing video games in English. They report that the game playing provided opportunities for interaction, and in the course of the conversational analysis of the game interactions, the authors found that the players drew on language from the game and incorporated it with Finnish, their first language to make a bilingual hybrid form of game communication (Piirainen-Marsh & Tainio, 2009a).

3.4.3.3 Multi-user

Supporting the affordance of interaction, the multi-user nature of 3D VEs can multiply opportunities for target language interaction through collaboration with multiple users, along with building relationships through teamwork. Peterson highlights the importance of collaboration in virtual worlds for language learning because of the need to foster

communication in the target language (Peterson, 2012a). His small-scale study involving eight EFL university students in Japan demonstrates how the multi-user capability of SL facilitates collaborative dialogue, which can provide valuable opportunities for target language interaction, as described in the interaction affordance. In a qualitative study involving two learners playing WoW in Spanish, Rama and colleagues described how collaboration was fostered between experts and novices in the game, and describes this as an emerging affordance for these types of environment (Rama, Black, van Es, & Warschauer, 2012).

Again, the literature predominantly focuses on adult learners, but one study with children learning an L2 in 3D VEs demonstrates the challenges associated with collaboration in a multi-user environment. Zheng *et al* describe how the differing attitudes to engagement and learning of Chinese and Australian students hindered their collaboration in Quest Atlantis. The 31 seventh grade Chinese students were focused on language learning goals, whereas the Australians were focused on ‘playing’. This led to complaints such as: “my co-questers didn’t do their part of the quest, thus I cannot submit ours.” (Zheng, Young, Brewer, & Wagner, 2009, p. 210).

3.4.3.4 Experiential

According to Kiili, the “ideology of experiential learning provides a fruitful basis for integration of gameplay and pedagogy” (Kiili, 2005, p. 17). De Freitas points out that “Game-based learning is often experience-based or exploratory, and therefore relies upon experiential, problem-based or exploratory learning approaches” (De Freitas, 2006, p. 53). Chittaro and Ranon highlight the potential of 3D VEs to provide experiences for learning (Chittaro & Ranon, 2007). They point out that interaction with a 3D VE is in the first person, and this is one of the affordances of the environment for experiential learning. However, this is an area where there is scant research to provide an evidence base for practice. In a case study with five graduate students over the course of one semester, Jarmon and colleagues aimed to explore how SL could be used for experiential learning. Based on participant surveys

and focus group interviews, the authors report that a significant level of experiential learning can occur in these environments and they encourage more research in the area. The experiential nature of the environment can lend itself to an experience of authentic use of the target language. According to García-Carbonell *et al*, one of the principal means of operationalising an experiential approach to language learning has been through task-based language teaching (García-Carbonell, Rising, Montero, & Watts, 2001). This will be discussed in the next section on goals.

3.4.3.5 Goals

As outlined in section 3.3.2 above, traditionally goals have been associated with games, and not with virtual worlds. Prensky identified goals as one of the key foundational elements of games, and describes them as central to user's motivation. He posits:

In a game, achieving your goals is a big piece of what motivates you... Goals and objectives are important because we are goal-oriented as a species. Unlike most animals, we are capable of conceiving of a future state and of devising strategies for achieving it, and most of us enjoy the process. (Prensky, 2001, p. 121)

The strict dichotomy of considering games to have goals and virtual worlds to be goal-less is becoming less useful, especially when employing these environments in the education sector. There are now instances of goal-oriented virtual worlds and furthermore, in virtual worlds for learning there are usually some form of learning goals that users aim to achieve in the environment. This approach is taken by Bellotti and colleagues, where they describe how they “embedded” educational goals in a virtual world, which they then termed a “serious virtual world”(Bellotti, Berta, De Gloria, & Primavera, 2010). Their 3D VE wasn't specifically for language learning, but a similar approach can be seen in CALL, for example the goal oriented virtual world Quest Atlantis (Barab et al., 2005), which has many elements associated more with gaming such as clearly defined goals and narrative. Since introducing goals to virtual worlds using a task-based approach to learning has blurred the distinction between games and virtual worlds, researchers can draw on the significant literature on goals in the gaming field

and apply to whatever 3D VE they choose.

The use of goals in a language learning 3D VE affords great potential both for motivation and for creating a need for the learner to use the language. This aligns with a Task-Based Language Teaching approach (TBLT). TBLT involves the use of authentic language to carry out meaningful tasks using the target language. The goal of the tasks is to “concentrate on involving pupils to the point where they forget they are learning and are intent only on using [target language] to achieve the goal in question” (Little et al., 1985, p. x). Learners are given tasks to complete which require use of the target language, with an emphasis on meaning and on the process rather than the product. There are several definitions of the term “task” in TBLT: “A task is an activity which requires learners to use language, with the emphasis on meaning, to attain an objective” (Bygate, Skehan, & Swain, 2001, p.11) or: “...a pedagogical task is a piece of classroom work that involves learners in comprehending, manipulating, producing or interacting in the target language” (Nunan, 2004, p.4)

TBLT has traditionally been associated with the use of digital games for language learning (Cornillie et al., 2012), as gaming goals can provide a framework for TBLT, where the goals in the game can only be achieved through target language interaction and use. This approach is proposed by Purushotma *et al*:

We are proposing a framework that emphasizes goal-directed activities within constructed gaming environments. Language, then, becomes a resource that players can and will need to utilize to carry out various social actions... that lead toward successfully completing puzzles, problems, tasks. (Purushotma, Thorne, & Wheatley, 2009, pp. 7–8)

In addition to the natural synchronisation of gaming and language learning goals in games, a TBLT approach has been applied in other types of 3D VEs by a number of researchers, including Peterson who designed EFL tasks for university students in Tokyo in both Active Worlds (Peterson, 2006) and SL (Peterson, 2012a), and reported valuable target language interaction through the tasks in both studies.

3.4.3.6 Rewards

There is some controversy about the use of rewards in 3D VEs, with disagreement about whether they are motivating or demotivating. Prensky asserts that the experience of winning and losing is a central and fundamental component of a game, and is integrated with the gaming goals: “The goal is often stated right at the beginning of the rules: Your goal is to get the highest score, to get to the end, to beat the big boss, to capture the flag, to get the best hand, etc.” (Prensky, 2001, p. 121). This concept is supported by Gee’s achievement principle, as reported by Bonk and Dennen: “Learners should be constantly rewarded, at each level of game play and skill mastery.” (Gee, 2003, in Bonk & Dennen, 2005, p. 8)

Squire references Csikszentmihalyi (1990), when he points out that there would be no need for external rewards if the optimal “flow” for the game was achieved, saying that the player would be “so engaged in activity that self-consciousness disappears, time becomes distorted, and people engage in complex, goal directed activity not for external rewards, but for simply the exhilaration of doing.” (Squire, 2003, p. 50) Ryan *et al* back up this idea with Self-Determination Theory, describing video games as intrinsically motivating, and claiming that external rewards will only be beneficial if they consist of giving feedback, not if they can be perceived as controlling the player’s behaviour (Ryan, Rigby, & Przybylski, 2006). However, the same authors describe how rewards are intrinsic and motivating in the game experience, stating that games:

establish very clear links between actions, consequences, and rewards. There is never any doubt when playing a game that if you work hard toward a goal that the goal will be achieved; in virtual worlds the ambiguity and haphazard connection between effort and reward that exists in the real world is replaced by a consistent and dependable system that all but ensures that you will get what you work toward and deserve. (Rigby & Ryan, 2011, p. 11)

There have been mixed results in studies of rewards for children using 3D VEs to learn, and the research literature remains quite scant in this area. In a quasi-experimental research study with 106 fifth grade students playing an educational game, Filsecker and Hickey found that the use of external rewards did not undermine the students’ motivation in

the experimental group, and that in fact the group receiving external rewards were found to have significantly higher learning gains. They conclude from this that digital games can facilitate the effective use of rewards to promote learning without demotivational side effects (Filsecker & Hickey, 2014). In contrast to this study, Ronimus and colleagues found that after an initial motivational effect, the use of rewards had no long term impact for young children (n=138) learning to read in a 8-week computer game intervention (Ronimus, Kujala, Tolvanen, & Lyytinen, 2014).

3.4.3.7 Fun

Similarly to the affordances of goals and rewards, fun is most usually associated with games: “fun is to games what water is to pools—the defining ingredient.” (Rigby & Ryan, 2011, p. 8). Prensky expands on this, to outline the centrality of fun in games:

The enjoyment, pleasure or “fun”, we derive from these activities is the principle source of what makes us return to do them again and again — and there is increased “fun” from the fact that the more we do them the better we get, the easier they become, and the more goals we can achieve. (Prensky, 2001, p. 111)

For many years, educationalists have been look to tap into the perceived “fun” of commercial games, and see how than this be leveraged for learning. Rigby and Ryan consider the concept of fun as too nebulous to be useful in considering video game development, and prefer to think of enjoyment coming from “need satisfaction”(Rigby & Ryan, 2011, see section 3.4.2.2). However, in many studies in the literature the participants’ response to an educational intervention in a 3D VE involve reference to fun. In O’Brien and Levy’s study using a 3D VE based on the city of Salzburg, the most common response from the 43 students was that it was fun, although the authors were unable to link this to any language gains (O’Brien & Levy, 2008). Yang and Zapata Riviera developed an educational game for learning pragmatics, and found that in an exit questionnaire the majority of the 15 students participating reported having fun with certain elements of the game, with 83% of the students self-reported language gains, although there was no test to evaluate these, and 92% of

students reporting increased motivation to learn using the technology (Yang & Zapata-Rivera, 2010).

These studies were all with adult learners, but in research with children learning an L2, Zheng and co-workers carried out a quasi-experimental study in China using Quest Atlantis, where they compared groups of 30 and 31 seventh grade children learning English in the classroom and with additional Quest Atlantis time. They found that the students who used QA had an improved affective response to English, and reported the experience as fun (Zheng et al., 2009). Fun is also a student response in multiple other studies in various 3D VEs such as SL (C. X. Wang et al., 2012), Open Wonderland (Ibanez et al., 2011) and The Sims (Ranalli, 2008).

3.4.3.8 Challenge

Challenge was identified as a central requirement to makes games fun from their earliest advent (Malone, 1981). Gee has been to the fore in games and language learning research, theorising why games make for effective learning, and how educators can access games as a valuable resource to support learning in the classroom. He remarks “Game companies need to sell games that are long, hard and require an extended commitment. They can’t dumb them down, because most players don’t want and won’t accept short or easy games” (Gee, 2007, p. 2). Why is this? According to Thorne *et al*, in gameplay, challenge can be a motivating factor: “...it may be surprising for those who have not experienced MMORPGs to know that the games are successful, in part, because of their complexity and difficulty” (Thorne, Black, & Sykes, 2009, p.810). The complex gameplay can actually be a source of motivation for the player. However, this affordance can be difficult to realise for all players. This is linked to the notion of competence in the ARC framework as a necessary condition for motivation (see section 3.4.2.2), in other words that the challenge level must be accessible to the user and they must feel competent to achieve it, otherwise demotivation will result. Similarly, if the challenge level is too low it can also result in demotivation. The

evidence base is quite limited for this affordance in the area of technology for language learning, however in the broader field of game-based learning, Ryan *et al* reports four separate studies exploring this theme, three with university level students engaged in gameplay (Study 1: 89 participants; study 2: 50 participants; study 3: 58 participants), and a fourth with an online gaming community (730 participants). The authors carried out statistical analysis on the completed game play questionnaires which found that feelings of competence predict enjoyment of the game and increased preference for future play (Ryan *et al.*, 2006).

In the CALL field, Chen and Yang used a commercial English video game with 22-35 university students learning English as a foreign language (Chen & Yang, 2013). They noted a mixed response to the challenge level of the game. In the post questionnaires, eight students reported that they found the challenging missions to be motivating, but nearly half of all students reported that the challenging missions were too difficult and too time consuming. The authors recommend selection of moderate challenge to try to make the tasks accessible to more students.

Moving to research related to child SLA, again the evidence base is limited. Butler carried out research with 82 Japanese children aged 11-12 years (Butler, 2015). The children were asked to design games for English language learning for younger children, and the authors recorded their group discussions while carrying out this task. The children were also asked to complete evaluation records after the process. The authors found that the element of challenge was the most valued game element across all groups. While the games the children developed were not all 3D VEs, the emphasis they placed on challenge is pertinent to this discussion.

3.4.4 Constraints and limitations of 3D VEs

The list of potential affordances of 3D VEs for language learning is impressive; however, it does need to be counterbalanced with the disadvantages, constraints and

limitations of the technology. These include technical issues, security and problems with cognitive load, and will be discussed in turn below.

3.4.4.1 Technical difficulties

In a detailed review of the use of virtual worlds in language learning, Peterson points out a number of issues with these environments (Peterson, 2011b). He identifies the complexity of some of the interfaces used in virtual world research as a barrier to learners, creating the need for time-consuming training. He also points out the necessity for high speed network access and some problems that users have with firewalls blocking the programmes.

Cooke-Plagwitz also highlights some disadvantages associated with 3D VEs. She lists the expense, high computer or network demands and the steep learning curve necessary unless the student is already accustomed to online gaming (Cooke-Plagwitz, 2008). Liou describes the difficulties caused by unstable internet connection in an EFL course in SL for Taiwanese students, underlining how dependent these methods are on reliable technology (Liou, 2012). There are several other instances in the literature where technical problems prevented optimal implementation of the 3D VE for learning (Wang et al., 2012), but Ibanez describes how these became opportunities for collaboration and interaction as they had support in place for these eventualities (Ibanez et al., 2011).

3.4.4.2 Security

Security can be an issue in online virtual communities and gaming environments, and this is of particular concern in work with children. Cooke-Plagwitz highlighted the insecurity of the online environment as a major issue in her review of virtual worlds for language learning (Cooke-Plagwitz, 2008). The anti-social behaviour of some online participants was raised as a cause for concern and potential disruption of class activities, along with the unsuitability of the platform for children because of the adult content involved in the wider SL community.

While a purpose built virtual learning environment does not have access to the vast number of users of some of the most popular online virtual worlds and games such as SL and WoW, and hence does not provide the same opportunity of interacting with native speakers, the security of a small contained environment may be more attractive to some designers. For example, for work with children the online communities would not be appropriate, whereas the custom-built environment can be child-friendly.

3.4.4.3 Cognitive load

A further issue relates to the cognitive load required to play some very interactive games, and how this can interfere with learning objectives. De Haan *et al* carried out an experimental study using a computer game for vocabulary teaching with 80 university students. They found that the interactivity of the game actually interfered with the language learning goals because of the high cognitive load on the players, and they recommend careful selection of game type in order to avoid this problem (deHaan, Reed, & Kuwada, 2010). Rama also highlights this as a potential barrier to learning after carrying out a qualitative study of two university students playing WoW in Spanish. He concludes that familiarity with the game mechanics is essential in order to benefit from the potential language learning affordances of the game (Rama et al., 2012).

In summary, while the use of 3D VEs shows potential for language learning, there are barriers to be overcome to ensure the affordances can be leveraged efficiently.

3.4.5 Effectiveness of 3D VEs for language learning

Having looked at the potential affordances that 3D VEs may provide for language learning, and the constraints that may limit their effectiveness, attention now turns to the literature to explore how successful these 3D VEs have proven as language learning tools in practice. Studies have examined 3D VEs' effectiveness in terms of both affective response and language gains. The research is currently more heavily weighted on the side of affective gains, for reasons discussed below. Furthermore, the majority of research in the literature is

with university students, with only a small number of studies exploring child language acquisition in 3D VEs. These will be referenced when present, but many of the studies reported involve older learners.

3.4.5.1 Affective Gains

One of the main emphases in the area of 3D VE language learning research has been looking at the learners' affective response to the technology. The affective impact reported in the literature will be critiqued according to the three principal affective themes in the literature - positive affective response, reported reduction in anxiety and increased motivation.

The most frequent reported affective impact of a language learning intervention using a 3D VE is the positive affective response of the participants. A positive response is reported in the literature for virtual world language learning (Canto et al., 2013; Ibanez et al., 2011; Liou, 2012; Wang et al., 2012) for games for language learning (Liu & Chu, 2010; Ranalli, 2008) and also purpose built 3D VEs (O'Brien & Levy, 2008; Shih & Yang, 2008). One potential advantage of a positive affective response to a 3D VE is a transfer of positive affect to the target language and culture. This is the theoretical assumption upon which much affective research is based, although the studies often don't trace a direct link between positive affect and learning outcomes. Wehner reports that when comparing two groups of university students studying Spanish, one group using Second Life and the other using traditional classroom methods, the group using Second Life were found to have a slightly more positive attitude towards their Spanish course and Spanish culture than the traditional classroom group (Wehner et al., 2011).

A reduction in anxiety is a further common theme in 3D VE language learning research. Peterson claims that there can be a lower stress level involved with language learning in a virtual world, taking away barriers to learning such as anxiety (Peterson, 2011b). He describes how the virtual worlds can be spaces for collaboration, facilitated by a supportive atmosphere created in-world through interaction and leading to a sense of

community and lower anxiety. Peterson associates the reduction in anxiety in 3D VEs with the anonymity afforded by the avatar and the text-based chat (Peterson, 2011a). Reinders and Wattana carried out a 15 week intervention with 30 Thai EFL university students playing the role playing game Ragnarok online. While the students reported high levels of anxiety using English in regular class on a pre-questionnaire, the researchers report a marked reduction in self-reported anxiety on post questionnaires when using English during gameplay. The participants were much more willing to communicate through English when engaged with the game and reported more confidence and a higher perceived competence in the language. The authors conclude that when the language learning task design effectively leverages the gaming affordances, this can be hugely beneficial in reducing anxiety and increasing willingness to communicate (Reinders & Wattana, 2014). In Wehner's SL study mentioned above, the group using SL reported having less anxiety in using Spanish and in taking part in the course than the traditional classroom method (Wehner et al., 2011). Low anxiety in a 3D VE for language learning is also reported by Shih and Yang, who describe an ethnographic study of undergraduate university students using an immersive and interactive virtual environment in the classroom. The authors report that in the interviews and questionnaires students claim they felt relaxed while working in the virtual world and that they enjoyed the tasks (Shih & Yang, 2008). Peterson used a task-based language teaching approach to EFL in SL over a four week period with eight Japanese university students. The participants reported a relaxed and supportive atmosphere while engaged with the tasks in the 3D VE (Peterson, 2012a). Rama *et al.* (2012) carried out a qualitative study of two language learners playing World of Warcraft in Spanish. They recorded game observations, carried out interviews with the participants and collected in-game chat logs and journal entries, and carried out a thematic analysis of this data for the affordances of the game. Based on this qualitative analysis, the authors reported that the game was a low anxiety setting, claiming that WoW facilitated the

creation of a safe learning space with an emphasis on communicative competence and the promotion of goal oriented collaboration between experts and novices.

The theme of motivation is also reported frequently in association with using 3D VEs for language learning. In Wehner's study comparing university students learning Spanish in the classroom and in SL, the SL group demonstrated a higher motivational intensity on the AMTB questionnaire (a validated instrument to test motivation and attitudes, see section 4.7.3) than the control (Wehner et al., 2011). Wang *et al.* found that 20 Chinese university students learning English in SL found the programme motivating. In the post-interviews, all of the students in the study said that they would like more opportunities to learn in Second Life (Wang et al., 2012). Berns used a game-like 3D VE for German language teaching with 85 university students. There was no control group in this study, but in the exit questionnaire, 86% of participants reported that the experience helped their motivation.

There is also some research to suggest affective gains for children learning an L2 in a 3D VE. Liu and Chu carried out a quasi-experimental study with 64 seventh grade students learning English as a foreign language and comparing a computer game with a non-gaming method. They reported that students in the experimental group had more motivation, and furthermore claimed a link between this motivation and the learning outcomes through qualitative data analysis of in-depth post interviews and post-tests (Liu & Chu, 2010). Connolly and colleagues developed a game for modern foreign language learning in secondary schools. 328 students used the game across 17 countries, and while there was no control group, and not all participants completed the questionnaires, the majority of those who did reported in the post questionnaire that it motivated them to learn and use foreign languages (Connolly, Stansfield, & Hainey, 2011). The affective findings in the research are encouraging, as they suggest that using a 3D VE can help to reduce the learner's anxiety and increase their motivation and positive affective response to language learning activities, thus creating more suitable conditions for language learning. This is quite a promising finding, as

affectivity has an important role to play in SLA (see section 3.4.2 for discussion on role of motivation).

3.4.5.2 Language gains

In contrast to the range of studies reporting affective response, there has been limited evidence for language learning gains in 3D VEs as shown by the limited number of studies that have offered a comprehensive analysis of the language learned by their participants over the course of their study (Reinhardt & Sykes, 2014). There have been some important limitations to the research currently published in this field. Many studies were carried out in the absence of control group, as they were focusing on exploring the students' affective response to the virtual world rather than the actual language they learned during the intervention, meaning that any language gains reported cannot be unequivocally attributed to the intervention. Warschauer and Healey suggest why there is an imbalance in the research between affective response and actual language gains:

Given the number of variables associated with language learning and the difficulty in controlling those variables, particularly in a second language learning setting, it is not surprising that those who design studies prefer to research the easier area of student attitude. (Warschauer & Healey, 1998, p. 62)

However, there are a small number of studies in the literature which did aim to evaluate language gains after a 3D VE intervention. The 20 Chinese university students who learned English in SL in Wang *et al.*'s quasi-experimental study demonstrated significant gains in a post language test when compared with a control group (Wang *et al.*, 2012). In Canto *et al.*'s study which compared video collaboration and Second Life groups, teachers reported an improvement in the communicative competence of participants in these groups, compared to a control group, particularly among those who began the intervention with poor oral skills (Canto *et al.*, 2013). However, there are limitations to this study as there were major discrepancies in the amount of time spent on task between the control group and the video collaboration and SL groups.

Berns *et al.* (2013) also attempted to assess the language learning in their 3D VE based intervention with 85 university students learning German. There was no control group in the study but the majority of participants demonstrated language gains on the post-test, in particular vocabulary gains, and 80% of students self-reported language gains. Chen and Yang tested a non-educational commercial adventure game in English to see could it support the vocabulary acquisition of 22 university EFL students in Taiwan. There was no control group but in the study the participants showed gains in vocabulary between the pre-and post-vocabulary tests. (Chen & Yang, 2013). In the absence of control groups in these studies, the learning effects cannot be unequivocally linked to their causes (Dörnyei, 2007), however, the frequent recurrence of such results is a positive indication that there may be a link that can be determined experimentally in further research.

De Haan and colleagues investigated the relationship between video game interactivity and second language vocabulary acquisition in an experimental study with 80 university EFL students. They compared English language learners undertaking different roles within the game, a watcher and a player, and collected a range of data, including a post vocabulary test, a delayed post vocabulary test two weeks later, a cognitive load measure and an experience questionnaire. They found that the high cognitive load on the player to take part in the game interfered with vocabulary acquisition, with watchers recalling more vocabulary than the players (deHaan et al., 2010).

Rankin *et al* carried out a small scale study with four EFL students, who spent 4 hours per week playing Everquest 2 in pairs over a four week period. All four students self-reported language gains, and these were confirmed by the researchers through tracking certain vocabulary in each student's game interactions throughout the project. The authors assert that target language output was enhanced through participation in the game-based project, and link the acquisition of certain target forms to the frequency with which they occurred in interactions between players and non-player characters, with higher frequency vocabulary

more likely to be acquired. However, they caution that an intermediate level of English proficiency was required to access the potential for language learning in the game (Rankin, Gold, & Gooch, 2006). Some of the same researchers were among a team who later carried out a study comparing 12 EFL students who either took part in Everquest 2 alone, or with a native English speaker partner. They found that groups who played the EverQuest 2 Game with native speakers demonstrated higher understanding of the target language. (Rankin, Morrison, McNeal, Gooch, & Shute, 2009). This contrasts with Long and Porter's assertion that learner-learner interactions are not significantly different from learner-native speaker interactions (Long & Porter, 1985).

Ranalli's adaptation of The Sims for university EFL students yielded an increase in the average vocabulary score on the post-test of the 9 participants. Ranalli had prepared supplementary material to help adapt the game for learning purposes, and it was difficult to distinguish whether the vocabulary gains came from the supplementary material or from the game itself (Ranalli, 2008). More insight can be gained into this issue in Miller and Hegelheimer's study, which used The Sims with 18 intermediate level EFL adult learners, and found a statistically significant increase in vocabulary when supplemental materials were provided, based on data analysis of weekly quizzes and questionnaires (Miller & Hegelheimer, 2006). O'Brien and Levy attempted to evaluate language gains in the use of their immersive German language 3D VE with 42 university students. They carried out post-tests to analyse language learning but the results were inconclusive and there was no control group (O'Brien & Levy, 2008).

In the literature relating to child SLA, Liu and Chu's quasi-experimental study with 64 seventh grade EFL students compared children learning English in a game-based learning environment with a non-game environment. The authors reported that the experimental group outperformed the control group in the post test (Liu & Chu, 2010). Turgut and Irgin carried out a qualitative study of ten Turkish children (aged 10-14) playing computer games in

English in internet cafés. The authors reported that playing the online games promoted language acquisition, particularly vocabulary, based on a qualitative study of children's interactions (Turgut & Irgin, 2009).

While the research supporting language learning gains in 3D VEs is limited at present, there are signs of potential within the field, and this would benefit from further exploration. The limited evidence suggests that using 3D VEs may facilitate increased language acquisition, and the area merits comprehensive study to determine what effect 3D VEs have on language learning, for example through an intervention with longer duration, use of control group, pre and post language testing, etc. It is also relevant to the discussion that in a significant meta-analysis of CALL research published recently by Grgurović and colleagues, it was found that CALL does have a positive effect in language gains when compared to teaching methods without technology (Grgurović, Chapelle, & Shelley, 2013). This demonstrates the potential of CALL applications for language teaching and learning, and adds weight to the argument for further investigation of initial findings in the 3D VE field.

3.4.6 Limitations in the 3D VE literature

As the discussion of the literature above outlines, the majority of studies are short in duration with small numbers of participants, and tend to explore affective elements. Questionnaires are the most frequently reported data collection instrument. Furthermore, the majority of studies are in ESL, with limited examples in the minority language context. In addition to this, most studies take place in the university with adult participants. An evidence base which is both broader and deeper is necessary – larger studies and studies in a broader range of contexts – to fully examine the affordances and contribution of 3D VEs in language learning, and something more than post-intervention questionnaires to explore the learning experiences of users and how they relate to the proposed affordances of the technology. Furthermore, studies have explored the affordances in detail, generally with user self-report, however explicit connections between affordances and specific learning gains are limited in

the literature. There is an urgent need for new research to address the gaps in the literature in the area of 3D VEs for minority languages and with primary age children, although a recent book chapter on gaming and young learners by Sundqvist is a very welcome contribution to field and may provide a springboard for future work (Sundqvist, 2016).

Peterson supports this call for more research in the field as he underlines the exploratory nature of current research, and draws attention to the limitations of existing research (Peterson, 2011). He identifies areas for more in-depth investigation, suggesting that more research is needed involving larger and more diverse groups of learners; and also mentions the role of the teacher as an area that needs more study.

3.5 Conclusion

This chapter began by tracing the development of the field of CALL, before introducing and classifying 3D VEs for language learning. The range of immersive environments included under this umbrella term was presented, along with the challenges of finding an inclusive taxonomy. This gap in the literature was addressed by this research study, and a new, flexible taxonomy will be outlined in section 5.8 (see also Dalton & Devitt, 2016). The concept of affordance in the 3D VE field was then introduced, and a brief summary given of the necessary conditions for SLA based on the interaction approach and recent motivational theories. The specific affordances of 3D VEs for language learning were then described and the evidence base from the literature presented for each, when possible. There are significant gaps in the literature for several of these affordances, another issue addressed by this thesis. The various constraints and limitations of using 3D VEs for language learning were outlined, and then a critical review was presented of the research literature on the effectiveness of 3D VEs for SLA, both in terms of affective and language gains. Finally, the limitations in the 3D VE for language learning literature were listed, with a view to identifying the main areas of contribution of this thesis – specifically 3D VEs for language learning with primary school children, and with a minority language, along with an in-depth exploration and evaluation of

the projected affordances of these technological tools. The next chapter will describe the design of this research study, which aimed to target these specific gaps in the literature and make an important contribution to the CALL field in the Irish and international context.

4 Design of Study

4.1 Introduction

The previous chapter explored the literature on 3D VEs for language learning. This study aims to address several gaps in the literature including the use of 3D VEs with primary age children and in a minority language context. This chapter will set out the design of the research study, which employs a 3D VE in a language learning intervention for primary school children learning Irish. Firstly, the research questions will be presented, followed by a description of pragmatism as the philosophical approach chosen for this research. Next, the methodological approach will be outlined, and the research instruments and data analysis will be described. Finally ethical considerations and the limitations of this research study will be discussed.

4.2 Research Questions

The aim of this study was to explore the use of technology to improve outcomes for Irish among primary school children. More specifically, this study aimed to design a 3D VE tool for an Irish language learning intervention and to use the intervention to explore the following research questions:

1. What are the children's attitudes to Irish, and does the intervention have any impact on these attitudes?
2. What were the characteristics of children's use of Irish during the intervention?
3. Is there evidence of language learning after participation in an intervention using the 3D VE tool? Does an additional element of focus-on-form in the 3D VE contribute to language gains?
4. What impact did the projected affordances have on the learning experience?

4.3 Overview of Study

The research study presented in this thesis was quite complex and incorporated several iterations drawing on multiple approaches. For purposes of clarity, an overview of the research and design process is presented in this section, before treating the individual elements of the design, development and research cycle in the remainder of this chapter and in chapters 5 and 6.

- The theoretical approach taken was a pragmatic framework which facilitated the ecological paradigm of using a multiplicity of methods to gain a depth of insight into the phenomenon being studied – in this case, children’s experiences learning Irish using a purpose-built game.
- A Design-Based Research methodology was used in the design process, with an emphasis on incorporating the research literature with the problem at hand and beginning a design cycle which incorporates user feedback and contributes to theory formation while optimising the design of a technological tool for learning.
- This necessitated consultation with the 3D VE users, who were children in this study. A Student Voice methodology was selected as the most appropriate to guide and direct this consultation process.
- The iterative design cycle progressed to a second iteration, where a 3D VE was used as the platform for a language teaching intervention, and this intervention was the basis for addressing the research questions of this thesis.
- A mixed methods approach was then taken in the data collection and analysis, with language assessments and questionnaires comprising most of the quantitative data, and focus group interviews and recorded game interactions offering a rich and detailed source of qualitative data.

An overview of the study may be seen in Table 4.1. The findings from the first iteration and the user consultation were instrumental in shaping the development of the second iteration. The second iteration is the focus of this thesis, as the research questions outlined above were addressed in this iteration.

4.4 Philosophical Approach - Pragmatism

Having presented a general overview of the study, this section will now explore the pragmatic philosophical approach adopted in this research. Given the complexity of any language learning environment, likened in section 2.6 to a jungle of interacting contexts and factors, a variety of research methods were needed in this study. This raises a philosophical problem, as traditionally some research approaches are considered theoretically incommensurable. Therefore, the theoretical frame must be sufficiently broad to allow a full spectrum of research methods. A pragmatic philosophical approach was adopted to accomplish this.

Historically, qualitative research was associated with a constructivist paradigm, whereas quantitative was associated with a positivist or post-positivist paradigm (Teddlie & Tashakkori, 2009) because of the fundamental epistemological differences between how knowledge is understood in each of these traditions. In the positivist tradition, knowledge is considered as objective, something separate from the researcher that he/she tries to uncover, whereas for constructivists, research is subjective and involves the construction of knowledge. This, and other fundamental differences are outlined in Creswell's description of four worldviews or paradigms of research, shown in Table 4.2. Three of these worldviews will be discussed below, excluding the advocacy/participatory one as a discussion of this perspective is beyond the scope of this work.

Table 4.1 Overview of study

	FIRST ITERATION	USER CONSULTATION	SECOND ITERATION
DETAILS	▪ Half day pilot study ▪ 25 participants (aged 10 years)	Consultation with 15 of the children from the first iteration	▪ Nine game sessions (30-50 mins each) over five weeks ▪ 17 participants (aged 10 years)
OVERVIEW	Language learning intervention in 3D VE	Consultation about experiences of 3D VEs outside of school and suggestions for creation of a 3D VE for learning Irish	Language learning intervention in 3D VE
OBJECTIVES	The goal of this iteration was to pilot a 3D VE with TBLT approach for learning Irish and to pilot the instruments	The goal of this consultation was to elicit children's opinions and recommendations for inclusion in the design process	The goal of the second iteration was to address the research questions of this study using the 3D VE and language teaching intervention
RESEARCH DESIGN	▪ Exploratory pilot ▪ No control group	▪ Exploratory consultation with two a priori themes	▪ Exploratory study ▪ Quasi-experimental element focusing on language gains. (Experimental group: 3DVE intervention with focus on form (the copula), Focus on Form Control: 3D VE intervention without focus on form, Intervention Control: no 3D VE intervention, no focus on form)
DATA COLLECTION	▪ Language assessments ▪ Questionnaires	▪ Focus group interview	▪ Language assessments ▪ Questionnaires ▪ Focus group interviews ▪ Audio recordings of groupwork interaction

Table 4.2 Four worldviews taken from p. 6, Creswell, 2003

Post-positivism	Constructivism
▪ Determination ▪ Reductionism ▪ Empirical observation and measurement ▪ Theory verification	▪ Understanding ▪ Multiple participant meanings ▪ Social and historical construction ▪ Theory generation
Advocacy/Participatory	Pragmatism
▪ Political ▪ Empowerment issue-oriented ▪ Collaborative ▪ Change-oriented	▪ Consequences of actions ▪ Problem-centred ▪ Pluralistic ▪ Real-world practice oriented

Lincoln and Guba's (1985) comparison of the positivist and constructivist paradigms are described by Teddlie and Tashakkori (2009) in a binary way as follows:

Epistemology – Positivists believe that the knower and the known are independent, whereas constructivists believe that the knower and the known are inseparable.

Axiology – Positivists believe that inquiry is value free, whereas constructivists believe that inquiry is value bound.

Ontology – Positivists believe that there is a single reality, whereas constructivists believe that there are multiple, constructed realities.

The possibility of **causal linkages** – Positivists believe that there are real causes that are temporally precedent to or simultaneous with effects. Constructivists believe that it is impossible to distinguish causes from effects.

Generalizability – Positivists believe that **nomothetic statements** (time- and context-free generalisations) are possible. Constructivists believe that only **ideographic statements** (time- and context-bound working hypotheses) are possible. (Teddlie & Tashakkori, 2009, pp.85-86)

Kuhn, 2012) on the basis of the contrasting foundations of constructivism and positivism. The *incompatibility thesis* posits that it is not appropriate to combine qualitative and quantitative methods due to the different philosophical positions held by each paradigm (see Lincoln & Guba, 1985). There is however, another way of viewing the two paradigms without necessitating a sharp divide between them. Howe compared the *incompatibility thesis* to the story of a drunken man looking for his keys under the street lamp because that is the only area which is lit up. He argued that the research question (the key in the metaphor) should determine what approach should be taken at any given time of a research study (the light source). A pragmatic philosophy, according to Howe, can allow for this flexibility “of the epistemological over the practical, of the conceptual over the empirical” (Howe, 1988, p.13) In this way, the demands of the research dictate the research methods, rather than vice versa, which Bernstein refers to as a "tyranny of method" (Bernstein, 198, in Howe, 1988, p.13)

Howe put forward an alternative - the *compatibility thesis*, which states that with a pragmatic philosophical framework, both qualitative and quantitative methods can be used together. Instead of diverging, qualitative and quantitative research can converge to mixed methods within the context of a pragmatic paradigm. The debate about the nature of knowledge and research informed by the constructivist or positivist traditions still continues today, with researchers such as Denzin and Lincoln (2005) maintaining a clear distinction between them, and others such as Lantolf (2002) proposing that they should be viewed on a continuum rather than a binary classification. This continuum is very helpful for researchers who wish to draw on both traditions. Indeed, Onwuegbuzie calls for “epistemological ecumenism” through the use of mixed methods research (Onwuegbuzie, 2002, p.518) based on a pragmatic paradigm.

Pragmatism, when regarded as an alternative paradigm, sidesteps the contentious issues of truth and reality, accepts, philosophically, that there are singular and multiple

realities that are open to empirical inquiry. This enables researchers to look at ‘real world’ problems and how to solve them, without getting diverted by incommensurate theories. (Feilzer, 2010).

This philosophical approach is particularly pertinent to the current study. As discussed in Chapter 2, an ecological approach to this study requires multiple viewpoints and an awareness of the complexity of the language learning experience. The research questions outlined above could be addressed solely through quantitative methods to provide one perspective on the language learning experience and context. However, incorporating a qualitative approach brings added depth and complexity, which can provide insight into the complex factors at play in the language learning environment and in each child’s own experience. For example, the children’s attitudes towards Irish could be assessed quantitatively, and a single underlying attitude assumed. However, bringing a qualitative perspective alongside the quantitative is an invaluable means of exploring the richness of each child’s experience. Each of the research questions can be addressed much more comprehensively when a multiplicity of methods are employed. As a methodological approach, pragmatism allows for a multiplicity of methods, which directly aligns with the goals of the ecological basis for this study.

4.5 Mixed Methods

This section will present the mixed methods approach selected for this study. Section 4.5.1 will give a rationale for using mixed methods, section 4.5.2 will outline the main principles of quantitative research, including experimental and quasi-experimental research, and section 4.5.3 will describe qualitative research. Finally, section 4.5.4 will set out the advantages of taking a mixed methods approach.

The methodology selected for this study was a mixed methods approach, incorporating descriptive quantitative research with a quasi-experimental sub-element to determine language gains and overall student attitudes to the Irish language, alongside qualitative

research to explore in-depth aspects of language use, development and learner motivation. This approach was selected to obtain data from a variety of perspectives in line with the theoretical constraints of an ecological paradigm, as described in section 2.7. Mixed methods research has only become a well-established methodological approach since the 1990s, even though Denzin extolled the advantages of researching with multiple methodological approaches as early as 1970 (Denzin, 2009). Mixed methods research may be defined as:

An intellectual and practical synthesis based on qualitative and quantitative research; it is the third methodological or research paradigm (along with qualitative and quantitative research). It recognizes the importance of traditional quantitative and qualitative research but also offers a powerful third paradigm choice that often will provide the most informative, complete, balanced, and useful research results. (R. B. Johnson, Onwuegbuzie, & Turner, 2007)

4.5.1 Rationale for Mixed Methods for this study

Mixed methods was selected as the most suitable research methodology for the present study because as noted above, the conceptual framework of an ecological understanding of language learning entails that the language learning context and experience be examined from a variety of perspectives and in a variety of ways. Quantitative data is required to provide an overview of children's attitudes (research question one), to compare the usage frequencies of different characteristics of language use (research question two), to assess language gains (research question three) and to compare the relative frequencies of different game experiences (question four). Qualitative data was required to provide depth and a rationale to the children's responses in relation to question one (attitudes), to identify the principal characteristics of the children's language use (question two), to explore the different types of language gains (question three) and to examine the interrelationships and the detail of the various experiences the children had of the game affordances. As Feilzer points out "Pragmatists do not "care" which methods they use as long as the methods chosen have the potential of answering what it is one wants to know." (Feilzer, 2010, p.14). The basic tenets

of both quantitative and qualitative research will be presented below, before describing how both approaches were applied in this research in the research design (section 4.7).

4.5.2 Quantitative Research

According to Brown, “any study that counts things could be considered quantitative. So, quantitative research can be defined as any research that focuses on counting things and on understanding the patterns that emerge from those counts” (J. D. Brown, 2011). Dörnyei expands further on this basic definition linking quantitative research to numbers, identifying several other important features. He states that quantitative research: employs a priori categorisation; is interested in variables rather than cases, uses statistics; is concerned with standardised procedures to assess objective reality and seeks generalizability of results (Dörnyei, 2007, pp. 33-34). Quantitative research is seen as a rigorous and scientific method, however it does have its limitations. The numerical results can be decontextualized and they cannot explain the reasons for the results observed. Furthermore, individual differences are lost in the process of averaging responses. According to Brown there are four main types of quantitative research: descriptive; exploratory; quasi-experimental and experimental (J. D. Brown, 2011). In this research study, the predominant approach was descriptive but a quasi-experimental element was included to specifically look at language gains. The next section will set the scene for this approach, through examining experimental and quasi-experimental quantitative research in the specific context of educational and SLA research.

4.5.2.1 Experimental/Quasi-experimental research

An experimental approach to quantitative research is often seen as the best way to establish presence of a cause-effect relationship between a variable and an effect. This approach originated in the natural sciences, but is widely used in both educational and SLA settings. In this study, two of the four research questions involve identification of a cause-effect relationship – question one, which relates to children’s attitudes to Irish; and question three which looks to assess language gains after the intervention. In the context of SLA

research, Dörnyei refers to experimental design as the best model for “rigorous research” (p.117 Dörnyei, 2007). The experimental set up is tightly controlled, and the researcher investigates a target variable while keeping other variables constant. By changing the target variable and measuring the effect, then comparing this with a control group, the researcher can hypothesise a potential causal relationship between that particular variable and the effect. The inclusion of a control group is necessary as there could be alternative sources of change in the experimental group other than the changing target variable – for example the maturation process, the effect of practice on the pre-test or the Hawthorne effect. Cohen *et al* list the features of a true experimental design in educational research:

- One or more control groups
- One or more experimental groups
- Random allocation to control and experimental groups
- Pre-test of the groups to ensure parity
- Post-test of the groups to see the effects on the dependent variable
- One or more interventions to the experimental group(s)
- Isolation, control and manipulation of independent variables
- Non-contamination between the control and experimental groups. (p. 275, Cohen, Manion, & Morrison, 2007)

A typical model for an experimental research design involves pre-test, post-test, experimental group, control group design as shown in Figure 4.1.

Experimental group	Pre-test	Intervention	Post-test
Control group	Pre-test	-	Post-test

Figure 4.1 Example of experimental design.

In order to ensure that the sample selected for participation in the empirical study is representative of a whole population of the study, probability sampling is used. This involves

random sampling of participants for both the experimental and control group, and suggests that the results of the study can be generalised to the wider population.

Unfortunately, in the fields of education and SLA, in practice a true experimental design is often not feasible as random sampling of participants may not be possible. In the context of research in education random sampling is not practical, and pre-existing groups are usually selected for participation, e.g. a language class in a university. In such cases it may be a “quasi-experimental” design – similar to experimental, but lacking the random sampling element, leading to limitations in the generalisability of the research results. These limitations need to be clearly defined and discussed in reporting any research involving non-random sampling. When random sampling is not used, the research involves working with non-equivalent groups. These differences lead to the presence of experimental error, such that the observed results may not be due to the target variable. For practical reasons, where randomisation is not an option, the use of non-equivalent groups has become standard practice (Dörnyei, 2007). However in such cases it is critical that group differences are taken into account and that every effort is made to decrease the experimental error introduced by this non-equivalence. Experimental error may be reduced through using analysis of covariance to adjust post-test scores for pre-test differences, or by matching participants in treatment and control groups. It is possible to design a quasi-experimental study in such a way that cause and effect can be linked, and to yield scientifically reliable results (Dörnyei, 2007). Nevertheless, it is important to note that the results of a quasi-experimental design cannot be interpreted and generalised as readily as an experimental design – limitations will remain. The experimental and quasi-experimental design can differ by participant factors, intervention factors or situational factors (Cohen, Manion, & Morrison, 2007).

4.5.3 Qualitative Research

. Qualitative research comprises a wide range of methods and approaches, and many of its own practitioners are divided on the question of definition, as Denzin and Lincoln point

out: “Qualitative research is many things to many people” (p. 10, Denzin & Lincoln, 2005). In essence, qualitative researchers don’t set up experimental conditions in which to carry out their studies, but aim to capture and interpret naturally occurring phenomena.

There are some core features to the qualitative approach that may help to delineate the field. Dörnyei identifies some of these principal characteristics (Dörnyei, 2007). The research design of a qualitative study is usually flexible - typically qualitative researchers aim to be free to respond to whatever emerges from the process of research, so research designs aren’t rigid, but open to adaptation and change.

Qualitative researchers use ethnographic prose, historical narratives, first-person accounts, still photographs, life histories, fictionalised “facts”, and biographical and autobiographical materials, among others. (Denzin and Lincoln, 2005, p.87 in Teddlie & Tashakkori, 2009). Therefore, qualitative data can involve text, images, interviews; all designed to capture the subjective experiences of individual in a naturalistic setting. As described by Bailey and Nunan; “qualitative data consist of records or phenomena which deal with the qualities or characteristics of those phenomena, rather than with measurements, frequencies, scores or ratings” (p. 2, (Bailey & Nunan, 1996). Qualitative researchers seek to explore naturally occurring phenomena; therefore a contrived or experimental set-up is avoided. Because of the exhaustive nature of this type of naturalistic data collection, the sample size for qualitative research designs is usually quite small.

In SLA research the principal methods of collecting qualitative language data are interviews, observations, recordings and written artefacts, according to Harklau (2011). The methods used in this study are described in section 4.7. The language data obtained through qualitative methods is much richer and of more depth than quantitative language testing. In the domain of SLA research, qualitative data is usually analysed in text form, for example through transcribing audio conversations or interviews held with the participants. This makes it possible to capture the participants’ language use and analyse it in a depth not possible

when relying solely on quantitative methods. This was important for the research questions in this study which focused on language use and language gains (questions two and three)

4.5.4 Advantages of mixed methods

Denzin's 1970 book *The Research Act* was hugely influential in shaping the theory of mixed methods research. He advised researchers to "approach the empirical world from as many methodological perspectives as possible." (Denzin, 2009, p.36) He highlighted the potential benefits of using multiple methods whereby the strengths of one method can offset the weaknesses of another, thus leading to a more solid and reliable body of research. This procedure became known as "triangulation", and is defined by Denzin as "the combination of methodologies in the study of the same phenomenon" (Denzin, 2009, p.291). He further expands on the concept, describing it as: "a complex process of playing each method off against the other so as to maximise the validity of field efforts" (Denzin, 2009, p. 310). This point is further developed more recently by Brown, who advocates the use of mixed methods in research, claiming that qualitative and quantitative methods, when combined, can "reinforce and cross-validate each other"(J. D. Brown, 2011).

Dörnyei describes this complementary nature of combining qualitative and quantitative research as one of the major strengths of mixed methods research (Dörnyei, 2007). He also mentions the potential for multi-level analysis using mixed methods, the possibility of improving the validity of research through triangulation, and the fact that mixed methods research will reach a wider audience through encompassing both qualitative and quantitative research interests. A mixed methods design can also help to compensate for the shortcomings of individual methods – for example the depth and richness of the qualitative data compensating for the objective and impersonal numerical data emerging from the quantitative study.

4.6 Methodological Approach

4.6.1 Introduction

Having set out the theoretical basis for the research project, this section will now present the methodological approaches taken in the design and research aspects of the study. The ecological theoretical basis of the project required a methodological approach capable of dealing with the complex ecological learning environment, the technology development process and the use of multiple data sources to answer the specific research questions listed in section 4.2. Within the framework of a mixed methods approach, a Design-Based Research paradigm was selected for this purpose, as it can provide a solid framework for technology design and educational intervention research, allowing for multiple perspectives and data sources to be used in a manner which integrates the design and research processes. This approach will be outlined in more detail in the next section. A student voice methodology was selected for the user consultation aspect of the study. These are detailed below.

4.6.2 Design-Based Research

Atkinson's metaphor of the language learning environment as a "jungle" becomes even more relevant when an immersive technological tool for language learning is introduced to the classroom. The complex ecology of the learning environment and the potential impact of the technological tool necessitate a research design process that can cope with multiple variables. Design based research (DBR) has this potential, as described by Wang and Hannafin in their definition of DBR as:

a systematic but flexible methodology aimed to improve educational practices through iterative analysis, design, development and implementation, based on collaboration among researchers and practitioners in real-world settings, and leading to contextually sensitive design principles and theories. (Wang & Hannafin, 2005, pp. 6–7)

DBR was chosen as the design approach for this study, as it allows for the incorporating of multiple perspectives in a feedback loop that links to iterative cycles of design. The iterative design cycle was crucial for this research study, as it provided a framework for developing, evaluating and optimising a language learning tool for children,

and incorporating their needs and preferences into the process. The principle of collaboration was required in engaging the children with the design process in an authentic way.

4.6.2.1 Origins and development of DBR

The development and evolution of Design Based Research has followed the principles of an ecological paradigm. The current Design-Based Research approach began in the 1990s with Collins' (1992) and Brown's (1992) "design experiments". This innovation showed a shift to a more ecological and context sensitive approach to studying and optimising learning. As Barab and Squire point out, Collins and Brown "began conducting "design experiments" because of the belief that many of the questions that were important to them could not be adequately addressed by laboratory-based examinations" (Barab & Squire, 2004, p. 12). In the past 25 years, DBR has grown in popularity and relevance, as an increasing body of researchers desire to study and transform learning outside of the laboratory, and to use the insight gleaned from these contextualised processes to interact with existing theories and shape new ones. This design-based research approach aligns with a pragmatic philosophical approach, "one in which the value of a theory lies in its ability to produce changes in the world" (Barab & Squire, 2004, p. 6). With the pragmatic philosophy and ecological approach inherent in Design Based Research, this approach was selected as the most appropriate to achieve the aims of the research project within the theoretical framework set out above.

4.6.2.2 Characteristics of DBR

DBR takes insights from the design cycle of engineering and incorporates this into educational research. According to Sheppard, what engineers do is: "scope, generate, evaluate, and realize ideas" (Sheppard, 2003 in Dym, 2007, p. 423). A typical engineering design process is shown in Figure 4.2, and involves identifying and researching a problem, developing a potential solution and building a prototype, testing the prototype and then repeating the design process as necessary to improve the product.

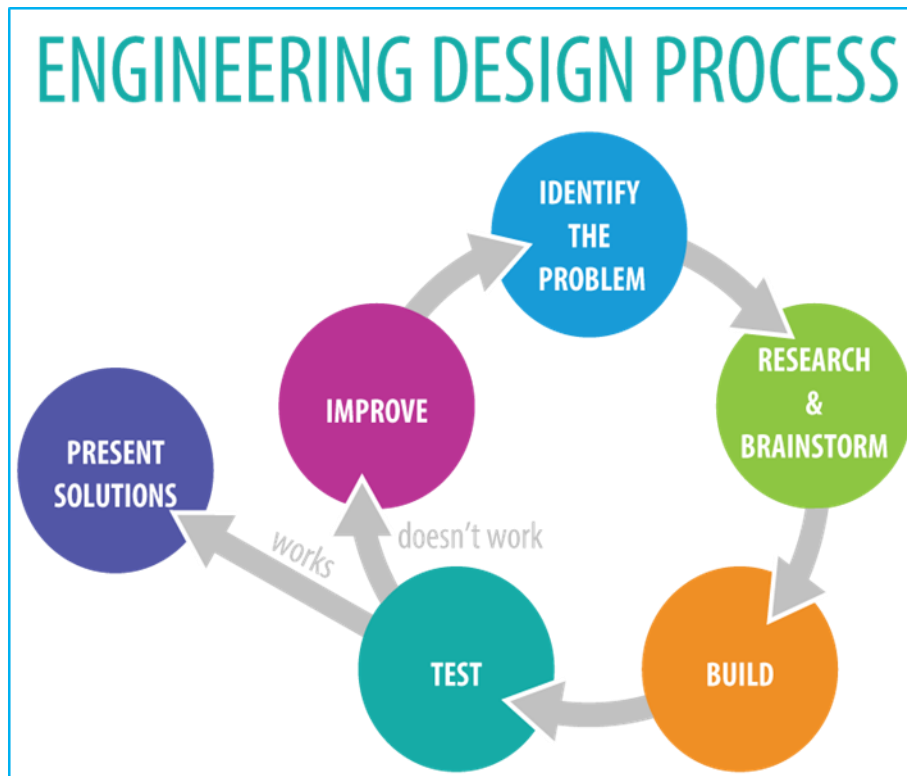


Figure 4.2 The Engineering Design Process (University of Toronto, n.d.)

This responsive process of prototyping, reflecting and redeveloping has strong potential for educational solutions, and could address the need identified by the United States National Research Council “for new research approaches that speak directly to problems of practice”(US National Research Council in The Design-Based Research Collective, 2003, p. 5). As in other design contexts, educational research can require extensive consultation with stakeholders to define and refine key issues and needs of learners, conceptualising and designing a possible solution to address this and review and analysis with learners of the impact and outcomes of the designed solution. This can also require multiple iterations to refine the proposed solution. DBR offers the framework to develop solutions for educational challenges, as highlighted by Reeves in his description of the DBR process as:

... addressing complex problems in real contexts in collaboration with practitioners; integrating known and hypothetical design principles with technological advances to render plausible solutions to these complex problems; and conducting rigorous and reflective inquiry to test and refine innovative learning environments as well as to define new design principles (Reeves, 2006, p. 58).

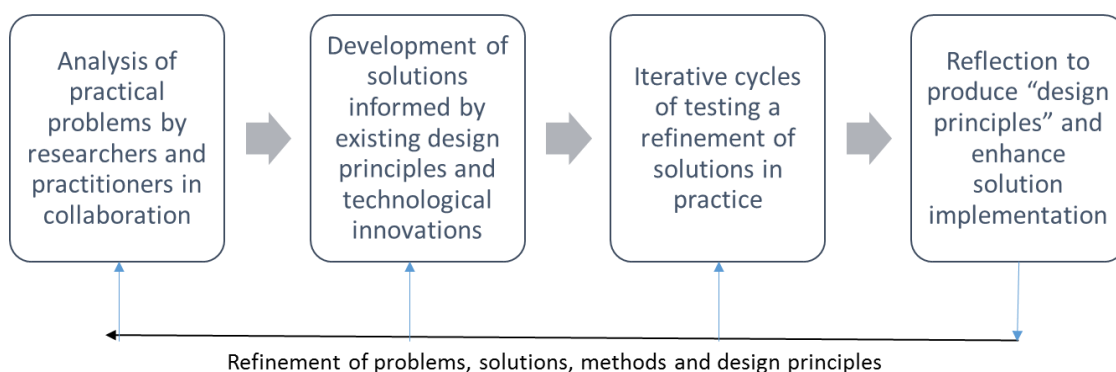


Figure 4.3. The DBR process (adapted from Amiel & Reeves, 2008, p. 34)

Amiel and Reeves provide a graphic illustration of this process (Figure 4.3), demonstrating how researchers and practitioners work together in the iterative design cycle. This co-operation is central to DBR, as researchers and practitioners work together to identify problems and create possible solutions driven by theory. This is actualised in this research study as the researcher has the dual role of researcher-practitioner. The potential solutions are tested and refined in an iterative way, and the lessons learned from the process are used to contribute to broader design principles and theory itself, so that they can be applied in a wider context.

Wang and Hannafin (2005) report the central characteristics of DBR, as seen in Table 4.3. There is considerable theoretical overlap between these characteristics and an ecological paradigm for SLA research, as described in Chapter 2, most notably the embedded and contextual nature of the research, how the stakeholders involvement is integrated and how a variety of perspectives are drawn upon to gain the deepest insight into the system.

4.6.2.3 DBR and CALL

DBR is particularly relevant to the design and development of technological tools for learning and has been growing in popularity in the development of technology-based learning interventions in recent years, Reeves and McKenney describing it as “especially appropriate” for CALL (T.C. Reeves & McKenney, 2013, p. 9).

Table 4.3. Characteristics of Design Based Research (Wang & Hannafin, 2005, p. 8)

Characteristics	Explanations
Pragmatic	• Design-based research refines both theory and practice. • The value of theory is appraised by the extent to which principles inform and improve practice.
Grounded	• Design is theory-driven and grounded in relevant research, theory and practice. • Design is conducted in real-world settings and the design process is embedded in, and studied through, design-based research.
Interactive, iterative, and flexible	• Designers are involved in the design processes and work together with participants. • Processes are iterative cycle of analysis, design, implementation, and redesign. • Initial plan is usually insufficiently detailed so that designers can make deliberate changes when necessary.
Integrative	• Mixed research methods are used to maximize the credibility of ongoing research. • Methods vary during different phases as new needs and issues emerge and the focus of the research evolves. • Rigor is purposefully maintained and discipline applied appropriate to the development phase.
Contextual	• The research process, research findings, and changes from the initial plan are documented. • Research results are connected with the design process and the setting. • The content and depth of generated design principles varies. • Guidance for applying generated principles is needed.

The novelty of a DBR approach is that it “advances design, research and practice concurrently” as opposed to traditional methods where “design and research have evolved in a largely sequential manner, with little direct influence on practice” (Feng Wang & Hannafin, 2005, p. 5). Sandoval and Bell delineate DBR as “theoretically framed, empirical research of learning and teaching based on particular designs for instruction. Design-based research simultaneously pursues the goals of developing effective learning environments and using such environments as natural laboratories to study learning and teaching”(Sandoval & Bell, 2004, pp. 199–200).

A growth in interest in DBR in the CALL field is evidenced by the recent CALICO monograph on the subject (Rodríguez & Pardo Ballester, 2013). In this volume, Reeves and

McKenney posit that “DBR has the potential to yield three important outcomes within the context of second language learning and instruction: effective interventions, theoretical/design principles, and professional development” (T.C. Reeves & McKenney, 2013, p. 12). They also identify significant challenges associated with DBR, which will be discussed below.

4.6.2.4 Rationale for DBR in this study

The study had the dual goal of designing a technological tool for a language learning intervention and using the intervention to explore a range of research questions. The principal alternative methodological options for best achieving the goals of this research would have been to select either action research or a qualitative case study. These will be briefly treated below and the reasons for selecting DBR outlined.

4.6.2.4.1 Action Research

Patton describes action research as follows:

Action research aims at solving specific problems within a program, organisation, or community. Action research explicitly and purposefully becomes part of the change process by engaging the people in the program or organisation in studying their own problems in order to solve these problems.... (Patton, 2002, p. 221).

DBR shares some characteristics with action research, in particular a process-based, iterative approach which incorporates participants’ input. However, there are some key differences between them. Action research typically focuses on solving issues at a local level, and then looks to generalise as a secondary aim. In contrast to this, DBR has the dual focus of solving problems and informing theory through all stages of the process. Wang and Hannafin describe DBR as “more a research paradigm than an evaluation method” (Feng Wang & Hannafin, 2005, p. 9) because of the key role of theory at all stages of the research. DBR is theory led, rather than problem-led, as is the case for Action Research. Furthermore, the goal of the design-based researcher is to test and progress theory as it is applied and empirically evaluated. Barab and Squire sum this up: “our goal, as applied researchers engaged in doing

design work, is to directly impact practice while advancing theory that will be of use to others” (Barab & Squire, 2004, p. 8). Finally, Action Research is often an internal process, whereas DBR usually takes an integrated approach with external researchers engaging with internal stakeholders to engage with the research challenge at hand. Due to the strong emphasis in this study on the interplay between theory and practice, DBR was a more appropriate selection than Action Research.

4.6.2.4.2 Qualitative Case Study

Qualitative case study was another alternative method to DBR. It may be defined as follows:

...qualitative case study is an approach to research that facilitates exploration of a phenomenon within its context using a variety of data sources. This ensures that the issue is not explored through one lens, but rather a variety of lenses which allows for multiple facets of the phenomenon to be revealed and understood.(Baxter & Jack, 2008, p. 544)

A case study can allow for an in-depth exploration of a particular case, examining the case from a variety of data sources and potentially giving insight into the broader application beyond the case under investigation. This aligns with the research goals of this study, however, the goal of this research was not to capture and richly describe a case. It was to create a case for description with the design and implementation of a new tool. Therefore, Design-Based Research was chosen as more suitable, due to its applicability in the context of development of technological tools.

In this research study, the design process was central to the whole project, as Barab and Squire describe: “design-based researchers are not simply observing interactions but are actually “causing” the very same interactions they are making claims about” (Barab & Squire, 2004, p. 9). Given the integration of research and design in this study, where the tool needed to be developed with stakeholder input before using it to address the study’s research questions, DBR was selected as the most suitable framework to encompass both the design and the research elements.

4.6.2.5 Rigour in DBR

DBR “comprises a collection of multiple research frameworks that are internally consistent but assume many forms and reflect varying levels of discipline and rigour” (Wang & Hannafin, 2005, p. 19). DBR differs from experimental research as the complex, interventionist and multivariate nature of DBR makes cause and effect relationships difficult to establish.

One of the most commonly faced methodological issues in design-based research is the tension between making an intervention “work” in a complex setting, which often necessitates changing the intervention as it unfolds...with the researchers’ need for empirical control, which argues against changing the planned “treatment.” (Sandoval & Bell, 2004, p. 200)

However, Shavelson and colleagues recommend applying the principles of scientific rigour to DBR. They set out the following guiding principles of scientific research, reporting that all scientific endeavours should:

- pose significant questions that can be investigated empirically,
- link research to relevant theory,
- use methods that permit direct investigation of the questions,
- provide a coherent and explicit chain of reasoning,
- attempt to yield findings that replicate and generalize across studies, and
- disclose research data and methods to enable and encourage professional scrutiny and critique. (Shavelson, Phillips, Towne, & Feuer, 2003, p. 26)

It was Shavelson’s approach that was adopted in this study to maximise the rigour without compromising on the richness of the qualitative features afforded by DBR research. Dede points out that for those who over-emphasise the scientific rigour, the researchers tend to favour “designs in which all variables lend themselves to easy collection and analysis. In this situation, when an intervention does not fare well in its initial implementation, changes are made more to preserve the analytic framework and methods than to increase effectiveness”(Dede, 2005, p. 6). In this way, the focus is on the data collection rather than the

phenomenon under investigation, which contradicts the purpose of carrying out DBR. Clearly a balance is needed in order to maintain an appropriate tension between rigour and the dynamic nature of DBR, which is one of its main strengths. Hoadley suggests that applying the rules of scientific rigour from experimental research to DBR is inappropriate and suggests that this approach over-emphasises some aspects of rigour over others. He posits that while DBR may not be rigorous when assessed by certain experimental attributes (for example as the treatment protocols are not fixed), it can still be used in a rigorous manner appropriate to its underlying principles, and can provide an effective means of researching the classroom context (Hoadley, 2004).

In this research study, every effort was made to enhance scientific rigour through observation of the general guidelines proposed by Shavelson *et al* (2003), without adopting an experimental paradigm, which would have limited the scope of the ecological nature of the research.

There are further challenges associated with utilising a DBR approach in a rigorous way. The DBR approach to solving educational problems and iteratively designing solutions using feedback from stakeholder and interacting with theory can be an intimidating prospect, leading Dede to refer to it as an “elephant” (Dede, 2005, p. 8). Firstly, the involvement of the stakeholders in the design process requires a high level of collaboration and commitment. This may be difficult to actualise in practice as all stakeholders may not be able to sustain the commitment levels over the time-frame. On a practical note, the iterative nature of DBR means that the time-frame can be longer than other research approaches, and in fact DBR is “rarely fully finished!” (T.C. Reeves & McKenney, 2013, p. 17) According to Reeves and McKenney, this can have an impact on funding application and on publication opportunities, which in turn can impact on employment prospects in some academic institutions, making DBR less attractive to untenured researchers. While they identify a paucity of DBR applications in the CALL literature, and acknowledge the complexity and challenge of DBR

they encourage researchers to engage with it, claiming that “the potential impact makes it all worthwhile” (T.C. Reeves & McKenney, 2013, p. 17).

4.6.3 Student Voice

In the framework of Design-Based Research, user consultation is a central component in the optimisation of CALL designs and interventions (see section 4.6.2). DBR includes user consultation as a key phase in the development process, but does not provide a framework for carrying out this consultation. For this research study, it was necessary to choose a consultation method to address the research need while remaining firmly rooted in the ecological and pragmatic philosophical framework. Student voice (Fielding, 2001; Rudduck & Fielding, 2006) was chosen as the most appropriate methodology.

4.6.3.1 What is a student voice methodology?

The student voice methodology has been developed in the field of education in recent years to offer a richer, more ethical framework that can explore students’ experiences and opinions in a way that respects their rights, values their opinions and clears the way for more effective education through student empowerment. There are two key principles in a Student Voice methodology:

- Authentic consultation
- Participation in the educational process (Rudduck & Fielding, 2006)

Authentic consultation entails authentic listening by acknowledging and where possible acting on what has been said (Flynn, 2014), and feeding back the response to the participants. The students’ opinions are valuable, are taken seriously and appropriate action is taken. When the students’ input is acted upon, this validates their value as stakeholders in education, and positions them as key stakeholders and decision-makers within the educational process. These principles align with the DBR user consultation, as this also emphasises the value of user input and taking action based on user recommendations.

4.6.3.2 Value of Student Voice approach with children

While the student voice approach applies to students of all ages, it is particularly valuable when working with children. The 1989 United Nations Convention of the Rights of the Child recommended in Article 12 that: “State Parties shall assure to the child who is capable of forming his or her own views the right to express those views freely in all matters affecting the child” (United Nations, 1989). Recognition of the child’s rights is important to ensure that research with children is ethical and respects “children’s intrinsic rights as autonomous individuals deserving of equality, choice, respect and consideration, rather than meeting other goals” (Bragg, 2007, p.12). Furthermore, it is a legal imperative in those countries which ratified the convention – for example, the UK (Lundy, 2007) and also Ireland.

A student voice methodology was chosen as the most appropriate way to involve users in the DBR process as it provides an ethical framework for consultation with children which emphasises the potential for empowerment and transformation of participants, and transformation of the educational process. In addition to the recognised value of incorporating user feedback in the design process (see section 4.6.2), using a student voice methodology ensures that the user feedback is obtained in an ethical and transformative way.

4.6.3.3 Benefits of the Student Voice approach

Rudduck et al summarise the value of this process to the researcher as follows:

Hearing students talk about their experiences as learners in schools has challenged assumptions, provoked reflection and has led to changes... These changes are a clear testament to the importance of what pupils have to say as expert witnesses to discussions of teaching, learning and schooling. (Rudduck et al., 2003, pp.275-276)

The student voice consultation process can also be of great benefit to the participants. The advantages to the student can include a stronger sense of membership, stronger sense of respect and self-worth, stronger sense of self-as-learner and a stronger sense of agency (Rudduck et al., 2003). Clearly, all these factors could contribute positively to the students’ engagement with their education. In the context of CALL, these individual benefits, in

particular self-as learner and agency, resonate with the literature on learner autonomy (Dam, 1995; Little et al., 2003). The student voice methodology can foster students' self-awareness as learners and as active agents in their own learning, two key characteristics of autonomous learners. The consultation process becomes an opportunity for learners to assume some control of the learning process, a necessary condition for autonomous learner development according to Scharle and Szabo: "learners can only assume responsibility for their learning if they have some control over the learning process" (Scharle & Szabo, 2000, p.80).

Increased language learner autonomy, agency, engagement and empowerment would be advantageous to the learning of any language. In the specific context of Irish language learning, these components are vital. There are significant challenges to the teaching of Irish as a second language in schools, with the issues of attitude and disengagement to the fore (see Harris, 2008; Harris et al., 2006; Harris & Murtagh, 1999). Given these persistent issues, consulting with children learning Irish in school could yield important results, both for the design of the 3D VE tool at the centre of this research and also in a broader sense through beginning a process of empowerment for children in school in relation to Irish specifically. The integration of a student voice approach to the user consultation of Design-Based Research is an important contribution of this research study.

4.6.4 Summary

This section has presented the methodological approaches adopted in this research. Design-Based Research and Student Voice methodologies were used as the basis for the design process of the 3D VE tool and language learning intervention, which in turn was examined using a combination of qualitative and quantitative methods, in line with the pragmatic philosophy and ecological framework underpinning the project.

4.7 Research Instruments

The primary research instruments selected for this study were focus group interviews, recordings of children's interactions, questionnaires and language assessments. The datasets

used to answer the research questions are shown in Table 4.4. More than one dataset was used for each question, but the primary dataset is the first one listed after each question.

The rationale for the selection of these data collection instruments will be treated below, and the individual application of each data collection type will be discussed in more detail in subsequent chapters dealing with the study procedures.

4.7.1 Focus Group Interviews

Focus group interviews were selected as an appropriate data collection technique throughout this project due to the desired emic focus of the research. According to Dörnyei,

Focus group interviews – as the name suggests – involve a group format whereby an interviewer records the responses of a small group... The focus group format is based on the collective experience of group brainstorming, this is, participants thinking together, inspiring and challenging each other, and reacting to the emerging issues and points. This within-group interaction can yield high quality data as it can create a synergistic environment that results in a deep and insightful discussion (Dörnyei, 2007, p. 144)

There are many potential benefits of using focus groups in qualitative research. The focus group setting can create an informal, relaxed atmosphere where participants can engage in a discussion with each other and the researcher, enabling the participants to play a more active role in leading the direction of the interviews and providing space for the participants to express themselves that may not be possible in a more formal, structured setting (Kamberelis & Dimitriadis, 2005; Liamputtong, 2011). However, it is important to note that “a focus group isn’t just getting a bunch of people together to talk. A focus group is a special type of group in terms of purpose, size, composition and procedures” (Krueger & Casey, 2009, p. 2). There are numerous important considerations when undertaking focus group research. The quality of the questioning is of paramount importance, as Liamputtong points out: “if there are too many

Table 4.4. Mapping the research instruments to the research questions

1. <i>What are the children's attitudes to Irish, and does the intervention have any impact on these attitudes?</i>		
Focus Groups	Questionnaires (AMTB and exit questionnaire)	Recordings/transcriptions of interactions
2. <i>What are the characteristics of children's use of Irish during the intervention?</i>		
Recordings/transcriptions of interactions	Focus Groups	Questionnaires (AMTB and exit questionnaire)
3. <i>Is there evidence of language learning after participation in an intervention using the 3D VE tool? Does an additional element of focus-on-form in the 3D VE contribute to language gains?</i>		
Language Assessments	Recordings/transcriptions of interactions	Focus Groups
4. <i>What impact did the projected affordances have on the learning experience?</i>		
Focus Groups	Recordings/transcriptions of interactions	Questionnaires (AMTB and exit questionnaire)

questions, if they are not asked specifically, and is there is no follow-up for clarification, these factors can affect the quality of information gathered.”(Liamputtong, 2011, p. 47)The role of the moderator is central to the effectiveness of the focus group methodology. Gates and Waight describe the moderator as “not so much the expedition leader; rather a combination of navigator and cartographer, ensuring that the group heads in the right direction but happy to investigate new paths if relevant to the purpose of the expedition”(Gates & Waight, 2007, p.

113). This is a possible challenge to effective use of focus group interviews, as the moderator has to find the correct balance between guiding the conversation according to the research agenda, and being flexible enough to allow participants to express ideas and opinions that may move in a different direction.

There are further considerations when the focus group methodology is used with children. One advantage of this approach with children is that “many children enjoy being with their friends and feel more comfortable when they outnumber the adult researchers”(Tisdall, Davis, & Gallagher, 2009, p. 76). However, there is also a downside when there are children in the same group who are not friends or don’t trust each other, and therefore won’t feel comfortable speaking openly. Another potential difficulty with this methodology is how particular individuals such as “dominant talkers, shy participants and those who proclaim themselves as experts”(Liamputtong, 2011, p. 80) can negatively impact participation and moderation of the interview sessions. Assertive moderation of the focus group is needed to ensure these individuals do not negatively impact the focus groups (Krueger & Casey, 2009). It is very easy for groups to go off-topic and not provide sufficient data to answer the research questions unless the moderator can keep the interviews on track. Another downside is the lack of privacy which means that sensitive topics cannot be readily discussed. Furthermore, there are limitations to the type and quality of data collected using focus groups – usually only a small number of topics can be dealt with, the data is not numerical and the research usually involves small sample sizes (L. Cohen et al., 2007). For the purposes of this research, the advantages of the focus group approach were considered to outweigh the limitations, and every effort was made to fully leverage the potential of this research instrument.

Focus group interviews were used twice in this research. Firstly they were used in the user consultation process in development of the 3D VE where they were used to elicit children’s experience of games and virtual worlds and their recommendations for a 3D VE for

language learning. They were also employed in the second iteration of the research, after the language learning intervention in the 3D VE to hear how children had experienced the intervention and how they responded to the intervention for learning Irish. A Student Voice approach was used in the preparation and actualisation of the focus group interviews (see section 4.6.3). The children's own input on the exit questionnaires was the starting point for preparation of the question guide. Furthermore, the children were made aware that their feedback would be integrated in future iterations of the project, so that they would understand the value of contributing to the research. The interviews were developed using a question guide based on the guidelines provided by Davidson and colleagues (in Liamputtong, 2011, p. 76), which recommends a sequence of introduction, transition, focus, summarising and concluding questions. Moderation was flexible, but remained focused on the question guide throughout in order to ensure sufficient focus on the research questions. Children were randomly assigned to the groups, so there was no accommodation made for varying levels of friendship and trust between participants. Most questions did not deal with sensitive issues, so privacy was not a strong concern. However, talking about perceived competence in Irish was a potentially sensitive topic, which was treated with sensitivity and empathy by the researcher-moderator. The focus group interviews were transcribed, but suffered some ill effects of background noise, as discussed in the next section about the children's interactions. Details of both focus group interviews will be presented in sections 5.7 and 6.8.

4.7.2 Recordings of children's interactions

The recording of learner interactions while engaged in language learning tasks is a well-established data collection technique in SLA (Dörnyei, 2007). These recordings can yield rich data about authentic learner language use (Bachman & Cohen, 1998). In this study, recording of the children's interactions took place in the classroom context. Classroom-based research has the advantage of situating research in an authentic context which allows the researcher to encompass a broad range of interactions and factors that are in the everyday

experience of the child. The classroom as the research environment was an integral part of this project, due to the ecological goals set out in Chapter 2. However, undertaking this type of research can lead to substantial challenges to the researcher. These include the unforeseen interruptions that take place in the school calendar, which can be very disruptive to the research (in this current context these included a cake sale, where half the students were volunteering, school tour, sports day, extra-curricular activities, etc). Another problem can be the fluid nature of the student body, with children being absent on certain days due to illness, holidays, other commitments. This makes it difficult to have a well-defined sample (Dörnyei, 2007). The necessity of communicating with a whole range of stakeholders – principal, teachers, parents, students and encouraging them to value the research can also prove challenging. Technical issues with computers in schools can also arise, such as faulty equipment or interference from background noise (Dörnyei, 2007). This was a serious problem in the current research study, with the background noise making some recordings incomprehensible, and preventing others from distinguishing between speakers.

4.7.3 Questionnaires

Questionnaires are a very popular data collection tool in SLA research. Brown defines questionnaires as: “any written instruments that present respondents with a series of questions or statements to which they are to react with by writing out their answers or selecting from among existing answers” (Brown, 2001, p. 6). Dörnyei and Taguchi point out that questionnaires can provide factual, behavioural and attitudinal data (Dörnyei & Taguchi, 2010). This is one of the reasons for their popularity, but their extreme efficiency and cost-effectiveness are also very attractive features of questionnaires.

One of the challenges of using questionnaires is the need for rigour in creating the questionnaires so that they do not provide invalid or unreliable data. Brown states that in creating the questionnaire the researcher must consider “the form of the questions, the meaning of the questions and the reactions of the respondents” (Brown, 2001, p. 9). He goes

on to stress the importance of validity and reliability in questionnaire research – that the questionnaires must measure what they are supposed to measure, and be consistent in its measurement. One way to safeguard the validity and reliability of data gathered using questionnaires is to employ instruments previously validated by other researchers (see section 4.7.3).

One disadvantage of using questionnaires is that they can provide insufficient depth to explore issues in great detail and the data provided by questionnaires may be quite superficial (Dörnyei & Taguchi, 2010). Gillham points out the danger of relying solely on questionnaires, indicating that triangulation is important to support any claims made on the basis of questionnaire research (Gillham, 2008). In order to address this potential limitation, in this study a variety of instruments were selected for each research question in order to contribute to a more complete and reliable overall picture. Another limitation of questionnaire research is that it is impossible to know if the respondents are answering truthfully – their answers may not reflect their true feelings for reasons of social desirability or self-deception (Dörnyei & Taguchi, 2010). In this study an attempt was made to overcome this issue through reassuring the children that there were no wrong answers, that their honest feelings were required to best contribute to the research, and that their answers were confidential and wouldn't be seen by the class teacher, principal, parents etc.

There were two types of questionnaires used in this research. The first was to explore children's attitudes and motivation with regard to Irish, and the second was an exit questionnaire after the intervention to elicit their experiences and feedback. This study did not adopt a basic pre and post intervention motivation test as it did not aim to carry out experimental research on the cause-effect relationship between the intervention and attitudinal change (there is a quasi-experimental element to this study, however it is strictly limited to investigating language gains, not affective response, see section 6.7). Instead, the AMTB was used to provide an overview of the children's attitudes with regard to Irish, in order to situate

the participants in this study in relation to previous nationally representative research by Harris and Murtagh (1999). The exit questionnaire was then developed to explore any attitudinal effects of the intervention itself. The Attitude/Motivation Test Battery was first developed by Gardner (Gardner, 1985), and subsequently adapted for use in the Irish context by Harris and Murtagh, who used it in the 1980s in the nationally representative *Twenty-Classes Study* (Harris & Murtagh, 1999). In more recent years, it was further adapted for use in a Gaelscoil context by Ó Duibhir (Ó Duibhir, 2009). In this research study, the original AMTB was used in the piloting phase, but subsequently a 44-item AMTB was developed based on Harris and Murtagh's original Irish AMTB and incorporating some of Ó Duibhir's amendments (see Appendix C). The AMTB was chosen for this research study in order to maintain continuity with previous work in the area, but it was shortened after the piloting phase in an attempt to address any problem with questionnaire fatigue (Dörnyei & Taguchi, 2010) as the children in this study were two years younger than those in previous studies and in the piloting process the 80-item original questionnaire was found to be too long for the younger age group. The majority of attitude/motivation scales assessed in the AMTB were preserved, but the number of items to assess each scale was reduced. Two scales were omitted for practical reasons – the interest in learning second/foreign languages and the use of Irish at home. The scales are presented in Table 4.5, showing the number of items per scale in the adapted AMTB.

Table 4.5 Comparison of original AMTB for Irish (Harris and Murtagh, 1999) and the adapted version in this study

Scale	Number of items in Harris and Murtagh AMTB	Number of items in adapted AMTB
Attitude to Irish speakers	10	4
Integrative orientation to Irish	4	3
Interest in second/foreign languages	10	0
Desire to learn Irish	7	5
Motivational intensity to learn Irish	5	5
Attitude to learning Irish	10	8
Instrumental orientation to Irish	4	1
Irish lesson anxiety	5	5
Parental encouragement	10	5
Irish ability self-concept	6	4
Use of Irish at home	3	0
Open ended questions about Irish	3	4

Apart from being shorter, another difference between the AMTB used in this study and Harris and Murtagh's AMTB was that instrumental orientation (for example motivation to learn the language based on getting a job) was not a main focus of this study, particularly as

the children involved were younger than those in Harris' study. Harris and Murtagh point out "the pragmatic rewards of learning a second language may appear quite remote to young learners" (Harris & Murtagh, 1999, p. 79), so this part of the AMTB was deemed not as relevant for young children and was limited to one question item: "I think it's important for me to learn Irish because it may be useful to me someday in getting a good job."

As previously mentioned, the exploration of children's attitudes and motivation for Irish was not set up as a quasi-experimental study. The AMTB was chosen to investigate the children's overall motivation in relation to Irish, but not specifically related to this intervention. The exit questionnaires on the other hand, directly targeted how the intervention influenced attitudes and motivation. The exit questionnaires for both the pilot and the main study were developed using examples in the literature, and incorporating more specific detail relevant to the individual context (see Appendix C). The IRIS digital repository (<http://www.iris-database.org/>) was used to source examples of exit questionnaires in L2 research, and two different questionnaires from this repository were adapted for use in this research study (Marsden & Chen, 2011; Ziegler, et al., 2012). The questionnaire items referred to the experience of the intervention, levels of enjoyment, responses to different game elements, self-reported impact, desire to participate in future, etc. The additional questions were formulated in accordance with guidelines set out by Cohen *et al* (L. Cohen et al., 2007) and included closed, open and scaled questions. The questionnaires were piloted before use.

4.7.4 Language Assessments

Language testing is an important part of any research study which aims to investigate language gains. Larsen-Freeman and Long describe a test as follows: "Tests are devised to measure what the learner knows and does not know of the target language. A subject's performance is measured against that of target-language speakers. In this sense, a test is normative" (Larsen-Freeman & Long, 2014, p. 41). Language testing can play an important role in gathering information about an individual's language performance, but also about the

effectiveness of a teaching intervention. Bachman and Palmer present a philosophy of language testing, with the goal of helping researchers to develop and administer tests more effectively, and avoid common pitfalls. Their philosophy is shown in Table 4.6, and was a source of guidance for test development in this study.

Table 4.6. Bachman and Palmer’s philosophy of language testing

1. Relate language testing to language teaching and language use.
2. Design your tests so as to encourage and enable test takers to perform at their highest level of ability.
3. Build considerations of fairness into test design.
4. Demand accountability for test use; hold yourself, as well as any others who use your test, accountable for the way your test is used.
5. Recognise that decisions based on test scores are fraught with dilemmas, and that there are no universal answers to these. (Bachman & Palmer, 1996, p. 13)

The success of language testing will depend on whether or not the tests are valid, as “if a test is not valid for the purpose for which it was designed, then the scores do not mean what they are believed to mean”(Alderson, Clapham, & Wall, 1995, p. 170). Validated tests are necessary to ensure that test results can be interpreted accurately and reliably. This is a difficulty in the minority language context, especially with children, as validated tests are not always available.

Another issue with language testing is that it can give a limited perspective on what the respondent actually knows in the language, as their responses are constrained to normative answers. This relates to the debate on implicit versus explicit knowledge, with Doughty arguing that implicit assessments are necessary to assess implicit knowledge and decontextualized assessment of focus on form does not actually test language performance (C. Doughty, 2003). One way to address this difficulty is to include free language production tasks in language assessments, rather than limit the assessment to constrained, closed responses, thus giving indication of emergence of the form rather than mastery:

it is often desirable to know how learners are using a particular structure long before the learners have ‘acquired’ it, in the sense of attained native-like control... One solution researchers have found is to focus on the emergence of structures, rather than on their mastery (Larsen-Freeman & Long, 2014, p. 41)

Another way to redress the balance is through triangulation of language test data with the interactional data of learners participating in either task-based or social language interaction, which gives a more complete view of how they use the language in context and also ties in to the language acquisition vs use debate highlighted in Chapter 2. This triangulation was an important approach in this research in order to gain deeper understandings of language use and acquisition by the children who participated (see section 4.5).

For the purposes of this research, the language assessments took the form of pre, post and delayed post-tests with both a question and answer section and a free production task. Samples of age-appropriate Irish language tests were difficult to find in the literature, and there were no validated tests for the language form of interest in this study, the copula. There are standardised tests for Irish for children in Irish immersion schools, but not English-medium schools. As that target grammatical feature to be tested was the copula, the Teastas Eorpach na Gaeilge (www.teg.ie - based on the Common European Framework of Reference for languages) syllabus and tests were consulted. The copula forms on the A1 and A2 syllabus were selected for inclusion in the language tests. The tests were developed with both a closed question and answer section, and a free production task. This free production task provided rich data, however a full analysis of the data is beyond the scope of the thesis, which focused on copula usage in the assessments and the children’s interactions through Irish. In the development of the language tests, Mackey and Gass’ guidelines to ensure internal validity of tests (Mackey & Gass, 2015, p. 171) were followed, including using a control group external to the experiment to balance maturational effects against the effects of the intervention. The tests were piloted and any necessary changes made before administering in the main study context. As these tests are not currently validated, they cannot be viewed as definitive measures of

copula acquisition. In this study the language tests may give indications of presence or absence of copula in the children's language, but substantial claims cannot be made unless these tests undergo validation for this purpose. This undertaking was beyond the scope of this research, but is a valuable area of further work.

4.7.5 Summary

This section described the principal research instruments selected for use for data collection in this study. They comprised focus group interviews, recordings of children's interactions, questionnaires and language assessments. The advantages and disadvantages of each were treated, and the choices made relative to each instrument were outlined.

4.8 Data Analysis

The data analysis in this research study involved application of both quantitative and qualitative methods to different parts of the data, with some overlap of methods on some of the data. Quantitative data analysis involves using statistical methods to make sense of numerical data. In this research project the quantitative data analysis involved descriptive statistics of the questionnaire data, the language assessments and quantitative counting of the codes in the focus group and interactional data. Qualitative data analysis on the other hand "works up from the data" and the goal of this analysis is "to have ideas emerge from... data"(Richards, 2014, p. 85). The qualitative analysis focused on coding the focus group interviews, an exploration of how Irish was used by the children in the interactional data, exploring children's responses to open-ended questions on the questionnaires, and a qualitative perspective on individual patterns of response on the language assessments. How each of the different data sets were analysed will be presented below.

4.8.1 Thematic analysis

4.8.1.1 User Consultation study

In the user consultation study the focus group interviews were analysed as follows. A thematic analysis was undertaken of the transcriptions using a combination of qualitative and

quantitative methods (Braun & Clarke, 2006; Ryan & Bernard, 2003). This was a somewhat novel approach where quantitative corpus analysis methods were applied to the qualitative data in order to support and enhance the qualitative data analysis process. Two a priori themes, goal orientation and social interaction, were derived from the 3D VE literature and the pilot intervention (Dalton & Devitt, 2013), while other themes were identified through careful reading and re-reading of the transcriptions. This phase of analysis focused on identifying and categorisation of keywords and short phrases according to individual themes. The transcriptions were then re-read and checked for any further keywords relating to each theme. The initial coding was carried out by the first author and validated by the second author, who suggested further keywords and themes. These are listed in Appendix 1.

The free coding software KHCoder was then used to calculate keyword frequencies within themes in the transcriptions of the children's conversations across the three focus group interviews. The software also did some initial linguistic pre-processing to facilitate analysis. The data was tagged for part of speech, which was useful for checking the occurrence of polysemous keywords, for example the word "mean". It was also lemmatised to ensure that all forms of keywords were grouped together, for example buy, buys and buying were all identified as deriving from the lemma "buy". A standard stop word list was used with several modifications, for example, keywords such as find and give were removed from the stop word list as these were relevant to particular themes under analysis. Multi-word phrases were added to the word frequency lists as strings in a forced pick up functionality, for example the phrase 'have to'.

The KH Coder thematic analysis provides a count of how many sentences contained key words for each theme. If a sentence contained a keyword or multiple keywords from a theme it was called a 'coded sentence'. The relative frequencies of themes were calculated by counting the total number of coded sentences and calculating the percentage of those sentences coded according to a particular theme. It was possible for a sentence to have more

than one coded theme. Sentences without coding were mainly one word sentences such as 'Yeah'. Each coded segment was reviewed manually through searching for individual words and looking at them in context. Some keywords had to be removed as they were present in other contexts and these incidences were inflating the results. These words included 'get', 'go', 'mean' and are marked with an asterisk in the appendix. The computational output was validated pre and post coding through reading the coded sentences for each theme.

4.8.1.2 Second Iteration

Braun and Clarke's framework for thematic analysis (Braun & Clarke, 2006). was also used in the thematic analysis of the focus group interviews and the interactional data in the main study, and a combination of qualitative and quantitative methods were used as above, however different software was used and a different theoretical approach was employed. In the user consultation analysis, a priori themes were identified before analysis. This was not the case in the second iteration, where a constant comparison model of thematic analysis was used (Glaser, 1965). This approach originated in grounded theory, but has become more widely used as an approach to qualitative analysis outside of this theoretical approach (Boeije, 2002). Fram maintains that using constant comparison outside of grounded theory combines the insights of an emic approach with the theoretical rigour of etic, theory led research (Fram, 2013). This was the approach adopted in this current study. The first phase of coding involved reading the interview and interactional data, identifying the codes in each one and comparing and adapting codes based on each additional data source. After all the data had been read and a list of codes compiled, a sample of the data was given to a second researcher to read and code in order to check for inter-coder reliability. The codes of the second researcher were compared to those of the first, and found to be within the acceptable range of agreement. There were some additional codes identified by the second coder, and these were added to the list. The entire data set was then coded using NVivo according to the list of codes.

The second phase of coding involved reviewing the list of codes and consolidating them into themes. Once potential themes had been identified, the codes were grouped according to these themes in NVivo. Then all the coded segments for each theme were collected and re-read in light of that theme. Discrepancies were highlighted at this stage, which led to reworking of the themes. Subsequently, the entire data set was reread in order to confirm that the themes identified accurately represented the data. Some further refining of themes was required at this stage. Finally, a detailed definition for each theme was developed.

Having refined the list of themes to give a complete and accurate representation of the data, and defined the scope and content of each individual theme, the themes were then compared to pertinent themes in the literature. A thematic map was designed according to the literature, and the themes from the data were organised according to this thematic map. Then a quantitative approach was used to count the relative frequencies of the codes. This was carried out to provide a broad picture of the general trends, in addition to qualitatively presenting the richness and depth of the data in each code. In addition to this, the interactional data was also coded for Irish usage, and the Irish utterances were analysed to explore how and why the children were using Irish.

4.8.2 Questionnaires and language assessments

The sample size for the study was too small to carry out meaningful inferential or multivariate statistical analysis, but an overview of the children's responses and experiences as represented in the questionnaire data was analysed using descriptive statistics. "Descriptive statistics are concerned with the interpretation and summarisation of frequency distributions (the number of cases in the categories of a variable) and percentage distributions (the percentage of cases in the categories of a variable)" (Rose & Sullivan, 1996, p. 84). They are useful as they provide a means of summarising and presenting the numerical data coming from questionnaires in a clear way. Descriptive statistics can only be used to report results, they cannot be used to draw inferences or make generalisations (Dörnyei, 2007).

The language assessments required correction according to normative standards, however, patterns in children's responses were also explored in a more qualitative manner. As previously mentioned, only the closed question/answer section of the language assessments will be reported in this thesis, the analysis of the children's free writing was beyond the scope of this project.

4.8.3 Triangulation

The variety of perspectives required by an ecological approach to this study was delivered through triangulation of data sources. Table 4.4 in section 4.7 showed the data sources for the four research questions. Each research question was addressed using three different data sources in order to gain different perspectives. This approach delivered a rich and detailed treatment of each question, as set out below:

1. What are the children's attitudes to Irish, and does the intervention have any impact on these attitudes?
 - Questionnaires provided quantitative counts of attitudes
 - Focus groups allowed children to describe their attitudes in more detail
 - Interactional data from the recordings allowed researcher to observe how attitudes were expressed during the activities
2. What were the characteristics of children's use of Irish during the intervention?
 - Interactional data allowed for qualitative and quantitative analysis of various usage characteristics
 - Focus groups yielded children's perspectives on how they used the language
 - Questionnaires provided further input on usage characteristics
3. Is there evidence of language learning after participation in an intervention using the 3D VE tool? Does an additional element of focus-on-form in the 3D VE contribute to language gains?

- Language assessments directly measure production of target grammatical feature
 - Interactional data shows children using language in context and demonstrating language gains
 - Focus groups allowed for children self-report language gains after intervention
4. What impact did the projected affordances have on the learning experience?
- Focus group interviews gave children opportunity to describe game experience
 - Interactional data demonstrates how different game affordances were experienced by children in game activities
 - Questionnaires allow for quantitative counting of different reported game experiences.

In this way, a rich tapestry was constructed around the children's experiences, both through self-report and through recorded groupwork, and a range of data could be accessed to answer each research question.

4.9 Ethics

As this project involved research with children under the age of 16, ethical considerations were a priority. The specific areas of concern were safety and security of all children participating in the project, particularly as it involved an online game. Informed child and parental consent needed to be obtained before taking part in the research. Protection of participants' privacy was also vital, as individual children's responses would be reported in this study. Consultation took place with all primary schools taking part in the research, along with the School of Education Ethics committee to ensure that the highest ethical standards were met throughout this project. Research was carried out in compliance with the standards set by the School of Education Ethics Committee and in line with individual primary school guidelines. The steps taken to maintain high ethical standard were at all times be open to review by the research supervisor and the School of Education Ethics Committee. A student

voice approach to the user consultation was adopted as an ethical way of involving children in research (see section 4.6.3). The ethical considerations of working with children were also to the fore in selecting the technology for the intervention, as it needed to be secure and age-appropriate (see section 3.4.4.2). A number of further steps were taken in order to ensure best practice when working with children. Permission was sought from the Board of Management of the schools involved, parents and the children themselves before the project started.

Consent forms were adapted for children's use with age-appropriate language and layout. The children were free to withdraw at any time if they or their parents so wished. As audio and video data was to be collected, permission was requested for this. The data collected was anonymised, and every effort taken to prevent tracing individual responses back to individual children. The data was stored in a secure place, and only the principal researcher had access to the data. More details of the steps taken to ensure ethical best practice for this study can be seen in Appendix A, along with copies of the consent forms used.

4.10 Limitations

This chapter has presented the conceptual and methodological approaches adopted in this research. These were selected in order to yield the richest data to address the research questions listed in section 4.2 and to facilitate the iterative design process of the project. However, the approach taken does result in a number of limitations of the study.

Firstly the small sample size excluded the possibility of carrying out meaningful statistical analysis on the language assessments to calculate effect sizes of language gains. This means that the results of this study do not give conclusive cause and effect evidence of the intervention resulting in language learning. However, given the primary goal to explore the children's language use and experience of the 3D VE, it was beyond the scope of the study to achieve both this through fine-grained qualitative analysis and the statistical evidence of effect that a larger scale study could have provided.

The ‘black box’ nature of the research meant that the different technical and pedagogical variables could not be controlled or tested separately from each other and this is a limitation of this study. However, this is a very common feature of classroom-based research (Burston, 2001, p. 513) and in recent years Chapelle has advocated moving away from trying to evaluate the effectiveness of CALL tools in isolation, and rather advocates the evaluation of specific elements of within-CALL intervention design (Chapelle, 2007). The quasi-experimental sub element of the study was based on Chapelle’s recommendations and aimed to evaluate one particular teaching approach within the 3D VE based intervention. This was an attempt to redress the balance between the ‘black box’ type research and a cause-effect evaluation.

In line with an ecological approach, the main intervention was carried out in the classroom to represent accurately the context of learning for the participant children. However, this had implications for the study as a whole. The school and classroom constraints limited the duration of the study as the intervention had to fit within the school timetable and curricular plans. In addition to this, the noisy classroom environment interfered with audio recording, meaning that not all children’s interactions could be captured by the audio recording devices, and some data was irretrievably lost. The ecological approach to studying language learning in context was the basis of the decision to carry out the intervention in the normal school classroom, and the data that was gathered validates this choice. These limitations of the classroom environment are accurate representations of the classroom ecology of language learners – it is a variable, noisy place where there are a range of different demands on student time and attention.

The presence of the researcher in the room during the intervention is another potential limitation of the study, and as the children knew they were being observed and recorded. However, the involvement of the researcher is an integral part of both the ecological paradigm and the DBR approach (see sections X and X). Furthermore, in the specific context of this

project the researcher involvement was central in order to adapt the challenge level and the rewards system in real time in the classroom in order to maximise participation.

In addition to this, the ‘Hawthorne effect’ may have been an issue (Roethlisberger & Dickson, 2003). The novelty factor of the computer technology could also have impacted children’s participation, and the enthusiasm they demonstrated may not have been maintained. Novelty effect is defined by Gravetter and Forzano as “a threat to external validity that occurs when individuals participating in a research study (a novel situation) perceive and respond differently than they would in the normal, real world” (Gravetter & Forzano, 2012, p. 595). The research study reported here was carried out over a longer time period than many others in the literature, so this may address the potential impact of novelty effect. Further progress could be made in this direction through lengthening the research intervention still further. It would have been desirable to carry out the research over a longer time period in order to definitively account for any novelty effect, but this was unfortunately beyond the scope of the study and remains an area for future work.

4.11 Conclusion

This chapter began by presenting the research questions addressed by this thesis and giving an overview of the structure of the study. The study design was seen to be quite complex, given that it involved a number of iterations and incorporates a variety of methods and approaches. This chapter then set out the conceptual basis for the research, describing the pragmatic philosophy that underpin the work. The Design-based research, Student Voice and Mixed Methods approaches to research methodology were then presented. An outline of the research instruments and data collection techniques followed, along with an initial overview of how the data was analysed. Finally, ethical considerations and the limitations of the study were discussed. Chapter 5 will describe the design process which comprised the first iteration and user consultation study, and then Chapter 6 will present the second iteration, which is the main focal point of this thesis.

5 The Design Process

5.1 Introduction

This section presents the iterative design cycle of the project, followed by the design objectives of the project and the pedagogical and technological considerations in the development of the 3D VE and intervention. The first section presents the design objectives, and section 5.2 provides an overview of the iterative design cycle. Then section 5.3 looks at the pedagogical considerations of the intervention, with CALL shown to be situated within the broader framework of SLA research, such that the selection of language teaching approaches is crucial for any planned intervention using technology. Section 5.5 sets forth the main technological issues which were taken into account for this study, and how they impacted on the tool selection for the pilot stage of the DBR cycle. The procedures and findings from the pilot stage are then presented, along with how feedback from this cycle influenced subsequent iterations. Finally, the second iteration of the DBR cycle, a user consultation process is detailed in section 5.7. It is important to note at this stage that the first iteration and the user consultation process had the aims of optimising the 3D VE and intervention for the second iteration, which aimed to address the research questions presented in section 4.2.

5.2 Iterative Design Cycle

The development process of the language learning tool for this research can be seen in Figure 5.1. In line with DBR principles, it took the form of an iterative design process, the first iteration comprising a pilot study which aimed to explore the issues and practicalities of developing and using a 3D VE tool for language learning. This culminated in a user consultation process, where the pilot study participants were invited to share their experiences, thoughts and opinions about games and virtual worlds for language learning. The pilot study and the user consultation shaped and informed the development of the 3D VE tool for the second iteration. This tool was used in a language learning intervention, and data

collected during this intervention was used to address the research questions set out in section 4.2. This current chapter sets out the procedures of the first iteration and the user consultation and the outcomes which informed the second iteration. Chapter 6 describes the second iteration in detail. Chapters 7 and 8 present and discuss the findings from the second iteration.

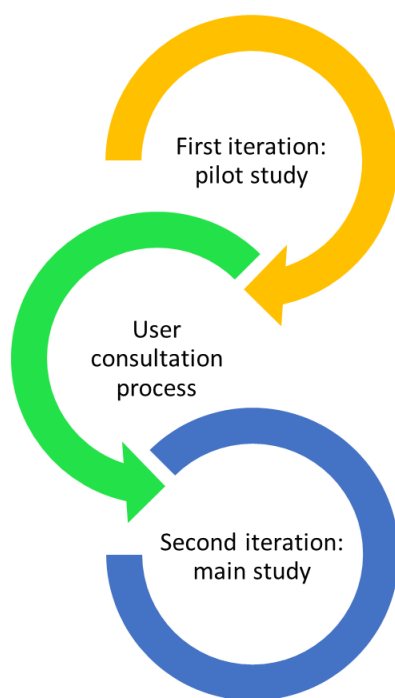


Figure 5.1 The design cycle of this research project

5.3 Design Objectives

The research questions for this project were outlined in section 4.2. As previously mentioned in section 4.6.2, DBR is unique in that it “simultaneously pursues the goals of developing effective learning environments and using such environments as natural laboratories to study learning and teaching” (Sandoval & Bell, 2004, pp. 199–200). In order to effectively use the 3D VE as a “laboratory” to address the research questions of the study, there were a number of broad objectives to the design process:

- To develop a 3D VE for learning Irish in primary school children.
- In the 3D VE to direct learning tasks towards the goal of narrative or storytelling while including a metalinguistic element of focus-on-form in the task design.

- To use a task based language teaching approach with children completing tasks in teams

These aims were realised through an iterative design process as described above, and through the selection of the most appropriate pedagogical and technological approaches for the 3D VE and intervention design as discussed in sections 5.3 and 5.5.

5.4 Pedagogical Approach

Chun believes that research in CALL should be seen as a subdiscipline of SLA, and should reflect the theory and practice of the general SLA discipline while viewing technology as the teaching/learning tool (Chun, 2011). It is this viewpoint that was adopted in this study. There were several goals that informed the choice of pedagogical approach to the intervention. They were of paramount importance to achieve the design process aims listed in section 5.3, and thereby create a suitable environment for exploring the research questions in section 4.2. The principal goals were:

1. to use the most effective tools available to promote language gains;
2. to encourage language production through pushed output;
3. to create an environment for meaningful language use;
4. to foster an authentic language community.

In order to achieve these aims, this study adopts some of the leading contemporary L2 instruction methodologies and integrates them with technology, namely; TBLT and focus on form. These teaching methodologies will be described in turn below, and a rationale given for their choice.

5.4.1 Task-based language teaching

TBLT is firmly rooted in the communicative approach to language teaching, whereby the student acquires the language through communication (R. Ellis, 2003), and it uses tasks as the focal point of teaching and learning. TBLT involves the use of authentic language to carry

out meaningful tasks using the target language. The goal of the tasks is to “concentrate on involving pupils to the point where they forget they are learning and are intent only on using [target language] to achieve the goal in question” (Little et al., 1985, p.x). Learners are given tasks to complete which require use of the target language, with an emphasis on meaning and on the process rather than the product. TBLT has enjoyed a growth in popularity in recent years, and has become a prominent area of language learning research, its increasing popularity evident from the surge in books and publications on the topic. There are several definitions of the term “task” in TBLT; here is a prominent one:

A task is an activity which requires learners to use language, with the emphasis on meaning, to attain an objective, and which is chosen so that it is most likely to provide information for learners and teachers which will help them evaluate their own learning. (Bygate, Skehan, & Swain, 2001, p.11)

Nunan is more explicit about the ways in which language can be used in a communicative task:

...a pedagogical task is a piece of classroom work that involves learners in comprehending, manipulating, producing or interacting in the target language while their attention is focused on mobilising their grammatical knowledge in order to express meaning, and in which the intention is to convey meaning rather than to manipulate form. The task should also have a sense of completeness, being able to stand alone as a communicative act in its own right with a beginning, a middle and an end. (p.4, Nunan, 2004)

Nunan’s inclusion of “mobilising grammatical knowledge” in his definition raises the point that while TBLT is predominantly a meaning-oriented methodology, it does not preclude elements of form focus, as outlined by Ellis : “Task-based teaching need not be seen as an alternative to more traditional, form-focused approaches but can be used alongside them” (R. Ellis, 2009). In fact Long recommends employing a Task-Based Language Teaching approach to address the challenge of teaching language form and structure within a communicative curriculum. (Long, 2000)

As well as being one of the most popular and widely studied approaches of communicative language teaching, TBLT aligns very easily with goal oriented virtual worlds.

This is the central pedagogical approach used for this research study, as it gives the children authentic reasons to communicate in the language and interact with the 3D VE and with each other.

5.4.2 Focus on form

As previously discussed in section 3.4.2.1 focus-on-form is considered an effective way to draw learners' attention to particular forms and thereby enhance acquisition. According to Long, Focus on form (FonF) refers to when learners' attention is drawn to language form in the context of meaning-focused language use (Long, 1983). Doughty and Williams (1998) propose a set of criteria for FonF instruction:

1. Engagement with meaning occurs before attention drawn to specific forms
2. Choice of forms is in response to learner needs, whether reactively or proactively
3. Learner's attention is drawn to form briefly and explicitly

Giving attention to linguistic form while engaged in communicative language learning has been identified as among the most effective approach to language teaching among those studies reporting effect size statistics (Norris & Ortega, 2000). Therefore, while the task-based and co-operative teaching models can create meaningful and authentic contexts for communication, it was also important to incorporate elements of explicit focus on specific linguistic features in order to maximise the language gains through the intervention. In this study this was the experimental condition for one group in a quasi-experimental design to evaluate language gains. This will be discussed in more detail in section 6.7.

5.5 Technological Approach

In order to leverage the potential affordances of 3D VEs for language learning highlighted in section 3.4.3, careful consideration was needed in selecting the most appropriate 3D VE for this study. The most important design constraints are as follows.

- Multi-user functionality and communication: Task design for this study is based on maximising opportunities for student interaction through team work and task-based language teaching. It was imperative therefore, that the 3D VE selected had the capability for multi-user functionality. The central role of interaction and communication in language learning was highlighted in Chapter 3. Therefore, any 3D VE tool for this research would need to provide facility for users to interact and communicate in world, preferably in real time and through multiple modes. Many 3D VEs allow communication through real time chat function both to individuals and groups, email functionality and voice chat through real time audio. These functions are vital to place communication through the target language at the core of the task design for the study.
- Security: As this research was directed towards primary school children, the security of the technology used was of huge importance. It was necessary to ensure that a safe and secure environment for children could be ensured in order to comply with ethical guidelines and to protect the children involved from any exposure to inappropriate online activity. Many of the 3D VES available have been designed for adult users, and therefore contain adult content or a level of open access that is not suitable for children. This was a vitally important phase of the selection process as the research could not continue unless safeguards were in place to protect the children involved. Another consideration in the area of security is the issue of access from behind a school firewall. The 3D VE selected for use would be employed over the internet so that schools could log in remotely. Firewall issues could create difficulty in many schools.
- Ease of design, ease of use: The technology to be selected needed to be user friendly and easy to learn how to navigate and complete the tasks in the 3D VE. Ease of

control was of paramount importance so that the technology would not prove a barrier to potential language learning. As the eventual prototype arising from this project was intended for simultaneous use in multiple schools that would access the technology remotely, it was not possible to provide comprehensive, on-site technical support for each school. The technology selected would have to be low-floor in terms of a minimal level of training needed, and high ceiling in terms of potential for development and functionality. Reliability was also a key concern so that technical issues could be kept to a minimum.

- **Budget Constraints:** This project was subject to major budget constraints and therefore it was not feasible to build or commission a standalone VE. In so far as possible, the aim of this study was to use free, open-source technology to develop an appropriate 3D VE for use in schools. This would make any potential solutions found more accessible to schools, however it did have the side effect of limiting choice of 3D VE. In order to design the intervention and activities in-world for the children, the availability of a wide range of free resources for use in the 3D VE was very desirable. Resources tend to be available more widely in the better established 3D VEs; however these can prove to be unsuitable for other reasons.

Four 3D VEs were selected for initial consideration and evaluation according to the project constraints as described above. A summary of how each 3D VE matched the requirements can be seen in Table 5.1. The selection of the most appropriate 3D VE to proceed to piloting will be discussed in the next section.

Table 5.1 Comparison and evaluation of 3D VE platforms according to project constraints

First Iteration: Pilot					
Platform	Multi-user functionality	Secure for children	Easy to design/ use	Free	Resources available
Second Life	✓	✗	✓	✗	✓
Active Worlds	✓	✗	✓	✗	✓
Sim on a Stick	✓	✓	✗	✓	Limited
Kitely	✓	✓/✗	✓	✗	✓

5.5.1 3D VE selection for Pilot Study

After the technological constraints were compared to the four 3D VEs listed in Table 5.1, no 3D VE fulfilled all the criteria. Sim-on-a-stick was selected as the best option among all four, primarily for its security (the issue of security was to the fore because of ethical considerations, given the age of the participants, see section 3.4.4.2), and also because it was available at no charge. There were some limitations with this 3D VE however – the design interface required a steep learning curve, and there were limited resources available. Nevertheless, the pilot stage of the DBR cycle was developed using a Sim-on-a-stick platform. The next section will give a brief overview of the pilot stage and how it impacted the subsequent cycles of the DBR project.

5.6 First Iteration: Pilot Study

The first iteration of the DBR process involved a pilot study, which was developed according to initial needs analysis and consultation with the literature. The pilot study aimed to explore some of the initial considerations for using a 3D VE tool for language learning with primary school children. It aimed to trial and to fine-tune the pedagogical and technological approach before carrying out a larger scale DBR iteration. In addition to this, it aimed to pilot

the research instruments to test for suitability for use in subsequent iterations. This section will present the procedures for the pilot, will give a brief summary of how the participants responded to it, before presenting an evaluation of the technology, the intervention and the research instruments, and any changes needed to improve implementation for the next iteration.

5.6.1 Pilot study procedures

The pilot study procedures are summarised in Table 5.2.

Table 5.2. The pilot study procedures

Pilot study procedures	
Participants	25 children in 4 th class, aged 9-10 years in mixed ability groups of 4-5 children
Venue	Bridge 21 collaborative learning space, TCD
Duration	150 minutes
Pedagogical approach	• TBLT approach • Storytelling tasks • Elements of Focus on form looking at parts of speech in Irish (verb/noun/adjective)
Technological approach	• Multi-user Sim-on-a-stick • Giant treehouse environment with multiple spaces, clues hidden around the tree (see Figure 5.2, Figure 5.3Figure 5.4)
Research Instruments (for piloting and data)	• The original 80-item AMTB – Attitude/Motivation Test Battery • Exit questionnaire (see section 4.7.3) • Language tests

It is important to note that the purpose of the research instruments mentioned was to pilot them for their use in the second iteration, in addition to using them to glean data about the pilot intervention. Some photographs of the SOAS environment can be seen in Figure 5.2, Figure 5.3 and Figure 5.4.



Figure 5.2. The 3D VE used in the pilot study



Figure 5.3. A subsection of the 3D VE where the children searched for clues



Figure 5.4. Another subsection of the environment where children searched for clues.

5.6.2 Response to the Pilot

All 25 children reported that they found the experience fun and interesting. All but one child said they would like to learn Irish this way more often. The AMTB yielded some interesting results. The majority of children (18/25) agreed with the statement “My parents feel that it is important that I work hard at Irish until I finish school”. However, only 14/25 children said that their parents were not usually very interested in their Irish schoolwork. These results are similar to Harris and Murtagh’s (1999). In this AMTB study, results showed that the children value the Irish language and see it as a significant part of Irish culture and identity. 18/25 children agreed with the statement “People who speak Irish help to make the Irish way of life special and different from other countries”, with no children disagreeing. 15 children thought that if Ireland lost the Irish language it would be a great loss, with only 2 children disagreeing. 13 children thought that people in Ireland should make more of an effort to learn the Irish language. When it came to the children’s motivation to learn Irish, 19 children said it was important because it would allow them to meet and talk with different kinds of people. 18 children agreed with the statement “It is important for me to improve my Irish because it will help me to read Irish books and understand Irish songs, stories and television programmes”. This shows a higher level of agreement than Harris & Murtagh’s previous study (1999). Perhaps this may indicate the influence of TG4 and the emergence of Irish language children’s programmes. In this study no children agreed with the

statement “I hate learning Irish”. 12 children strongly disagreed with this statement, with 5 slightly disagreeing and 8 neutrals.

There was no evidence of language gains from the post-test, which was to be expected after such a short intervention. The very positive response from the children was encouraging, and indicated that this combination of virtual world platform and task-based language learning may indeed hold potential in the ongoing challenge of finding meaningful and effective ways to teach Irish. Interestingly, children reacted positively not only to the virtual world itself but also to the tasks they had to carry out in-world. Some of their feedback is presented in Figure 5.5.



Figure 5.5. Feedback from the children on what they enjoyed about the pilot

The pilot study proved extremely useful in determining the future directions of the research, as a number of issues with the approach were highlighted. These are described below.

5.6.2.1 Technology review

After the pilot study the SOAS platform used was reviewed so that any necessary adjustments or improvements necessary could be identified before proceeding with the next DBR iteration. A summary of this review can be seen in Table 5.3.

Table 5.3 Review of Sim-on-a-stick platform after pilot study

Advantages	Disadvantages
1. Multi-user functionality 2. Secure for children 3. Free 4. Expertise in platform gained through pilot development 5. Good quality graphics	1. High floor entry level 2. Low ceiling development 3. Difficult to apply TBLT approach as the environment not designed for embedding tasks 4. Not available in Irish 5. Requires viewer software which may be blocked by firewall 6. Lack of availability of child avatars. 7. Difficulty sourcing resources

As a result of this review of SOAS, it was decided that, while on paper in the initial evaluation process this 3D VE had appeared to be the most suitable, it was in fact not fit for purpose for the main study. It was necessary to source a more suitable 3D VE which addressed the disadvantages of SOAS while retaining the advantages, so the pool of 3D VEs for review was extended. Four additional 3D VEs were considered, and evaluated according to the criteria listed above. The comparison of the four 3D VEs can be seen in Table 5.4. These had not been identified in the first phase for various reasons – OWL because it is a less well known 3D VE with very limited reporting in the literature, Minecraft and Unity because

they belong more to the gaming field, and Quest Atlantis because a game structure and narrative are already in place in this 3D VE, limiting the potential for repurposing.

Table 5.4 Review of 3D VEs for main study following the pilot

Second Iteration: Additional 3D VEs reviewed for Main study					
Platform	Multi-user functionality	Secure for children	Easy to design/ use	Free	Resources available
Minecraft	✓	✓/✗	✓	✗	Limited
Quest Atlantis	✓	✓	✓	✓	Limited
Unity (game design engine)	✓/✗	✓/✗	✗	✗	Limited
Open Wonderland (OWL)	✓	✓	✓	✓	✓

As a result of this second round of platform evaluation, OWL was selected as the most appropriate choice of software to proceed with the next iteration of the DBR cycle. It fulfilled all the technology selection criteria and offered a number of additional benefits. A summary of the properties and features of OWL is given in Table 5.5. The main limitation of the platform was that as it is free software, continuously under development, it is always in beta phase. Also, while the online OWL community are very helpful with technical support, as the platform is not widely used, expertise in the software is not readily accessible.

Table 5.5 Advantages of Open Wonderland platform and how it addresses problems with SOAS

Advantages of OWL
• Free • Purpose-built for education and collaboration – facilitates TBLT • Drag and drop content - addresses high ceiling problem • Compatible with resources from 3D warehouse – addresses resource problem • Basic build comes with some content – addresses resource problem • Plug-ins available for collaborative writing – facilitates TBLT and groupwork • Audio and web chat enabled – facilitates communication • Can be run via internet, no need for separate viewer – addresses viewer problem • Opportunity to give feedback to questions • Apps available for use like games – scavenger hunt, quizzes, etc – facilitates TBLT • Platform can be translated to Irish – addresses language problem

5.6.2.2 Intervention and Instrument review

Before proceeding to the next iteration of the DBR cycle, several other issues were apparent from the pilot iteration. There was a very positive response from the children towards the TBLT approach, towards the groupwork and the narrative, validating this pedagogical approach in the next iteration. However, the need for a longer intervention was evident, as language gains cannot be realistically measured after such a short intervention. The short duration of the intervention also impacted on target language use. There was no time to pre-teach the vocabulary needed to engage with group work in the 3D VE, so the children spoke largely in English throughout, except when reading the instructions or referring to items in world that were labelled in Irish. In terms of the instruments used in the pilot and their suitability for use in subsequent research iterations, the AMTB and the post-test motivational questionnaire were judged appropriate for future use. However, the length of the AMTB was an issue for the children (younger than in Harris' research), and it was decided to offer a shortened version of the AMTB in the main study as the children reported fatigue while completing it.

The pre and post language tests however, were found to be unsuitable due to the difficulty of a lack of standardisation of the difficulty levels of both tests (see section 4.7.4 for discussion). The issues arising from the pilot study and subsequent review process led to some significant changes in the vision for the second iteration. Before development began, another important investigation had to take place – eliciting the views of potential users of the 3D VE tool. This process will be described below, along with the significant impact it had on the direction of the research design and theoretical perspectives.

5.7 User Consultation Process

A requirement of the DBR process is to consult with users and to incorporate their recommendations into future iterations of the design (see section 4.6.2). This is also central to a student voice approach to education (see section 4.6.3). With a view to including children's voice in the development of the second iteration (see Barab & Squire, 2004), a consultation process was carried out with some of the children who took part in the first iteration. This consultation built on the first iteration pilot study and had significant impact on the theoretical direction of the research design process. It also contributed to the development of an important theoretical contribution of this thesis (see Dalton & Devitt, 2016), which will be presented in section 5.8. The findings from this consultation were used in conjunction with the researcher reflections on the pilot to inform and shape the development of the 3D VE tool and language learning intervention in the second iteration, the main body of research in this thesis which had the goal of addressing the research questions listed above.

5.7.1 Procedures

Six months after the pilot study, all of the children who took part in the initial research in the 3D VE were invited to participate in this consultation. A subset of 15 children volunteered to take part in the user consultation 5 months later when the children were 10-11 years old. An issue of gender imbalance arose during the sampling for the user consultation,

with two boys and 13 girls volunteering, not inconsistent with gender imbalances in language learning classrooms (Carr & Pauwels, 2009).

Focus group interviews were held with the 15 children. The goal of these interviews was to hear from the children about their experiences of learning Irish at school and of playing computer games at home or in school in order to investigate their recommendations for using these 3D VEs for learning Irish. The children were interviewed for 30 minutes in three groups of five, the groups assigned at random. Guidelines for focus groups for children were used to ensure best practice in the groups (Vaughn et al., 1996). The children directed the conversation with the facilitation of the researcher exploring paths opened by the children themselves. The open-ended questions focused on the children's personal experience of learning Irish in school and the games and virtual worlds they engage with outside of school. The audio recordings of these interviews were transcribed and analysed thematically as previously outlined in section 4.8.1.

5.7.2 Findings

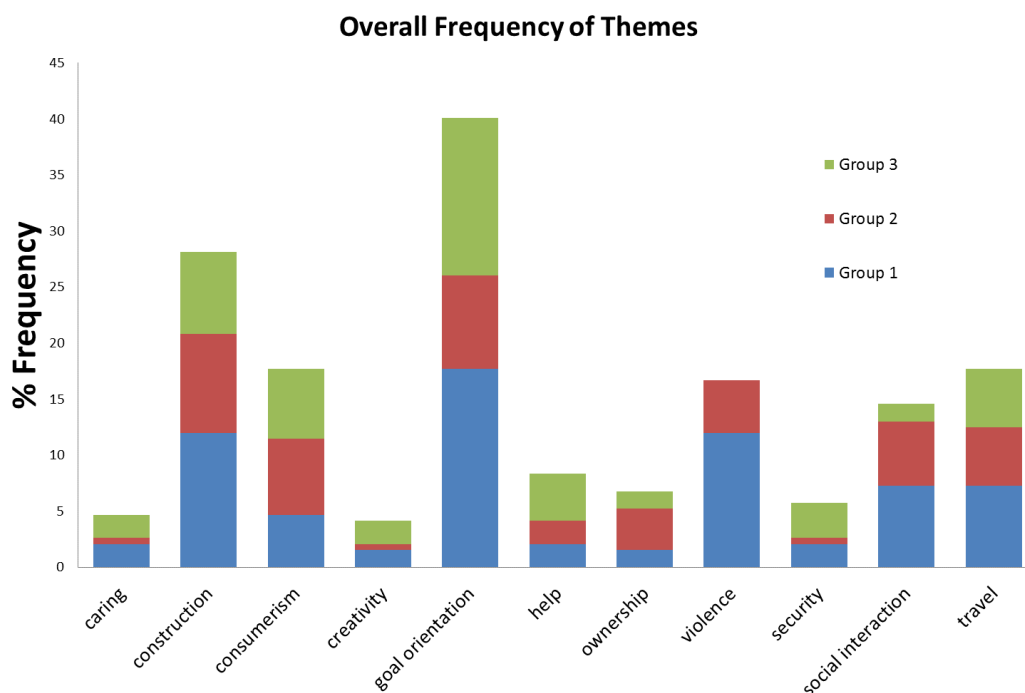


Figure 5.6 Overall frequency of themes in User Consultation process

A detailed report of the findings from this consultation process may be seen in Appendix F, or in Dalton & Devitt, 2016. In summary, the children showed an overwhelming preference for goal-oriented 3D VEs, with the desire for goal orientation expressed through wanting to have missions to complete, to be able to earn points, to make, build or buy things in world, etc. The overall prevalence of themes can be seen in

Figure 5.6. The children didn't emphasise the social nature of 3D VEs, but appeared to see this as an integral part of any game or virtual world and assumed that whatever goals they would be undertaking, would be in the context of communicating with friends.

As previously discussed, incorporating the recommendations of users is central to the DBR methodology. Therefore, the children's strong emphasis on having clearly defined goals in a 3D VE for learning Irish was responsible for shaping the approach taken in the second iteration (see section 6.2). In practical terms this led to the development of the 3D VE for the second iteration as a game with clearly defined missions and goals.

In addition to this impact on the 3D VE and intervention design, this also demonstrated the need for a more flexible taxonomy of 3D VEs in terms of their goal orientation. This led to an important theoretical contribution of this thesis, in line with the DBR methodology of using research to shape theory (see section 4.6.2). This is described in the next section.

5.8 Theoretical contribution from first iteration and user consultation

A central element of DBR is how the successive iterations feed back into the theoretical bases for the research. This took place in this current study through development and refinement of a new taxonomy for 3D VEs. An interesting question deriving from the children's engagement with the platform was: is it a virtual world or a game? In the preparation for the intervention, the principal researcher had exclusively referred to the platform as a virtual world. However, during the pilot, the children spontaneously called it a game, talking about "playing the game" when referring to completing the tasks in the virtual

world. Given the fact that virtual world and gaming are two distinct fields of language learning research, this response from the children highlighted the need to more clearly classify the type of platform being used, and its relationship to virtual world or gaming research, or both.

Furthermore, once this process of classification had begun, it became clear that the children were the best advocates for their own language learning needs and their perspective on possible environments was essential in order to discover and optimise the best platform for their language learning. The theoretical exploration of the platform classification is outlined in the next section, followed by a description of a user consultation study carried out with the children on these platforms.

Reflection on the data from the first iteration and the user consultation process forced a reconsideration of the classification of the environment. Research into the use of virtual worlds and games for learning has developed in two parallel fields, which at times can overlap or diverge. The term ‘virtual world’, in its strictest sense, refers to an open-ended, social, three-dimensional virtual environment, where there is no goal orientation, and the learning affordances centre on interaction and constructivist learning. A ‘game’, on the other hand, is understood to have a narrative and clearly defined goals. Goal orientation has emerged as a clear criterion which can distinguish between the two. Cornillie et al (2012) separated Digital Game-based Language Learning (DGBLL) from Virtual World Language Learning (VWLL) in their categorisation of games and virtual environments according to goal orientation. In their classification, goal orientation is a binary variable, its presence given as an indicator of the DGBLL category. Virtual worlds are excluded from DGBLL because of their lack of goal orientation in line with Prensky’s categorisation of a virtual world as a toy (2001b). This is a strict interpretation of the broader literature on learning in immersive environments where goals are a characteristic of the overall environment, combining the environment and the learning task (De Freitas, 2014).

Reflection on the data highlighted a number of anomalies with this classification.

When a ‘virtual world’ is used as a platform for task-based language teaching, does it remain a ‘virtual world’? There may not be intrinsic goal orientation in the platform, but now there is extrinsic goal-orientation in the language learning design. When a ‘game’ is used without specific language learning goals, does it classify as DGBLL? In this case the intrinsic goal orientation is there, but there is no goal orientation in the language learning design. Berns et al demonstrate this anomaly in their 2013 study where they describe “game-like” applications in a 3DVE (2013). The platform they are using is more like a virtual world, but they are using goal orientation in the tasks, therefore making the experience “game-like”.

The fuzzy classification (Zadeh, 1965) presented in this thesis builds on Cornillie *et al*’s classification, taking the useful binary distinction of learning objectives and gaming goals. However, it makes two key adaptations:

1. goal orientation is represented as a continuum that combines two classification features;
2. The two classification features represent two realisations of goal orientation, one intrinsic (in the platform) and one extrinsic (in the language learning design) but both impacting on learner motivation and interaction within the overall learning experience.

In the continuum (Table 5.6), 3DVEs are situated according to their net goal orientation, a fuzzy relation between intrinsic and extrinsic goal orientation. The nature of the fuzzy relation is unspecified here as this would require empirical investigation of user experiences of goal orientation in different environment types. This reconceptualization allows the extension of DGBLL theory to a broader range of 3DVEs, uniting the fields of research, and enabling the affordance of goal orientation to be exploited more broadly. In that

case, individual researchers and language teachers could decide what degree and type of goal orientation on this continuum is most appropriate for their own language teaching needs.

Table 5.6. 3DVE Fuzzy Taxonomy

	Low Goal Orientation Continuum High				
	Virtual world without extrinsic LL goals	Virtual world with extrinsic LL goals	Game without extrinsic LL goals	Game with extrinsic LL goals	Custom-built LL game
Intrinsic goal orientation (game design)	—	—	√	√	√
Extrinsic goal orientation (LL design)	—	√	—	√	√
Example	—	Second Life (Wehner et al., 2011)	World of Warcraft (Rama et al., 2012)	Sims (Ranalli, 2008)	Croquelandia (Sykes et al., 2008)

5.9 Conclusion

The chapter gave an overview of the design process of this research. It first set out the technological and pedagogical considerations of the research and then detailed the first DBR iteration and the user consultation study. The impact that both processes had on tool and intervention development on the second iteration was outlined, along with a theoretical contribution arising from the design research. After the first iteration and the user consultation had been employed to optimise and fine tune the intervention and 3D VE tool in order to address the research questions of this thesis in a second iteration. This will be described in the next chapter.

6 Second Iteration

6.1 Introduction

This chapter will present the procedures of the second iteration, which is the main focus of this study and which aimed to address the research questions presented in section 4.2. Section 6.2 outlines the pedagogical considerations and describes how a game narrative was used in the intervention to embed a TBLT approach. Section 6.3 explores the technological considerations, and section 6.4 specifies the wide range of projected intervention affordances for language learning offered by this implementation. The sampling and duration of the intervention are described in sections 6.5 and 6.6. An additional research element to the descriptive approach taken was the incorporation of a quasi-experimental sub-section to specifically look at language gains through adding a focus on form element to the intervention, and this is presented in section 6.7, along with the practical structuring of the experimental and control groups. The data collection and analysis are outlined in section 6.8

6.2 Pedagogical considerations

The theoretical basis for the intervention has been described previously in section 5.3. The adaptation of the pedagogical aims to the 3D VE is presented below.

One aim of the project was to integrate the principles of task-based language teaching (Nunan, 2004) with a game narrative, so that the language learning goals could be integrated as goals of the game (see Purushotma et al., 2009). It was important to choose an appropriate game genre that would facilitate this approach. In the user consultation study the children had indicated their preferences for having missions to accomplish and goals to achieve. Based on this emphasis on goal orientation, the range of game genres to choose from included adventure, construction, combat, life-simulation, mystery. In this instance, there were restrictions on the choice of genre based on the limitations of the platform available, the desired pushed output pedagogical approach, and the desire to interest both boys and girls. Construction was ruled out due to limitations in the game platform, combat was ruled out for

similar reasons, but also as age-inappropriate and possibly less appealing to the girls. The life-simulation option had been more popular among the girls in the user consultation study, and the platform was not sophisticated enough to provide a realistic experience such as the Sims. Finally, the mystery genre was selected as that which could be best adapted to the game platform, would have equal appeal to both sexes, could support a TBLT approach and could be used to encourage pushed output.

Therefore, the 3D VE was developed to support a game narrative developed in the form of a mystery to be solved. The mystery unfolded as users were told that something had happened in the Japanese embassy last night, and they had to travel around, looking for clues, firstly to discover what had actually happened (a mass disappearance of a group of people) and subsequently to uncover who was responsible. The users were invited to act as detectives in the mystery, and were given a series of investigative tasks where they could gradually collect clues and piece them together to find out what was going on and who were the guilty parties. The tasks for the intervention had a dual role – incorporating language production and interactive tasks with the goals of the game, for which points could be earned. Several different types of tasks were used, and presented to the children each day in the form of a mission:

- Find information about mystery and suspects through travelling around the 3D VE, and collecting clues
- Complete character profiles through sharing information and clues with team members over text chat
- Write a police report about the mystery and the clues uncovered about what happened
- Answer quizzes about the characters based on the information gathered

These were carried out in groups of two to four children, depending on the mission. Setting

the correct difficulty level of the tasks proved a major challenge. If the tasks are too difficult, then the children will not have confidence in their competence and could disengage. During the roll out of the project, the difficulty level was adapted on a day to day basis as the researcher observed how the children engaged with each task. The original pitch was found to be too high, and there was a lot of frustration observed among the children on the first two days. Their disengagement because of perceived lack of competence was evident. When the challenge level was adjusted downwards, more children became more involved in the game as now they felt they could actually do it.

Focus on form: The language feature selected for the focus on form element of this intervention was an chopail – the copula, (section 4.7.4), which is not usually taught explicitly in English-medium primary schools, but taught implicitly in the context of certain common phrases which use this sentence construction.

An element of focus on form was incorporated in the intervention through providing enriched input which contained numerous examples of correct usage of the copula. However, this was not realised to the same extent as originally intended and out of the nine game sessions, less than half of two of these sessions involved direct engagement with the copula. In the quizzes used in two of the tasks, the answers were in sentences using the copula. The non-experimental group had merely to find the factually correct answer, whereas the experimental group had a selection of different grammatical forms to choose from, all with the same factual answer. This was explicit focus on form, while the control group were exposed to implicit focus on form. For example in Figure 6.1, for the question “What job does Sophie have?” the children in the non-experimental group have to select the answer from actor, secretary, mayor and teacher, all of which are given in the correct grammatical form. The experimental group can see immediately that Sophie is an actor (aisteoir), however they have to select the grammatically correct answer. They are given some extra materials to help them, in the form of an information sheet detailing how to use the copula. If they select the

correct answer they are given a tick and some words of praise, if they select the incorrect form, they see a red X and are asked to try again. This is the only element of corrective feedback in the game. Unfortunately, this level of exposure could not be expected to make a significant contribution to the children's acquisition of the form, particularly over such a short intervention.



Figure 6.1. A comparison of a game quiz activity with and without focus on form

6.3 Technological considerations

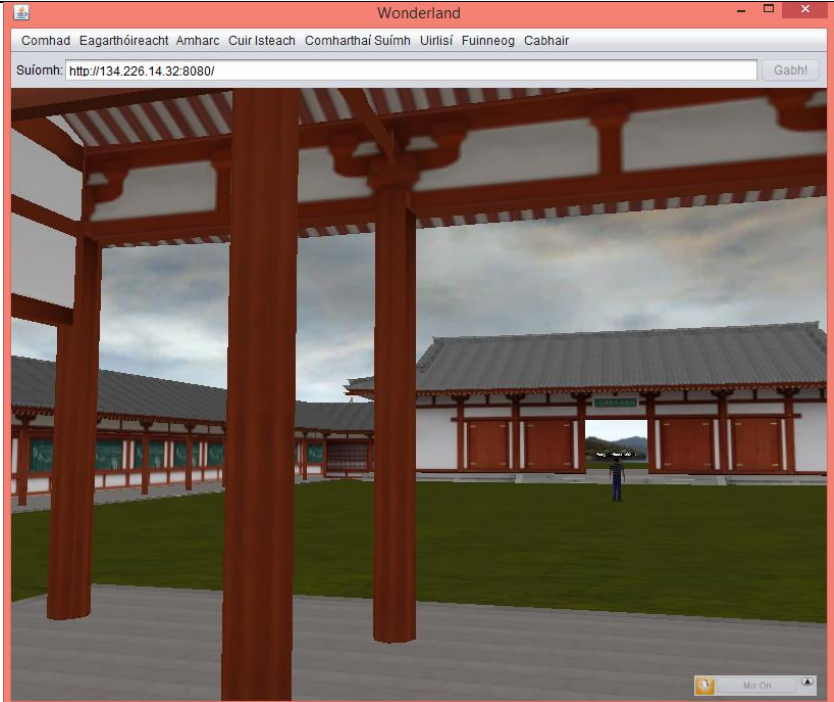
Open Wonderland was selected as the most appropriate 3D VE platform for this study (see section 5.6.2.1). The basic toolkit was downloaded and eight different areas in the world were developed based on the default combined worlds package. These zones were developed using free 3D resources from Trimble 3D Warehouse, and were designed to support the narrative of the intervention as described below. The different zones in the world can be reached through portals or through a travel menu at the top of the page. Several of these zones are presented in Table 6.1. The participants have the option of individual or group chat with each other. The interface was translated to Gaeilge to increase the participants' sense of immersion in the language.

Table 6.1. The main zones in the customised OWL 3D VE

The welcome area where users log in and find their avatar and portals to other zones.

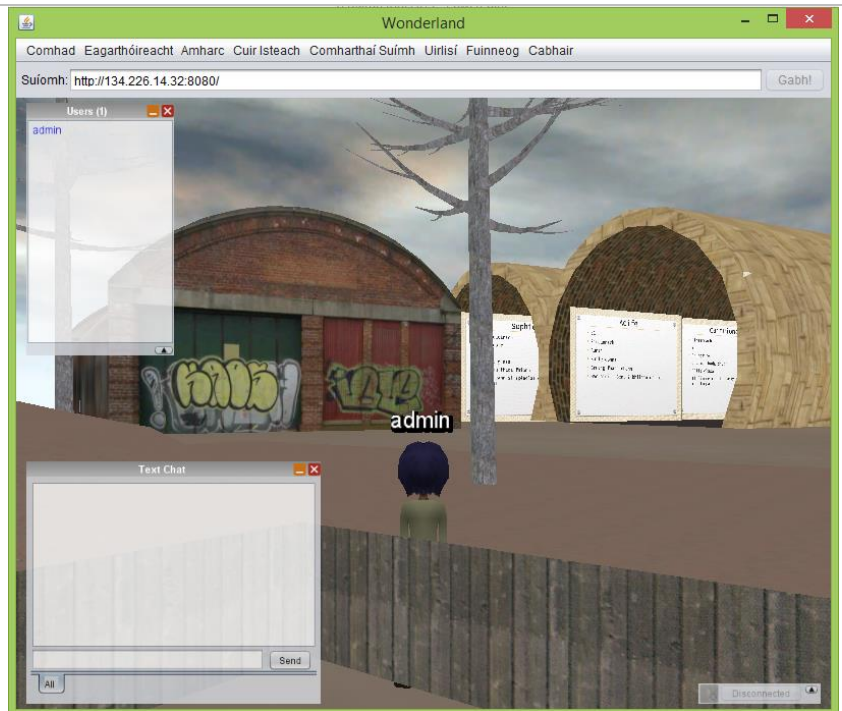


The Japanese Embassy: an important zone in the unfolding of the mystery narrative.



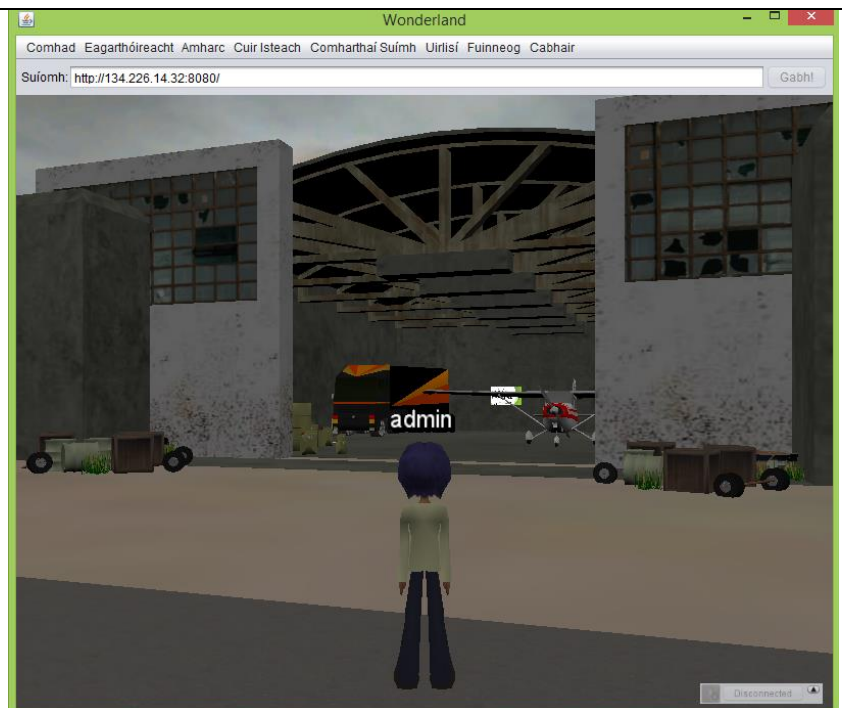
The mystery HQ

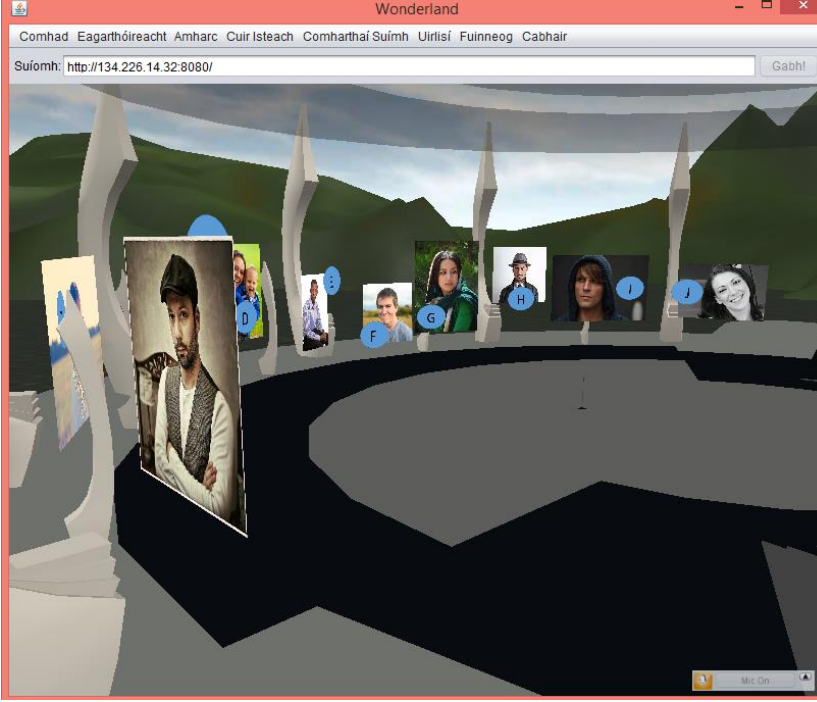
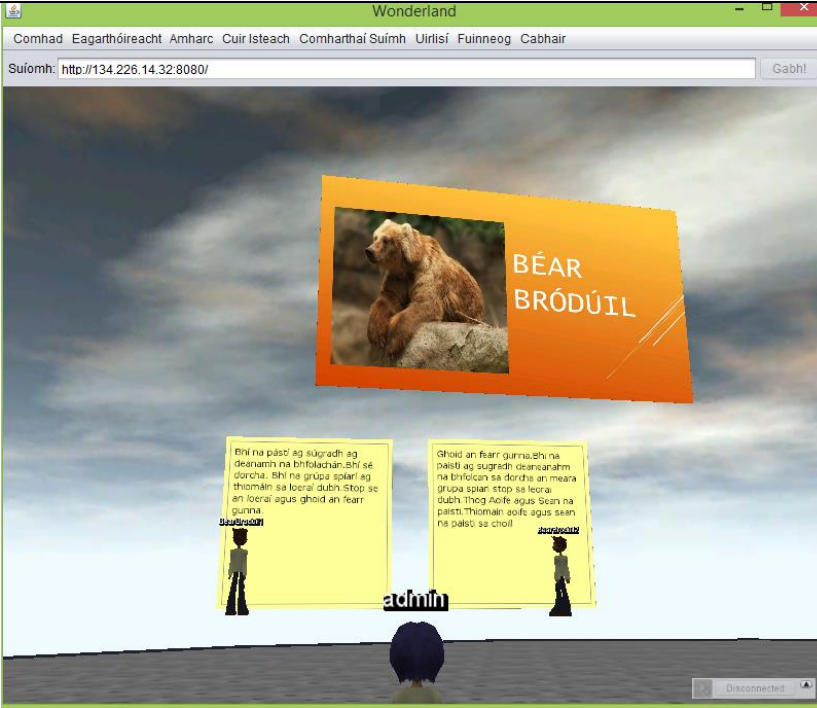
where users can find
detailed profiles on
each suspect.



An abandoned

airport – a zone
where children travel
to find clues to solve
the mystery



The theatre displaying all the missing persons/suspects in the mystery.	 The screenshot shows a 3D virtual environment titled 'Wonderland'. The interface at the top includes a menu with options: Comhad, Eagarthóireacht, Amharc, Cuir Isteach, Comharthaí Suímh, Uirlisí, Fuinneog, Cabhair. Below the menu is a search bar with the text 'Suiómh: http://134.226.14.32:8080/' and a 'Gabh!' button. The main view shows a virtual stage with a large portrait of a man in a hat and vest. Several other avatars are visible, each with a letter (D, F, G, H, I, J) next to them. The background features a stylized landscape with mountains and a body of water.
A work zone where children act as detectives and complete written reports about the mystery.	 The screenshot shows a 3D virtual environment titled 'Wonderland'. The interface at the top is the same as the previous screenshot. The main view shows a virtual work zone with a large orange sign that reads 'BÉAR BRÓDÚIL' next to a picture of a bear. Below the sign are two yellow text boxes containing Irish text. Two avatars are visible in the scene, one standing near the text boxes and another in the foreground. The background features a stylized landscape with mountains and a body of water.

Despite OWL being selected as the most appropriate 3D VE platform, there were technical challenges associated with it. The software used for this project is free, open source and continually under development. This means that the essentially beta software is not always reliable, and needs considerable expertise in order to run it effectively. The online OWL community were an invaluable source of information and advice during the server set up time, however, this took considerably longer than expected due to the wide range of

technical problems that were encountered. This had an impact on the timing of implementation of the intervention itself, as described below. There were numerous other difficulties that arose in the development process. It was necessary to keep the file sizes of the resources to below 1MB, or the performance of the 3D VE would be impacted, either through lagging, freezing or crashing. Another issue that arose during development was how incorporating resources with high quality graphics caused problems with the 3D VE performance on all but the most up to date and powerful computers. There was a limit to the graphics quality that was possible for running on a low bandwidth network and computers with lower-end graphics.

Furthermore, as it was not feasible to run the 3D VE server from a laptop for the duration of the intervention, it was necessary to source hosting for the 3D VE. IT

Services in TCD provided hosting, but the server administration required was substantial, and support was obtained from the Trinity Centre for High Performance Computing (<http://www.tchpc.tcd.ie/>). As a result of these technical considerations, the sampling of schools was restricted, as was the timeframe, but the final study was carried out in one school over a four week period with two to three game sessions per week.

6.4 Intervention affordances

Due to the nature of the 3D VE platform being used, and the limited resources at the researcher's disposal, the game narrative encompassed both the 3D VE itself and a mission booklet that the children received in hard copy during the project. This was a 'black box' style intervention (see section 6.7), which was conceived as a whole rather than separable into individual parts, the exception being the presence or absence of focus-on-form for the quasi-experimental assessment of language gains. The whole intervention was designed to try maximise the language learning affordances experienced by the users. These affordances are examined holistically, encompassing the affordances of the game and the teaching approach

to evaluate how the experience as a whole was designed to maximise the children's engagement with the Irish language.

The projected affordances of the intervention were:

Immersion: in line with the literature on 3d VEs, the immersive nature of the 3D VE, along with using an avatar to interact in-world was intended to give the children a sense of presence and to support an authentic experience of being immersed in an Irish-language environment and part of an Irish-speaking community. The mystery narrative of the game also supported an immersive experience for the children, which transcended the technology and became present in the classroom as the children discussed the mystery, the characters, the missions, etc.

Experiential/Active learning: This affordance is strongly linked to immersion. If the immersive element of the game is convincing, then the activities for the children to complete using the avatars can be experienced as active learning, compared to more common classroom practice of reading and writing. The game narrative and the facility to be able to travel around the world and interact with it were intended to support children to feel more actively engaged. Furthermore, the pedagogical approach of TBLT facilitated an active learning experience.

Teamwork: The missions were designed for completion in teams. Each team had four members, with two subgroups of two children to a computer located at different points in the classroom. The task designed required that the two sub-groups at each computer would need to negotiate to achieve their goals and the sub-groups would have to communicate via text chat. This experimental set up was designed to support good team interactions and supportive peer relationships, with the goal of creating a normalised group context for speaking in Irish. This is closely related to the interaction affordance.

Interaction: the platform itself allowed for text-chat between avatars and groups. The tasks were designed to necessitate conversations between team members orally and through chat in order to maximise interaction through Irish.

Goal orientation: The missions were designed as a series of tasks that the children needed to complete in order to solve the mystery. Therefore they had an overarching goal; to solve the mystery; which comprised numerous short-term goals in each mission. The technology used allowed for incorporation of missions into the environment, but these were largely dictated by the TBLT teaching approach used.

Rewards: There were several different types of rewards available to the children. These were mostly external to the game, due to the technical difficulties of incorporating the rewards into the platform, although this would have been desirable. The children could earn points through successful completion of the different elements of each mission. Their progress was monitored on a leaderboard in the classroom, which was updated as each group progressed. There was also a trophy available to the group which made the most effort to speak Irish, and this was awarded to a different group at the end of each session, and was accompanied by substantial bonus points. This was a process to provide points for effort rather than just for achievement and to try to encourage children to participate. A further reward that was incorporated into the game was a portal that would only be unlocked if the group had successfully completed prior missions. This was an imitation of the type of unlocking that appears in commercial games, but was only used for one of the missions due to technical constraints.

Fun: The tasks were structured in the form of a mystery game in order to support the idea of the game being fun. The aim was to leverage the children's associations of fun and enjoyment with computer games and utilise this for the Irish game, even though they would realise that there was a strong emphasis on learning. However, it is important to note that the fun of the

intervention could come from a range of different sources – for example, using a computer in class, working with friends, being allowed to use text chat, etc.

Challenge: The challenge in the game was projected to afford motivation for children. This was a difficult affordance to realise, as the optimum challenge level differs for each child, and if the challenge was set too low or too high it could result in demotivation. Therefore, this was a flexible affordance that was adapted throughout the intervention in line with how the children responded to the difficulty level of the tasks, and this was facilitated by the researcher role as practitioner in the classroom during the intervention. This was necessary as the consequences of the challenge being mishandled in the classroom would have been the collapse of the learning environment.

6.5 School Selection

As discussed in section 4.5.2, for practical reasons, it is often not possible to employ random sampling for SLA or educational research. Participants are usually in pre-existing groups, such as classes in schools or universities. Therefore, it is not feasible to set up true experimental conditions when exploring language learning in the school setting. A quasi-experimental approach may be approximated by limiting the variables between the control and experimental group. For school-based research, school environments may vary according to whether they are urban/rural, co-educational/single sex and disadvantaged/non-disadvantaged, not to mention differences between classes within the schools and individuals within the class. For this example it would be necessary to match the school type to reduce the introduction of experimental error.

While random selection of participants is not feasible for a classroom-based intervention, in theory, random selection of schools to participate could be possible. However, for this project, there were a number of limiting factors which prevented this type of random sampling at the school level. For the first iteration, opportunistic sampling was used, and the intervention took place on site in Trinity College. The second iteration of the project was

envisaged as a school-based intervention, therefore participating schools needed to have access to sufficient technological resources to run the game in their school. Before inviting schools to participate, it was necessary to find schools who would potentially have the resources required. The technological criteria for participation were as follows:

1. School must have access to one laptop/desktop computer between two children
2. Computers must have accelerated graphics card and sufficient memory
3. Reliable internet connection must be available

Therefore, in order to find schools who would fulfil these criteria, a list of Digital Schools of Distinction was obtained from the website www.digitalschools.ie. This is a government-run initiative promoting excellence in the use of ICT in schools. They recognise schools who are positively engaging with technology and have made the “Digital School of Distinction” award available to schools which excel in this area. Schools on this list were then assumed to be likely to fulfil the technological criteria listed above. Further selection criteria were then applied to this list of schools:

1. Co-educational school – to include both boys and girls
2. Located near Dublin – for ease of access for training and school visits
3. Junior primary schools excluded (a lower limit of 4th class was placed on participation)
4. In receipt of Digital School of Distinction Award, as an indication of a high level of technology available in the school.

From the list of participating Digital Schools on their website, and according to these selection criteria, a shortlist was made of schools to invite to participate in this research. A

letter of invitation was sent to these schools, followed by a telephone call. Where interest was expressed, a visit was paid to the school to assess the technological resources and run a trial of the game. An overview of the schools invited, how many expressed interest and how many fulfilled the technological criteria is shown in Table 6.2.

Table 6.2 Summary of schools invited to participate, those interested and those suitable

School/ Location	Invited	Expressed interest	Fulfilled technological criteria
English-medium: Dublin	8	3	0
English-medium: Rest of Leinster	7	1	1
Irish-medium: Dublin	9	1	0
Irish-medium: Rest of Leinster	4	3	0

In total, four English medium and four Irish-medium primary schools expressed an interest in participating, but there was only one school which had access to the required technology to take part in the project - an English-medium school outside of Dublin. The school was a rural, Catholic, non-disadvantaged school with 145 pupils. Children in 4th class were selected for participation, with a total of 17 children in the class, including several children with special educational needs who don't study Irish. A further school was selected from the same county to take part in the same questionnaires and language assessments but without the intervention, in order to provide a control group for test effect (as described in section 4.5.2.1). This school was also rural, Catholic, and non-disadvantaged, and it had 102

pupils. In the control school, children in 4th class were selected for participation, with a total of 9 in the class, of whom 8 participated.

The difficulties encountered in finding schools with adequate ICT resources reflects recent research at second level (Johnston, 2014), and highlights the urgent need to schools to have access to the resources required to incorporate new technologies into the teaching and learning environment. The lack of random sampling for this study is a limitation with regards to its potential for generalisation (see section 4.10), however, as detailed above, technical issues constrained the feasibility to carry out the research in a more randomised manner.

6.6 Duration

In educational intervention research there is a preponderance of shorter interventions. Dörnyei reports that in 1995 in four selected educational psychology journals 26% of the interventions lasted for longer than one day, whereas by 2004 this had reduced to 16% (p. 119, Dörnyei, 2007). A similar trend is seen in the area of SLA. In their meta-analysis of L2 instructional effectiveness research, Norris and Ortega (2000) reported that the average duration of intervention was approximately 4 hours. In the context of classroom-based research, a typical language class might take 1 hour, and in a university setting there might be one class per week. This could mean that some interventions take place over a longer period of time due to the structure of the academic environment. Grgurović et al did not report a mean duration for their meta-analysis of CALL effectiveness, but of the 61 treatments included from 37 different studies, 34 treatments were less than 10 hours in duration, whereas 27 lasted more than 10 hours. This indicates that perhaps there is a shift towards longer interventions in CALL research when compared to general L2 instructional or general educational research. However, the meta-analyses mentioned only reviewed selected studies, so firm conclusions cannot be drawn. In practice, the length of intervention may be determined by practical issues such as resources available, access to participants, etc. In this study, these practical issues dictated the duration of the research intervention. The

intervention took place over a five week period, with online sessions between one and three times a week. The length of the intervention and the number of sessions per week were decided in conjunction with the class teacher and the school principal, and depended on a number of school-related factors, as mentioned in section 4.10. Each session lasted between 40 minutes to one hour, with between 30 and 50 minutes in the game. There was no time for training in co-operative group work, or to pre-teach the language needed for group work in Irish. The children had one orientation session in the game and then the project began.

6.7 Quasi-experimental element

As previously mentioned sub-element of the broader study was a quasi-experimental study to evaluate language gains. This research involved what could be termed a ‘black box’ intervention. Just as a ‘black box’ is comprised of complex internal mechanisms, which cannot be isolated or easily understood from the black exterior, this research intervention can be considered analogous as it integrated a 3D VE with specific language teaching approaches in a classroom context. This makes it difficult to isolate individual variables and control them for experimental research. This is a broader issue in classroom research, as described by Burston:

Outside of clinically controlled (and quite artificial) testing environments, links between cause and effect can never be unequivocally demonstrated. Real life classroom teaching, by its very nature, involves numerous variables which are difficult to specify and even harder to control. (Burston, 2001, p. 513)

As described in section 4.5.2, a quasi-experimental study is an approximation of an experiment to examine cause and effect, but without the random sampling necessary for a true experimental study. In the traditional quasi-experimental model, an experimental group receives an intervention and they are compared to a control group who do not receive this intervention. This approach has been used widely in CALL research, where researchers have compared students learning language with and without the use of technology, in order to ascertain whether there is any evidence of improved language gains using the technology.

Chapelle recognises that this approach is widespread in CALL, and recommends that instead of testing for computer effectiveness, comparative research should: “investigate[s] the outcomes of two real options for pedagogical tasks or curricula for a purpose.” (Chapelle, 2005, p. 591)

Given that the intervention integrated specific pedagogical approaches with the 3D VE, and in answer to Chapelle’s call for a more meaningful type of comparative research, in this study, it was not deemed appropriate to attempt to isolate the technology as the variable in a quasi-experimental study. Instead, a quasi-experimental approach was used to set up a comparison between two pedagogical approaches, one with focus on form, one without. It is very important to note that this was specifically and only to assess language gains, and did not extend to the remainder of the affective attitudinal and motivational factors at play in the project. There was an additional control group to control for test effect. The experimental and control groups are listed in Table 6.3. This was not for direct comparison with the other experimental groups as a way of comparing the use of the 3D VE vs traditional classroom teaching, but merely to control for test effect, i.e. to see if taking the test repeatedly could lead to a change in test performance without receiving any specific learning intervention based on the test content. The research design is shown in Table 6.4.

The children who took part in the intervention were randomly assigned into two groups – one which included an element of focus on form in their tasks and another which did not. The purpose of this was to explore whether or not explicit focus on form could support the children’s learning of a specific language feature. The pre and post language tests were also administered to a control group who did not receive any instruction other than their regular school Irish class.

This was not for direct comparison with the other experimental groups as a way of comparing the use of the 3D VE vs traditional classroom teaching, but merely to control for test effect, i.e. to see if taking the test repeatedly could lead to a change in test performance

without receiving any specific learning intervention based on the test content. The research design is shown in Table 6.4.

Table 6.3. Quasi-experimental design to assess language gains: groups and their purpose

Group	Purpose
Experimental Group (n=9) Intervention with focus-on-form	To compare potential impact of focus-on-form element on language assessment scores
Control Group 1 (n=8) Intervention without focus-on-form	
Control Group 2 (n=8) Second school with no intervention 8 children	To control for test effect and maturational effects

Table 6.4. Quasi-experimental design to assess language gains

Experimental Group	Pre-test	Intervention with focus-on-form	Post-test	Delayed Post-test
Control group 1: Within experiment	Pre-test	Intervention without focus-on-form	Post-test	Delayed Post-test
Control group 2	Pre-test	-	Post-test	Delayed Post-test

Children worked in pairs with one computer between two children. Each pair was partnered with another pair in the classroom, but not adjacent to them, in order to create opportunities for interaction through text chat in the 3D VE. There were three teams of four children and a fourth team which had five, each team composed of two subteams as previously outlined.

Each team was initially composed as a mixed ability group, based on a ranking of the children's ability in Irish provided by the class teacher. The teams were then randomly

assigned to either focus on form or no focus on form. There were some changes made to the teams after the first two days of the intervention for classroom management reasons and in order to promote inclusion of all children. Of the 17 children who initially volunteered to take part, one child withdrew from the game halfway through the project. However, he did take part in the focus groups after the project and gave his reasons for withdrawing.

6.8 Data collection and analysis

The data collection was described in section 4.7. Some specific additional details relative to each instrument are given below.

- In this research study, an important source of data was the written transcriptions of audio recordings of children's interactions as they took part in the language learning intervention in the 3D VE. Audio recording of children's interactions – these were recorded every day at each laptop shared by two children. The recordings were then transcribed, and the names anonymised. Transcription of recordings can be “fraught with slippage; it is dependent on the knowledge and skill of the transcribing person” (Miles, Huberman, & Saldaña, 2014, p. 71). The noise interference problems mentioned in section 4.7.2 considerably reduced the data retrieved and made it necessary to study interactions in pairs rather than separate individuals (except where this was evident in the context). In the transcriptions, the marker “inaudible” is used when the sound quality failed and the transcriber was unable to decode what the speaker was saying. Missing recordings were due to student absences and student error in initiating or saving the recording. In a small number of cases, the recordings were present, but the audio quality was too poor to allow meaningful transcription. The transcriptions retrieved from each group for each session are shown in Table 6.5, and the total corpus length was almost 31,000 words.

Table 6.5. Transcriptions retrieved for each group

Session	1	2	3	4	5	6	7	8	9
Caroline & John	x	✓	✓	✓	✓	✓	x	x	x
Anna & Karen	✓	✓	x	✓	✓	✓	✓	x	✓
Laura & Maria	x	✓	✓	✓	✓	✓	✓	✓	✓
Luke, Philip, Seán	x	✓	✓	✓	x	✓	x	✓	✓
Kevin & Simon	✓	✓	✓	✓	x	x	x	x	x
Olivia & Peter	✓	✓	✓	✓	✓	✓	✓	x	✓
Mark & Sarah	✓	x	✓	✓	✓	x	x	✓	✓
Ryan & Stephen	✓	✓	✓	x	✓	x	x	x	✓

- Focus group interviews – these were held after the intervention with groups of 4-5 children. All of the focus group interview data was successfully transcribed, but due to background noise it was difficult to distinguish individual voices in the recordings, so participants are left un-named, unless it is evident from the context who is speaking.
- Questionnaires – there were some children absent for either the AMTB or the exit questionnaire. Some children left certain questions unanswered.
- Language assessments - the question-based language assessments were designed to elicit copula use from the children. The aim was that over the course of the project the children would become familiar with the copula construction and be able to apply it. However, in the final game implementation, only two tasks in the game were specifically focusing on the copula. Another issue that arose with the language assessments was that of absenteeism. A significant proportion of children were absent for at least one of the language assessments, making it difficult to draw any general conclusions.

The data analysis was carried out as previously described in section 4.8.

6.9 Conclusion

This chapter has presented the procedures involved in the second iteration of the DBR process. It outlined some technological and pedagogical considerations before detailing the

participants in the study, the duration of the intervention, the quasi-experimental design of the language gains investigation and some particulars of data collection in addition to those previously outlined in section 4.7. As noted previously, it was this second iteration that was used to explore the research questions set out in section 4.2. The next chapter will present the results from this second iteration.

7 Results

7.1 Introduction

This chapter will present the results from each research instrument – questionnaires, language assessments, recordings of game interactions and focus group interviews. The quantitative data (questionnaires and language assessments) is dealt with in section 7.2, however, the vast bulk of the findings relate to the qualitative analysis of the game interactions and the focus group interviews, presented in sections 7.3 and 7.4 respectively.

7.2 Questionnaires

The results of the AMTB will first be outlined, followed by the results of the exit questionnaire. Full details of the children's responses may be seen in Appendix D, however only the key findings will be described below.

7.2.1 AMTB

Prior to participation in the online game project, the children's overall attitudes towards Irish and their motivation to learn it were explored using the Attitude/Motivation Test Battery (section 4.7.3). There were 40 Likert scale questions and four open ended questions.

7.2.1.1 Likert Scale Responses

The children's responses to the multiple choice questions are presented below, grouped according to the scale which they were designed to measure (Harris & Murtagh, 1999). The numbers in each table refer to the number of children (total n=15) who chose particular response options on each item. For each item, the most frequently selected option is highlighted in pink. There are no means or standard deviations provided in the results due to the small sample size, which inhibited statistical analysis.

Table 7.1 Attitude to Learning Irish

Attitude to learning Irish	Strongly disagree	Slightly disagree	Neutral	Slightly agree	Strongly agree
1. Learning Irish is a waste of time.	4	8	1	1	1
2. When I leave school, I will give up learning Irish completely because I am not interested in it.	4	5	5	1	0
3. I really enjoy learning Irish.	3	2	3	4	3
4. Irish is an important school subject.	0	1	0	4	10
5. I hate learning Irish.	6	5	3	0	1
6. The time I spend learning Irish, I would rather spend on other subjects.	1	4	2	7	1
7. I think that learning Irish is boring.	2	4	5	3	1
8. I want to learn as much Irish as possible.	0	1	6	5	3

The children's feedback in the area of attitude to learning Irish is quite mixed (Table 7.1). Most children agree that Irish is an important school subject, and don't hate learning Irish, or think it a waste of time. However, eight out of 15 children say that they would rather spend time on other subjects. There was a favourable response to the statement about wanting to learn as much Irish as possible, but the highest frequency response was actually neutral. Considering learning Irish as boring got a further high neutral score. Nine children said they wouldn't give up Irish after leaving school. Seven said that they really enjoy learning Irish, compared to five who do not, and three neutrals.

Table 7.2 Motivational Intensity to Learn Irish

Motivational intensity to learn Irish	Strongly disagree	Slightly disagree	Neutral	Slightly agree	Strongly agree
1. To be honest, I don't really try very hard to learn Irish at school.	6	0	7	2	0
2. I often think about what I have learned in my Irish lesson when the day is over.	2	2	7	3	1
3. During the Irish lesson I put my hand up to answer very often.	0	5	6	0	4
4. I don't go to too much trouble with my Irish homework.	5	2	3	5	0
5. I try to understand Irish programmes on television.	1	1	6	4	3

The most popular response was neutral for most of the questions on the motivational intensity to learn Irish scale (Table 7.2). For several items, the children outside the neutral category are quite evenly split between agreeing and disagreeing – for example, the item about thinking of the Irish lesson after it's over, volunteering answers during the Irish lesson. There is an encouraging positive shift in item 5 – seven children saying they try to understand Irish programmes on television, and also in item one, six children strongly disagreeing that they don't really try to learn Irish.

Table 7.3 Desire to Learn Irish

Desire to learn Irish	Strongly disagree	Slightly disagree	Neutral	Slightly agree	Strongly agree
1. I would like to go to a Summer Course in Irish.	4	5	3	1	2
2. Compared to subjects like Maths and English reading, I don't like Irish very much.	2	1	6	4	2
3. I would like to visit the Gaeltacht.	3	3	2	3	4
4. If there were Irish-speaking families living near me, I would like to speak Irish to them.	3	1	2	4	5
5. If there was a chance to speak Irish outside of school, I would like to try speaking it.	2	2	8	1	2

While some of the scales in the AMTB relate to the cultural idea of Irish, and how the children value it, the Desire to learn Irish scale is one that measures how much each child actually wants to actively learn the language (Table 7.3). The results on this scale don't all lean in the same direction. Nine out of the 15 children would not like to attend a summer course in Irish, while only three children would. When asked if they didn't like Irish when compared to Maths and English, six children were neutral, six agreed with the statement, and only three disagreed. When asked if they would like to visit the Gaeltacht, the group is almost evenly split between agreeing and disagreeing, with one child extra wanting to visit. The item that seemed to receive the most favourable response was about wanting to speak in Irish to Irish-speaking families, if they lived nearby. Nine children said they would like to, while four said no. In the last item, while three children say they would like to speak Irish outside of school if they have the opportunity, four children disagree.

Table 7.4 Irish Lesson Anxiety

Irish Lesson Anxiety	Strongly disagree	Slightly disagree	Neutral	Slightly agree	Strongly agree
1. It embarrasses me to put up my hand and say something aloud during the Irish lesson.	8	1	4	1	1
2. I don't feel sure of myself when I am speaking out loud in Irish during the lesson.	2	4	3	6	0
3. I get nervous and mixed up when I am speaking in my Irish class.	1	2	4	6	2
4. I always feel that the rest of the pupils in my class are better at speaking Irish than I am.	3	1	5	3	3
5. I am afraid that the other pupils in the class will laugh at me when I speak Irish.	6	2	2	4	1

There were mixed responses on the Irish lesson anxiety scale (Table 7.4). Most children strongly disagreed that they would be embarrassed to put up their hand and say something aloud during the Irish lesson. A majority of children also disagreed that they feel afraid that the other children will laugh at them when they speak Irish. However, five children, one third of those who responded, agreed with this statement. Furthermore, eight out of the fifteen children agreed that they get nervous and mixed up when speaking in Irish class, and six children said they don't feel sure of themselves when speaking out loud in Irish. Six children also agreed with the statement that they always feel the rest of the children in the class are better at Irish than they are.

Table 7.5 Irish Ability Self-Concept

Irish ability self-concept	Strongly disagree	Slightly disagree	Neutral	Slightly agree	Strongly agree
1. If I visited the Gaeltacht, I would be able to look for and follow directions to make my way.	1	5	4	2	3
2. By the time I finish school, I will be able to speak Irish quite well.	1	1	5	3	5
3. I understand most of what the teacher says in Irish in school.	0	3	5	6	1
4. My Irish has improved greatly since I was in 2nd class.	0	1	0	9	5

The children's Irish ability self-concept (Table 7.5) seems to be quite positive, most children claiming to be able to understand most of what the teacher says in school, that their Irish has improved a lot since second class and also believing that they will be able to speak Irish quite well when they leave school. The item with the most negative responses is to do with asking for directions in the Gaeltacht. There is a slight negative shift in the responses – six children disagreeing that they would be able to do this, while five children agree that they would.

Table 7.6 Integrative Orientation

Integrative Orientation	Strongly disagree	Slightly disagree	Neutral	Slightly agree	Strongly agree
1. Learning Irish is important for me because it will allow me to meet and talk to different kinds of people.	0	3	3	5	4
2. It is important to me to improve my Irish because it will make me feel more at home with people who speak Irish.	1	1	1	6	6
3. It is important for me to improve my Irish because it will help me to read Irish books and to understand Irish songs, stories and television programmes.	1	1	4	3	6

All items on the integrative orientation scale received a majority of positive responses (Table 7.6). A desire to meet different people, and feel at home with those who speak Irish seems to be important for the children in wanting to learn Irish. In reality, there are minimal opportunities for this to take place outside of school, perhaps with the exception of Irish language television. Wanting to understand Irish books, television etc., also was described by a majority of children as an important reason for improving their Irish.

Table 7.7 Attitude to Irish Speakers

Attitude to Irish speakers	Strongly disagree	Slightly disagree	Neutral	Slightly agree	Strongly agree
1. If Ireland lost the Irish language and the Irish way of life, it would really be a great loss.	0	0	3	2	10
2. Some of the best people in Ireland are Irish speakers.	2	2	5	4	2
3. People in our country who only speak English should try harder to learn the Irish language.	2	1	1	5	6
4. People who speak Irish help to make the Irish way of life special and different from other countries.	0	0	5	4	6

With regards to the children's attitudes to Irish speakers (Table 7.7), a strong majority agreed that it would be a great loss if Ireland lost the Irish language, no children disagreeing with the statement. There were also predominantly favourable responses to the other items, indicating the children have a positive attitude towards the cultural and national aspects of Irish.

Table 7.8 Instrumental Orientation

Instrumental Orientation	Strongly disagree	Slightly disagree	Neutral	Slightly agree	Strongly agree
1. I think it's important for me to learn Irish because it may be useful to me someday in getting a good job.	0	1	0	7	7

Table 7.8 shows the only question in the questionnaire relating to the children's instrumental orientation to learning Irish (see section 4.7.3 for discussion on why this wasn't a

focus of this study). For the one question included, the vast majority of children in the class agreed that getting a good job was a source of motivation for them learning Irish. Only one child disagreed with the statement.

Table 7.9 Parental Encouragement

Parental Encouragement	Strongly disagree	Slightly disagree	Neutral	Slightly agree	Strongly agree
1. My parents try to help me with my Irish.	4	1	1	4	5
2. My parents feel that because we live in Ireland, I should study Irish.	4	3	1	2	5
3. My parents feel that it is important that I work hard at Irish until I finish school.	1	1	2	5	6
4. My parents really encourage me to work hard at my Irish.	0	5	3	2	5
5. My parents are usually very interested in anything to do with my Irish schoolwork.	2	3	4	4	2

For the scale on parental encouragement (Table 7.9), the results indicate that most children in the class experience parental support and encouragement for Irish. The item with the most positive response was item three – working hard at Irish until the child finishes school. Several of the other questions seemed to receive quite a mixed response, with almost half the group split between agreeing and disagreeing. While nine children agreed that their parents try to help them with their Irish, a significant minority of four children strongly disagree with this statement, with another child disagreeing slightly. Similarly, while seven children agree that their parents encourage them to work hard at Irish, five children slightly disagree with the statement.

7.2.1.2 Open-ended questions

The full responses to the four open-ended questions may be seen in Appendix D, but the overall trends will be presented here.

1. The things I like about how I learn Irish in school

The most frequently mentioned elements here were Bun go Barr (the textbook), games, songs, reading and videos.

2. The things I dislike about how I learn Irish in school

There were a wide range of elements listed for this question, including speaking out loud, songs and poems, that it is boring, writing, spellings, tests. Three children said they didn't dislike anything. One child said it is embarrassing when you don't know the answer.

3. I would enjoy learning more if...

Eight children mentioned using computers, computer games or games in general. Having access to help, making it more fun, or if it was easier were also mentioned.

4. These are the things that motivate me or make me want to speak Irish...

The most popular thread running through the responses to this question was seeing or hearing others speak Irish, including the school principal, other children, people outside of school and the TV. One child mentioned that it is the language of our country, another said they wanted to get a good job.

7.2.2 Exit questionnaire results

After taking part in the project, the children were invited to complete an exit questionnaire, which aimed to elicit their feedback about the experience of taking part in the project and using the game to learn Irish. There were six questions which used multiple choice responses on a five-point Likert scale. There were also ten non-Likert questions, some of which required yes/no answers, other which were open-ended (see section 4.7.3 for questionnaire development). This section will first look at the children's responses to the multiple choice questions before moving on to present the non-Likert responses.

7.2.2.1 Likert Scale Questions

The overall frequencies of response to the multiple choice questions will be presented here. The numbers in each table refer to the number of children selecting a particular response

for each item. The highest frequency response for each item is highlighted in pink, and the items are ranked according to positive response.

Table 7.10 shows the relative impact that different aspects of the game had on children having fun, according to the children themselves. The responses illustrate that working as part of a team was a central part of them having fun in a game. This item, along with that referring to text chat had the two highest overall frequencies of children agreeing with the statement. Finding clues and solving the mystery were also very frequently reported as supporting the fun aspect of the game, followed by using the computer, earning points, travelling. Travelling was also mentioned a lot in the ‘other’ section – children talked about going through portals, going to different places in the world and flying. Earning points was brought up again in the ‘other’ comments, along with the fun of waiting to see who would win the trophy.

Table 7.11 shows a list of the different areas within the game, and how the children reported having fun in each area. The most popular areas were the Airport and the Headquarters. This is not surprising, as these two areas involved the most active experience of finding clues.

Table 7.10. What helped the children to have fun in the game

What helped you to have fun?	Really didn't help	didn't help	neutral	helped a bit	helped a lot
Working with your team	2	0	1	3	10
Earning points	1	0	4	2	9
Solving the mystery	0	0	4	5	7
Using your computer skills to learn Irish	1	2	2	5	7
Using the text chat	1	1	1	7	6
Finding the clues	0	2	3	6	6
Using Irish to do the missions	0	1	5	4	6
Listening to the children giving clues	0	2	3	6	5
Finding out what to do	0	2	5	4	5
Being on the computer	0	2	5	5	4
Travelling around the game	0	3	4	6	4
Writing the story	3	2	5	5	2
Other: trying to go get names of people going back and forward; I enjoyed travelling threw the portals and learning about the missing people and the suspects; I enjoyed speaking Irish; Earning points; I had fun learning Irish; When we alway find clues I have fun; Finding clues. Flying.; The computer; Going to all different places. Seeing who would get the trophy at the end.; Going to different places. HQ.; Travelling around the game. Being able to fly.;Getting a turn; Working with others.					

Table 7.11. Where in the game they had fun

Where in the game did you have fun?	Really didn't have fun	Didn't have much fun	Neutral	Had some fun	Had lots of fun
Aerfort	1	0	3	4	9
HQ	0	0	2	4	9
Ceantar Gamma	0	2	4	5	5
Ceantar Omega	3	1	1	9	2
Fáiltiú	2	4	2	6	2
Amharclann	0	2	9	5	0
Ambasáid na Seapáine	1	3	8	4	1
Teach an Ambasadóra	1	3	7	5	0

Table 7.12 then gives an overview of how the children rated the options of what encouraged them to work harder in the game. The most common sources of motivation for the children were earning points and being high on the leaderboard, with 15 and 14 children out of 16 claiming motivation from these. This is followed by, 12 children agreeing for each one, working with the team, being sure of doing the task well and having some catching up to do on the leaderboard. Nine children agreed that friend's encouragement motivated them to work harder, but four children disagreed. The issue of the difficulty level of the tasks showed a mixed response from the children. Nine children were motivated when the tasks were easy, and nine children were motivated when they were really difficult. However, when the tasks were really difficult seven children said that it didn't motivate them. In the other category, travelling to new places and text chat were mentioned as sources of motivation.

Table 7.12. What motivated the children to work harder

What motivated you to work harder?	Really didn't motivate me	Didn't motivate me	Neutral	Motivated me a bit	Really motivated me
Having some catching up to do on the leaderboard	0	0	3	0	12
Earning points	0	0	1	4	11
Being high on the leaderboard	1	0	0	4	10
Working with my team	1	1	2	2	10
Friend's encouragement	3	1	3	2	7
When the tasks were really difficult	5	2	1	2	7
Being sure I could do the task well	0	1	3	7	5
When the tasks were easy	1	1	5	4	5
Having choice in what to do	0	1	5	7	3
Other: When we went to new places; My team send me a text to help me get the answer.					

According to the results in Table 7.13, the most popular part of the missions was finding out who was guilty, with a total of 13 children agreeing that they liked it. This is followed by travelling around the world to find clues, with 12 children. These all relate to active learning and problem solving. Perhaps the least liked element of the missions was reading the instructions, with six children neutral, five children liking and five children not liking it.

Table 7.13. What elements of the mission the children liked

What parts of the missions did you like?	Really didn't like	didn't like	neutral	liked a bit	Really liked
Finding out who was guilty	1	0	1	4	9
Travelling to different parts of the world to find clues	1	0	3	4	8
Doing the quizzes	1	0	3	3	7
Reading the instructions	2	3	6	5	0
Writing the story, getting points for all the words	0	0	6	4	5
Other: Reading the interviews.					

Most children report using all of the problem solving strategy option given to them in the question in Table 7.14, and no alternative strategies were forthcoming from the children. Asking their partner and asking the teacher were the most popular strategies. Using text chat received a high number of affirmatives, but also six children said they rarely or never did it, highlighting the problems some children had with text chat.

Table 7.14. Problem solving strategies

If you were stuck, what did you do to get unstuck	Never did it	Rarely did it	Don't know	Sometimes did it	Always did it
Read the instructions	1	0	6	3	7
Ask your partner	1	2	2	9	2
Ask the teacher	2	1	3	8	3
Send a text chat to a friend	1	5	2	6	3

Table 7.15 shows the children's responses about what helped them to feel confident speaking Irish during the project. When the team spoke Irish was the most popular selection, followed by teacher encouragement. In the 'other' category, three children mentioned their partner as helping them to feel confident using Irish, and one child said that getting points helped.

Table 7.15. What brought confidence speaking Irish

What helped you to feel confident speaking in Irish during the project?	Really didn't help	Didn't help	Neutral	Helped a bit	Really helped
When your friends encouraged you to speak Irish	1	2	4	2	8
Reading the instructions in Irish	2	3	1	4	7
When your team spoke Irish	2	1	1	7	6
When the teacher encouraged you to speak Irish	0	2	2	6	6
When the teacher spoke Irish	3	3	1	5	5
Other: My partner talk to me in Irish; Me partner; My partner; Getting points					

7.2.2.2 Open production questions

In addition to the multiple choice questions, there were ten other questions on the questionnaire, some of which elicited a yes/no response, others which were open-ended and

called for elaboration from the child. These are summarised below, but full responses to each question can be seen in Appendix D.

Table 7.16 shows the distribution of responses for the yes/no questions. There was a very positive overall response to the project and the game, the majority of children reporting that they enjoyed the project, that the game was fun, that it helped their Irish and that they would like to do it again. In contrast, when asked about undertaking similar activities without the computer, there was a more negative response from the children.

Table 7.16. Exit questionnaire: Children's responses to the project and game

Ref	Yes	To some extent	No	Other
Did you enjoy taking part in this project?	14	2	0	1
Did you have fun in the game?	15	2	0	0
Do you think this game helped you with your Irish?	10	2	3	2
Do you think you could do the same kind of Irish activities in the classroom without the computers?	3	5	6	3
Would they be fun without the computers?	3	2	11	1
Would you like to use a computer game in school to learn Irish again?	12	2	1	2

7.2.2.3 Open-ended questions

The open ended questions asked can be seen in Table 7.17. Again, the general trends in the responses are given here, with further details in Appendix D.

Table 7.17. The open ended questions on the exit questionnaire

Question
What did your team do well together?
What could your team do better next time?
What helped you to use Gaeilge when talking and chatting in the game?
What was the hardest part of trying to use Gaeilge?
Why would/wouldn't you like to use a computer game to learn Irish in school again?
What would make the game better?

The children were asked what their team had done well together, and what the team could do better next time. The main areas the children highlighted for working well as a team were finding clues (5 children), and several specific elements of the missions (5 children) – using text chat for a jigsaw task, etc. One child mentioned that what they did well together was fight. When asked what the team could improve next time, three different children mentioned the need to stop fighting, with another child suggesting frustration needs to be managed better, two mentioned speaking Irish more, and two children suggested the team could be faster. These responses tie in with the discussion of teamwork in the focus group interviews (see section 7.4.2.2).

When asked what helped them to use Irish during the game, six children didn't respond. Of the remaining children, two of them mentioned the instruction sheets, others mentioned the new words they learned. Two mentioned the team or their friends, one said that points helped him to speak Irish. One boy merely said that he didn't speak Irish. This child reported difficulties engaging with the game and with his team and it appeared that the level of Irish was not accessible for him. This will be discussed further below in the focus group interview findings. There was a variety of answers to the next question, which asked what the hardest part of trying to use Irish was. These included writing a story, finding clues, talking, texting, reading, trying to tell someone what to do in Irish. Clearly when trying to use Irish, the children had the experience of being stuck – not having the language necessary to do what was asked of them. This can be beneficial for language learning, provided the children have access to resources where they can find the language they need and don't remain stuck.

When asked why they would/wouldn't like to use a computer game for learning Irish again, the most popular positive answer was that it was fun. On the negative side, one child said he doesn't always like computers, and another said it would be cheating to learn Irish on a computer game.

At the end of the questionnaire, the children were given the opportunity to make some suggestions about how to improve the game in a future iteration. Their recommendations included better graphics, making the game faster, putting in levels, more missions and more resources in the game such as cars. This illustrates their familiarity with commercial games which are far superior products to the game used in this project.

7.2.3 Language Assessments

Language assessments were developed (see section 4.7.4) and administered before, immediately after, and several weeks after the intervention. The goal of these assessments was to elicit copula use from the children and provide evidence of acquisition of the copula form by the children. A complete data set was not obtained due to frequent absenteeism (absenteeism indicated through shaded sections of Table 7.18. This had a major negative impact on the validity of these tests, as only eight children completed all three tests, three in the experimental group and five in the within-experiment control. Another limiting factor was that as a result of random assignment to experiential and control groups within the intervention, the children who struggled most with the language assessments were unevenly distributed between the two groups, with the majority of them in the experimental group. Therefore, it is not possible to draw any definitive conclusions from the language assessments, and the quasi-experimental set up was not realised as intended. Nevertheless, the limited data available shows some interesting features that merit future study.

The overall frequencies of types of sentence used by the children in the experimental group (who received focus-on form support) from the pre (1) to post (2) to delayed post (3) tests are shown in Table 7.18. Absences are shaded in grey.

Table 7.18. Experimental group types of sentence

	Verb Initial			Alternative syntax			Copula use			Other/no answer		
	1	2	3	1	2	3	1	2	3	1	2	3
Mark												5
Stephen				3						2	5	5
Philip	1									4	5	
Ryan				4	4	3	1	1				2
Seán				1						4	5	
Laura		1	4	4	3		1	1	1			
Sarah	4		4						1	1		
Maria						2				5		3

The results in the within experimental control groups who received no form-focused support are shown in Table 7.19, and the results from the external control group are shown in Table 7.20.

Tables of the children's full responses to the language assessments may be seen in Appendix D. While it is difficult to carry out a valid comparison of all three groups due to the issue of absenteeism, the overall picture is interesting. In the pre-test, the majority of responses contained the verb *tá* instead of the copula. There were fewer instances of *tá* in the post-test, and fewer again in the delayed post-test. However, the copula was not used by the children except in a small minority of cases in the copula construction that would be most familiar to them (see below). While use the verb *tá* gradually diminished, what seemed to emerge in its place for some children was a sentence construction that had similarities to the syntax of the copula, but did not include the copula itself. It was not possible to analyse this statistically due to the very small sample size.

Table 7.19. Control group 1 (in-experiment, no FonF): types of sentence

	Verb Initial			Alternative syntax			Copula use			Other/no answer		
	1	2	3	1	2	3	1	2	3	1	2	3
Peter	1			1						3		
Philip	1									4	5	
Kevin	2	1	1			1		1		3	3	3
John	3	1		2	3	4		1	1			
Simon										5		
Luke	NA											
Olivia	5				5	4			1			
Karen		2	3		1	2		1			1	
Anna	2	3	4							3	2	1
Caroline	5	2			2	5		1				

Table 7.20. Control group 2: types of sentence

	Verb Initial			Alternative syntax			Copula use			Other/no answer		
	1	2	3	1	2	3	1	2	3	1	2	3
CB1	3	3	5					1		2	1	
CB2	3	2								2	3	5
CB3			3			1		1	1	5	4	
CB4										5	5	5
CC1				4	4	4	1	1	1			
CC2	2	1	1	1	2	1		1	1	2	1	2
CC3	4	4	2			2	1	1	1			
CC4	1		4		1			2	1	4	2	

Three children were unable to complete the assessments – Mark, Simon and Luke. For just under half of the children overall there is evidence of a shift in the type of sentence structure used over the intervention, but the clearest examples of this are actually in the within-experiment control group, contrary to the intended outcome of the focus on form element of the control group. However, this could be related to the data collection issues – only three children in the experimental group completed all three tests. Furthermore, there could be an effect of the children’s ability, as the participants were randomly assigned to experimental and control groups as the majority of children in the experimental group struggled to answer the questions in the assessments– the column showing the frequency of children leaving questions blank or using inappropriate forms of sentence structure (for example rewriting the question) is the most common category of answer for this group of children. Some examples of children in the control group who demonstrated an evolution of sentence structure over the three tests are given in Table 7.21.

Table 7.21. Examples of shift in sentence structure from pre to post and delayed post-tests

	Pre-test	Post-test	Delayed Post-test
Olivia	Bhí Eoin an Garda nua	Adam an Garda nua	Pól an Garda nua
Kevin	Chuaigh Aoife an gruagaire	Tá Seán hé múinteoir	Maria Molloy hí príomhoide
John	Cheannaigh Martha is ainm don siopadóir	Lucy is ainm don siopadóir	Caroline is ainm don aisteoir
Caroline	Tá fiaclóir bheatha atá Neasa.	Tslí bheatha leictreoir atá ag Nathan.	Slí bheatha feirmeoir paddy.

In the examples shown in Table 7.21, all children used a verb initial construction in the pre-test. Two used tá/bhí and the other two selected other past tense verbs. In the post-test only one child was using a verb initial construction, and in the delayed post-test no children used a verb initial construction, or tá. Only one of the sentences in the post and delayed post-test is correct - the one using “is ainm”. There was one question in each test using the

construction “Cad is ainm...” the copula construction that the children would be most familiar with from school for introducing themselves. No children used the copula correctly in the first test, but six did in the second test and five in the third.

However, the children highlighted in Table 7.21 were the children in control group 1 – i.e., they took part in the game and were exposed to the copula in the game content, but did not receive additional form-focused input.

There is evidence of flux in all groups between the sentence structures used. While in some children the shift away from verb-initial constructions may indicate a growing awareness of alternative structures, such as the copula, there is no evidence of acquisition of that form from before to after the intervention. See section 8.4.4 for discussion.

7.3 Game interactions

7.3.1 Introduction

This section will present the results from analysis of the children’s interactions while playing the game, the recording of which was reported in section 4.7.2. The game interaction data was coded as described in section 4.8.1, and analysed in two main categories – Language and Experience of the game. These broad categories are shown in Table 7.22. For the purpose of triangulation with the focus group and questionnaire data, the entire corpus was also coded for any references to the game experience.

Table 7.22. Overview of relative frequencies of coded references for Language and Experience of the game.

Category	Coded references
Language	4121
▪ Speaking about Irish	45
▪ Utterances using Irish	2839
▪ Function of Irish use (task-oriented or social)	1237
Experience of game	232

This section will present the results of the data analysis of the game interaction corpus, presented according to the above categories.

7.3.2 Language

7.3.2.1 Introduction

This section will present the findings from the game interactions in the language category under the following headings – speaking about Irish, utterances using Irish and function of Irish use.

7.3.2.2 Language: Speaking about Irish

There was a very small number of interactions where children reflected on Irish – making up only 11% of the total interactions in the Language category. The conversations where children discuss Irish can be divided into three main categories, as shown in Table 7.23 with their relative frequencies.

Table 7.23. Relative frequencies of Speaking about Irish subthemes.

Speaking about Irish	Coded References
Perceived lack of competence in Irish	26
Having to speak Irish for the game	13
Attitude towards Irish	6

The data pertaining to each category will be presented below and discussed in more detail.

7.3.2.2.1 Perceived lack of competence in Irish

There were five children who made comments that indicated a perceived lack of competence in Irish. The children and the number of comments they made each are shown in Table 7.24. The full list of negative comments is shown in Appendix D. The children's perception of lack of competence will be discussed below in comparison to actual ability in Irish, as determined by the language assessments and teacher observation.

Luke, Mark and Simon had the lowest Irish ability in the class, according to the teacher ranking for the mixed ability groups, and according to the language assessments carried out in the intervention (see section 4.7.4. Neither Luke nor Mark were able to make any attempt at the assessments, and Simon merely copied out the questions in the one assessment he attempted). Luke and Mark had particular learning needs which meant that their participation in Irish lessons in school was limited to some oral work. They were

enthusiastic about taking part in the project, so they were grouped with more able partners to help scaffold their participation.

The majority of comments which reflect a negative perception of competence in Irish come from Mark and Simon. Simon's difficulties with the language led to him to withdraw from the game half way through, although he did take part in the focus group interviews afterwards and gave his feedback. Mark on the other hand, while he commented a lot about his perceived lack of competence in Irish, entered into the project with enthusiasm, and frequently attempted to use the Irish he had. His teammate was Sarah, one of the strongest students in the class, but she also had effective teamwork skills and was able to encourage Mark and to continue including him in the game. Simon's teammate was Kevin, another child with strong language skills. At the beginning he made several attempts to include his teammate, and to share the work,

Kevin: Simon, I need help... At around 9 o'clock

Kevin: i write the first you write the second i write the third you write the fourth,

Kevin: do you know how to do a fada [an accent to mark long vowels]? a fada? Hold alt gr and then you have to move and then press the button

but Simon still decided to withdraw. Simon's feedback afterwards was that he felt left out by his teammate (see section 7.4.2.8). Luke was the least negative of the lower ability children. He only made one comment about not being able to speak in Irish, but overall he engaged very well with the game and was hugely positive in his feedback in the focus group interviews.

Table 7.24. Children's perceived lack of competence in Irish

Child	#references	Sample comments
Mark	13	▪ I'm not good at Irish ▪ Do I look like I know my Gaeilge, no. well I know a lot of orally but I can't spell it. ▪ I wish I went to the Gaeltacht, laughs, oh I wouldn't make it a year there or a day or I won't make it a second there ▪ Speak English! ok, guys I don't understand
Simon	6	▪ I have no idea what that means. ▪ Sure I don't know any Irish. ▪ I can't do Irish anyway
Seán	4	▪ tá mé ag go huafásach ar an Gaeilge [I am terrible on the Irish] ▪ I don't understand a word of Irish
Philip	2	▪ I don't know Irish
Luke	1	▪ I don't know how to talk in Irish

The remaining two children who made negative comments about their ability in Irish were Philip and Seán. The teacher had ranked both boys with average ability for the mixed ability groups, however it is difficult to confirm this with the language assessments due to frequent absenteeism. Philip mentioned a few times that he didn't know how to speak Irish. When he encountered a challenge in Irish, he experienced a strong emotional reaction and needed consistent encouragement, support and positive reinforcement to keep him involved in the project. During the project, Philip was the child in the class who needed the most encouragement. He was strongly motivated by the rewards system, and when his team were in the lead, he was motivated and enthusiastic. In the focus group interviews he spoke about how he wanted to give up, but didn't. The encouragement and support that he received during the project was sufficient to help him overcome his negative perception of his ability.

Seán was in Philip and Luke's group. He displayed an even stronger negative perception of his Irish skills than his teammates. Interestingly, he chose to express his negative perception of his Irish ability through Irish, three times out of four negative phrases about his ability. He did not respond to encouragement as Philip did. In the focus group interviews after the project, it was Seán who gave the most critical and negative feedback, and was one of a small number of children who expressed no interest in being able to speak Irish (see section 7.4.1).

7.3.2.2.2 Having to speak Irish for the game

Six out of eight groups made reference to needing to speak Irish for the game.

Caroline & John: No this is an Irish game, I know but it's an Irish game you have to, I know but it's an Irish game so you have to speak Irish and even if you're not good at Irish HSI4

Some children did their best to do this through Irish.

Anna & Karen: Stopaigí [Stop:plural] speaking Béarla [English] HSI1

Olivia & Peter: Oh, stop. Tá an pionguin fhiosrach a haon [The Inquisitive Penguin 1 are], em, em ag caint le Béarla [speaking with English].HSI2

In some cases there is evidence of how a teammate's reminder can encourage the children to speak Irish.

Peter: It's like a castle place

Olivia: Bí ag caint ag... Gaeilge [Speak Irish] Peter

Peter: Ceart go leor [OK] HSI3

Luke, Philip & Seán: we haven't spoken one word of Irish

féach ar an ...[look at the]

féach ar an ... agus níl [look at the... and it isn't] HSI6

Some children's efforts to speak in Irish can also be clearly seen.

Mark: Sorry I need to speak more Irish if we want to win this HSI10

Sarah: téigh go dtí airport [go to the airport], stopaigí [stop:plural]

Mark: tá ag airport [is/are (no subject) at airport] , ah I'm trying to speak Irish HSI11

7.3.2.2.3 Attitude towards Irish

Given the fact that most of the transcriptions deal with task-oriented exchanges, there were very few conversations that indicated attitude to Irish rather than ability in Irish or response to the game itself. There are only four references to this from two groups. For Olivia

and Peter, we can see that Olivia says she doesn't like Irish when she doesn't understand what to do.

Olivia: em féach tú [look you] ... oh we have to report an Gardaí faoi [the police about] an event san ambasáid [in the embassy]. I don't get this. I don't like Irish ATT1

However, on two subsequent occasions she spoke into the recording device at the end of the task and said that she loves Irish.

Olivia: Tá mé críochnaithe [I'm finished]. is breá liom Gaeilge [I love Irish]. ATT3

We have already seen how Mark and Sarah interacted about Mark's difficulties with Irish. However, he also shows a positive attitude towards the language, saying that he wants to practice:

Mark: No I just wanna practise my Irish, tá [it is]. Is that Irish? tá [it is] yeh ATT4

7.3.2.2.4 Summary

While the remarks about Irish made up only 11% of the total Language category, more than half of the comments relate to a negative perception of Irish ability. There was also evidence to show that the children were aware that they needed to speak in Irish to take part in the game and earn points, and that they were on the whole willing to try this. In terms of the children's attitudes to Irish in general, very little information can be gleaned from the observational data as it wasn't something they talked about very often.

7.3.2.3 Language: Utterances using Irish

Out of a total word count of 30,963 words in the transcribed observational data, 6,994 of these words make up phrases using Irish exclusively, or phrases that blend English and Irish. This is 23% of the total corpus. However this is merely a broadly indicative figure - due to limitations in the transcription process, as described in section 6.8. The children used Irish in various different ways for two main purposes – to complete the tasks and to interact socially in an informal way. This section will first look at how Irish was used by the children, then explore why, looking at both task-oriented and socially-oriented utterances using Irish.

7.3.2.3.1 Overview

The 50 most frequently used Irish words in the data are shown in Table 7.25. We see that Tá [present tense: to be] is by far the most commonly occurring word.

Table 7.25. The most frequently occurring Irish words in the interaction corpus

	Word	Frequency		Word	Frequency
1	tá	435	26	fan	33
2	go	178	27	leithscéal	32
3	ag	158	28	le	31
4	níl	157	29	é	31
5	mé	138	30	tú	30
6	ar	86	31	agat	29
7	féach	84	32	atá	29
8	bhí	78	33	nóiméad	29
9	agus	74	34	í	26
10	na	67	35	hata	25
11	sé	67	36	bhfuil	24
12	o	64	37	cad	24
13	dtí	62	38	chonaic	24
14	ceantar	57	39	dó	24
15	dia	56	40	e	24
16	duit	48	41	gaeilge	24
17	mo	47	42	sa	22
18	stopaigí	47	43	timpeall	22
19	maith	44	44	cén	21
20	téigh	44	45	déan	21
21	críochnaithe	43	46	fear	21
22	fada	40	47	gruaig	21
23	gabh	35	48	haon	21
24	raibh	34	49	slán	21
25	scríobh	34	50	cé	20

The groups varied in their attempts to use Irish. A comparison of the percentage Irish use per group is shown in Table 7.26. Anna and Karen had the highest coverage of Irish, followed by Mark and Sarah and Olivia and Peter. These three groups showed consistent efforts to communicate through Irish, even when they encountered gaps in their language knowledge. The Irish that they used was often creative and improvised, in a way that was not seen in the other groups. The two groups with the least coverage were also the two groups containing two of the weakest children in the class at Irish, and the three children with the most negative attitude towards the language. The relationship between attitude and motivation to use a language and ability in the language are inextricably linked (see section 3.4.2). A child's language ability and their attitude towards the language will both impact on their

language use, and it is perhaps no surprise that the children with the most negative attitudes were the children who used Irish the least.

Table 7.26. The percentage Irish used in interactions per group

Team	% Coverage
Anna & Karen	25
Mark & Sarah	22
Olivia & Peter	21
Ryan & Stephen	19
Caroline & John	19
Laura & Maria	18
Kevin & Simon	11
Luke, Philip & Seán	9

7.3.2.3.2 How Irish was used

The children all knew that they needed to use Irish to successfully complete the game and possibly earn points and rewards (see section 6.4 for details). Different children and different groups addressed themselves to this task with varying levels of effort. All groups made use of the Irish they already knew, frequently exchanging greetings in Irish, or using classroom phrases that they had learned in school. In addition to this, in other interactions, some groups tried to speak only in Irish. This meant that their range of expression was limited, but the goal of the intervention was to push children to language production, and some groups responded very well to the challenge. Most groups tended to mix the Irish they had with English to get their meaning across. The different ways in which they used Irish will now be explored in more detail.

7.3.2.3.2.1 Greetings and classroom phrases

The class seemed to have a certain repertoire of Irish greetings and classroom phrases that they were very comfortable using. The most commonly used phrases in this category, and an approximation of their relative frequencies are shown in Table 7.27.

Table 7.27. Most frequently used classroom phrases

Classroom Phrase	Relative Frequency
Dia duit/Dia's Muire duit [hello]	48
Stopaigí [stop: plural]	47
Táim críochnaithe [I'm finished]	43
Go raibh maith agat [Thank you]	34
Gabh mo leithscéal [Excuse me]	32
Déan deifir [Hurry up]	15
Conas atá tú? [How are you?]	14
Tá mé go maith [I am well]	14
Ceart go leor [OK]	14
Tá fáilte romhat [You're welcome]	11
Brostaigí [Hurry: plural]	11

The children did not seem to understand the plural nature of both stopaigí and brostaigí, and used them as unanalysed chunks, often for singular cases, however they used all the other phrases appropriately. One interesting usage of very common Irish phrases was by Mark and Sarah. They were having an argument, Sarah asking Mark to stop. He finally agrees, she thanks him, and he changes the usual you're welcome response to you're not welcome:

Sarah: níl níl níl níl níl [it isn't, used as 'no'] stopaigí [stop:plural] ok stop Mark!

Mark: Ok, stopaigí [stop:plural]

Sarah: Go raibh míle maith agat [Thank you]

Mark: Níl fáilte romhat [You're not welcome]

Given that Mark is one of the weakest at Irish in the class and does not usually take part in the Irish lesson due to his learning needs, this demonstrates a flexibility with the language that he does have.

The groups were given a prompt sheet with some useful phrases for them to use in the project. However, only two groups tried to use them, and even they only tried for the first day or two. The prompt sheet included phrases such as “An bhfuil cabhair ag teastáil uait?” [Do you need help?]; “Tá an ceart agat” [You're right]; “Caithfidimid.... a dhéanamh” [We have to..], but these did not permeate the children's interactions, perhaps as they had not been pre-taught and did not form a central part of the tasks which the children had to complete.

7.3.2.3.2.2 All Irish utterances

Excluding the greetings and other classroom phrases, there were still 400 utterances/interactions that took place entirely through Irish. The breakdown across groups is shown in Table 7.28.

Table 7.28. Comparison of All Irish utterances by team

Team	All Irish Utterances
Mark & Sarah	98
Anna & Karen	82
Olivia & Peter	63
Ryan & Stephen	48
Caroline & John	40
Laura & Maria	29
Luke, Philip & Seán	24
Kevin & Simon	16

Some trends can be seen across all groups in how they attempted to speak only in Irish. A lot of repetition was used to emphasise or communicate meaning in the absence of enough Irish to elaborate on a point.

Karen: Féach ar an.... [look at the..]
 Anna: Ar fheabhas [Brilliant]
 Karen: Féach féach [Look look]
 Anna: Féach ar sin [Look at that]... IP1

Spéaclaí! spéaclaí spéaclaí [glasses glasses] IP4

Other times, the children used sentence constructs they already knew, for example “ba mhaith liom” [I would like] or “ceart go leor” [ok] to communicate meaning effectively.

ba mhaith liom deich pointe [I would like ten points] IP7

cá bhfuil an aerfort? [where is the airport?] IP9

Some children tried to improvise in sentence construction, using some sentence elements with which they were familiar and trying to adapt them to suit their needs.

Oh téigh go dtí ar ais ar aerfort [Go back to the airport]. HQ? níl a fhios agam [I don't know] IP11

Cén dath na súile? [what colour the eyes] IP13

Sarah: Téigh go dtí Niamh próifílí [Go to Niamh profiles] IP16

Peter: féach go dtí an... [look to the]
 Olivia: ok, em, téigh go dtí an ...[go to the] IP19

Em. ar fheabhas [excellent], agus tá isteach sa pictúir [and is (no subject) in the picture] Peter
Peter pictúir [picture] IP20

The above extracts illustrate that the children can successfully communicate meaning through Irish, even if their sentences are not always grammatically accurate. These samples demonstrate the pushed output nature of the game, where children needed to use whatever Irish they had to make their meaning clear and progress in the game. IP19 is an example of peer correction, where Olivia rephrases Peter's comment correctly.

The extracts show many instances of children using the Irish that they already know, transferring knowledge of sentence structure to their current contexts and improvising with Irish when they need to communicate something new. It would appear that the collaborative and task-based approach used created a suitable environment for the children to use the language they already had.

7.3.2.3.2.3 Mixed Irish-English utterances

In addition to the utterances and interactions described above which were entirely in Irish, there were even more examples of the children using a mix of both English and Irish in their speech (529 coded utterances). This was done in several ways. At times, the utterances were Irish dominant but used English insertions, usually indicating missing vocabulary. Other times, the utterances were English dominant with Irish word insertions, often from the game itself or from phrases they knew from school already. There were also instances of evenly mixed sentences, comprising chunks in English and chunks in Irish. These three types will be discussed in turn, with illustrative quotes from the data.

7.3.2.3.2.3.1 Irish Dominant

In the Irish dominant examples, to a large extent the Irish syntax is preserved and an English content word (noun, adjective or verb) is inserted, or else an English link word.

Noun insertion: Nouns were the most common words to be inserted into Irish sentences.

Cad é ar Gaeilge ar [What is Irish for]... clue? MIE1

Puppy
tá madra beag [there is a small dog] MIE4
ag féach ar na [looking at the] names Caitríona MIE5

Táim críochnaithe ar an gorm [I'm finished on the blue]... paper.MIE14

Verb insertion: There were also several instances where the English of the verb was inserted into the sentence.

an bhfuil cead [are (missing subject) allowed]... write as Béarla [in English] MIE6

There's Anacanda Dílis a dó [Faithful Anaconda 2] MIE12

O: Tá mise ar fheabhas [I am excellent]

P: Ceart go leor [ok]. We are ar fheabhas [excellent] MIE13

Adjective insertion: In these adjective insertion examples the correct Irish syntax is maintained.

tá sé [it is] an-[very]distracting MIE2

Tá mé [I am] ana [very]glitchy MIE9

Link words: The use of link words may demonstrate an increasing normalisation of using a mix of Irish and English (see section 8.3.4 for discussion).

Wait is... gruagaire í [she is a hairdresser] MIE7

féach mé í [I look her] so cas timpeall [turn around] MIE10

Nah, ok. tá mé dul ag ceantar gamma [I'm going at Area Gamma] MIE15

7.3.2.3.2.3.2 English dominant

English utterances with Irish insertions are also very prevalent in the observational data. Often this involved an English syntax with insertion of an Irish noun, often coming from the game terminology or the instructions the children were reading.

um where's the aerfort [airport] MIE17

so, ok, we need to go to the amharclann [theatre] MIE20

Sarah: Mark, we've to go to the Fáiltiú [Reception] MIE23

Aoife's not there, Aoife is a rúnaí [secretary] MIE29

HQ maybe? There's Piongain Fhiosrach a haon [Inquisitive Penguin 1] MIE30

Another frequent occurrence was the children using Tá to start sentences, even if they were unable to complete the sentence in Irish.

Tá. .. miss i didn't put it anywhere it was just on my desk MIE22

O: Tá an [The ___ is] ... Cos that's our base. Ok. MIE27

Níl was the word they used for no, and often completed the sentence in English.

níl that's it's a Mario a three d Mario MIE19

Mark: OK... they're texting... ok níl níl MIE26

O: Níl... we have to wait for, em... mystery a dó MIE23

Other times they used some common classroom words and inserted them into an English sentence.

Are we críochnaithe [finished]? MIE21

Sarah: stopaigí [stop:plural]... turn around MIE24

In most of these utterances we can see that the children were quite focused on the task they had to do. There may have been a link between the cognitive demand of the task and the amount of English the children spoke – they may have reverted to English sentences when under pressure in an attempt to manage the cognitive load.

7.3.2.3.2.3.3 Balanced English-Irish

The previous section dealt with insertions of one or two words from one language into a sentence in the other language. There were also more complex mixed utterances and phrases where words from the two languages were more evenly mixed in the utterances. These were in fact the most common type of mixed language utterances. In these examples the children migrate fluidly between the two languages maintaining a coherency of meaning. Some children make the effort to stay speaking in Irish, using the Irish they know creatively and using English when they need to.

tá sé ag [it is at] text chat, tá sé [it is] information about Séan MIE33

tá sé [it is] Séan, Séan, Séan Adam é [subject of copula, masc]. É Adam. Adam é. Tá mé [I am] disagree with you MIE34

Let's go emmm... suas suas suas [up up up]. Ar fheabhas [excellent]. Emmm tá an BF2 [the BF2 is] an Fáilte [the reception]. Maybe. Déan deifir [hurry up]. Oh, tá [it is]. MIE48

Other children speak predominantly in English, but then remember to use Irish words and phrases, usually connected with the game terminology or the task instructions.

Yeah, I just want to make sure we keep... déan deifir, déan deifir [hurry up hurry up]... déan deifir ag eitilt, ag eitilt [hurry up flying, flying] MIE35

so we need to look for the pictures féach ar an [look at the] pictures MIE37

Are ye still in HQ? Aw you should see it it's so cool. This is class! Oh tá HQ [HQ is]... go maith [good]. Go maith [good], very good. It's... tá HQ [Hq is]... tá mé ag dul ar [I am going on HQ] HQ. MIE50

Some of these extracts show the children attempting to translate English to Irish or vice versa

tá gearr {short}... gearr... eh... gruaig fada [long hair] long blonde hair, long brown hair MIE38

Níl mé go maith [I'm not good] an game – I hate this game MIE49

7.3.2.4 Language: The functions of language use

The instances of Irish were categorised according to two broad themes: task-oriented language use and social language use. The task design was structured to ensure that teammates would need to collaborate in order to complete the tasks (see section 6.2).

However, while the task-oriented language may have involved social interaction, all of the interactions are focused on completing the task at hand. The social category then encompasses all the occasions when the children engaged in non-task oriented social interactions. There were significantly more task-oriented than social utterances using Irish, by a ratio of 4:1.

7.3.2.4.1.1 Task-oriented language use

The majority of the children's utterances using Irish were task-oriented in nature, with 679 coded utterances for tasks, and 184 social. This indicates that the game setup was successful - the game was designed using task-based language teaching principles to create an environment where the children would have to use Irish to complete the tasks. The task-based

interactions do show evidence of Irish use, however while concentrating on task completion, a high proportion of English was used by the children. The mixed English-Irish utterances outnumbered all Irish utterances by a ratio of 3:2 in the task-oriented category. Many of them were so focused on achieving the goals of the game that they seemed to forget to use Irish. This may be related to the cognitive load or challenge of the game – when this was high, the children tended to use more English, and this will be discussed in section 8.3.5. The different types of task engagement are as follows:

- A. Reading the instructions
- B. Looking for information in the game
- C. Communicating with teammates over chat for clues
- D. Doing quizzes
- E. Writing reports

The section discusses the Irish use for each of these tasks, and gives illustrative quotes for each. Further extracts in this area may be seen in Appendix D.

The first task-oriented category is reading the mission instructions. In reading the instructions students:

- Translated

I'll try and translate this in English
téigh ar ais arís go dtí an aerfort[go back again to the airport], go back to the airport TASKA4
- Paraphrased

Ryan & Stephen: téigh do dtí an HQ agus féach ar do phrófil [go to the HQ and look at your profile] TASKA1
- Began task according to instructions without translation

Mark: Ok, what are we doing in the HQ?
Sarah: Ok, féach ar na próifílí [look at the profiles]... cén slí bheatha [what job...]
Mark: we're going to have to go moving
Sarah... atá acu [do they have]. So téigh go dtí [go to] Anthony profile
Mark: OK... they're texting... ok níl níl
Sarah: Téigh go dtí Anthony [go to Anthony]
Mark: Anthony, I think Anthony proifílí [profiles] TASKA5

The second category of interaction relates to finding information in the game required to complete tasks. These utterances are typically in English with Irish single insertions.

Laura & Maria: Well she has brown hair, dath [colour]... blonde hair, blonde, [inaudible] eyes, súil [eye]... TASKB1

Mark & Sarah: Gruaig fada [long hair]... so blonde hair... a hat and hair TASKB2

Often the Irish words used are those in the game or in the instructions.

Caroline & John: Well it's worth a try, ambasadóir [ambassador] TASKB4

It may be the case that when the children are so absorbed in the activity that it is too much cognitive load to try speak in Irish as well as try to find the clues or information in the world. However, some teams make more of an effort to communicate through Gaeilge while working on the tasks, notably Mark and Sarah, Karen and Anna.

Mark & Sarah: he's wearing a hat, his eyes kinda look grey
but em níl gruaig fada TASKB2

Some children try to clarify meaning through questioning in Irish.

Luke, Philip & Seán: féach ar an agallamh [look at the interview]

Uh agallamh [interview]? What's that? cé tá agallamh [who is interview] TASKB6

There are also examples of children attempting to communicate through Irish, and having to improvise.

Olivia & Peter: Tá... Tá an... San aer.[the ____ is in the air].. tá san aer... an BF [it is in the air , the BF clue] TASKB7

Ryan & Stephen: Will I just write it on PF?

Yeah, ag scríobh [writing]TASKB8

Some tasks required the children to communicate with another pair of children over text chat in order to complete jigsaw type tasks (D. W. Johnson & Johnson, 1999). All groups engaged to some extent with the text chat.

Caroline & John: click onto this and you've to type, fáinne cluasa [earrings]... earrings
TASKC3

In some cases, children discussed what to say in the chat to the other team in order to focus attention, or express frustration with their teammates not responding to text chat, or check orally across the classroom that their chat message has been received.

Laura & Maria: They're not even concentrating

What'll I say – concentrate

Cén dath a súile? [what colour her eyes]

Agus an súile [and the eyes]... s u fada i l e fada i l e. So you need to press send TASKC2

Kevin & Simon: Olivia come onnnn cá bhfuil Olivia agus Peter[where are Olivia and Peter]?
ní raibh siad ag caint [they weren't speaking] TASKC4

Luke, Philip and Seán: Laura and Maria did you get that? TASKC5

Another task the children had to do was to complete quizzes in the game about the information they had been gathering in the tasks. Some groups had form-focused tasks to do, other had meaning focused (see section 6.7 for description of experimental set-up). Most groups interacted with the Irish multiple choice answers in the quizzes and discussed the possible answers in English, however some children discussed the possibilities in Irish.

Olivia & Peter: Niamh is a múinteoir [teacher]
that one
this one, that was aoife
cén [which]... ag Anthony, Anthony is a ...TASKD4

Sarah: Ok Cillian... déan click is something é [click he is something]. Is... No this one
Mark: sorry, I pressed the wrong one
Sarah: this one, this one TASKD3

Caroline & John: is aisteoir níl is ... is cócaire [..is an actor, no is a chef..]
níl
Aisteoir... [actor]
Is cócair... féach is ar...[is a chef... look]
Oh TASKD1

For one of the form focused groups, we can see the children trying to see a pattern in the answers, but not correctly identifying that í is for a woman and é is for a man.

Ryan & Stephen: oh is it always one at the top
maybe
[inaudible]
it's always í it's always í í e fada e fada try e fada TASKD5

The final task of the game was to write a report of the mystery and everything that had happened. This task was entirely language oriented and the children interacted primarily about vocabulary and spelling during the task.

Laura & Maria: bhí.... ag déanamh na boileacháin, [...were playing hide and seek] how do you spell that
umm [inaudible] how do you spell déanamh, how do you spell déanamh
déana
yeh
mh
yeh ok
umm na – n a
bhfolachán TASKE1

Ryan & Stephen: chuala sí baby ag caoineadh [she heard a baby crying]
 sé sé... [he he]
 bhí sí...[she was]
 what's baby in Irish
 ...
 what's baby in Irish
 leanbh [baby] TASKE2

Karen & Anna: K: Tá sé [it is] suddenly, what's suddenly?
 A: Níl fhios agam [I don't know]. Níl fhios agam... Go tobann [suddenly].
 K: Go tobann.....
 A: e-a-... mar...mar... mar...[because]
 K: fear...[man]
 A: t-h-o-g. Thóg. Thóg. Thóg [took]
 K: Ok, so thóg
 A: Thóg... man took, oh eh...
 K: Tá ... na páistí... [the children are] TASKE4

Again, a lot of English is used in these task-based interactions. The children demonstrate frequent interaction with Irish words, but through English. There are frequent requests for how to spell words, and for Irish vocabulary.

7.3.2.4.1.2 Social language use

The primary focus in this thesis is on the task-based interactions, not the social. In the game interaction data, the majority of interactions were task-oriented, but the children still engaged in social chat with their teammates in Irish that was not directed towards completing the tasks. It was certainly encouraged by the strong emphasis placed on using Irish by the teacher, and the promise of earning points for Irish use may have been an incentive for children to interact off-task as well as on-task in Irish.

While the mixed Irish English utterances outnumbered all Irish utterances in the task-oriented category, they were approximately equivalent in the social category. A large proportion of the social language in the transcripts comprises greetings such as “Dia duit” [hello] and “Conas atá tú?” [how are you?], which frequently took place before the children began the tasks.

Dia duit
 Dia is Muire duit
 Conas atá tú

Tá mé go maith buíochas le dia [I'm well, thanks be to God]

Céard atá today's misean [what is today's mission] SOC1

There are also examples of informal and creative use of Irish, for example the children talking about elements of the game that they are encountering, or chatting about the game in Irish.

puppy

tá madra beag [there is a small dog]...ruff ruff ar madra SOC3

this game is so glitchy

ta me ana[I am very] glitchy SOC8

Tá mé síos [I am down]... tá in a puddle... a piece of uisce [water]. Maria, Maria, tá mé [I am] in a puddle of uisce [water]. I'm in a puddle of water... SOC10

O: An maith leat an ceantar gamma[do you like the Area Gamma?]?

P: emmm Níl... tá an ceart go leor [No. . it is ok] SOC13

7.3.2.5 Summary

Most children who took part in the project engaged well with Irish, through using the Irish they already knew from school and through interacting with the new language they encountered in the game. Shorter utterances in Irish were most common, with longer phrases containing some English words. Codemixing was extremely prevalent and was a strategy that the children used to maintain fluency of discourse and make progress with the game. Social interactions were more likely to be all through Irish than task-oriented interactions, perhaps due to the higher cognitive load of the tasks that made it more difficult for children to concentrate on language production in addition to the problem solving needed for the tasks.

7.3.3 Experience of the game

7.3.3.1 Introduction

Most of the observational data was quite task-oriented, and the children did not spend a lot of time critically reflecting on their experience. The coded references about the game comprise only 5% of all the coded references, but some evidence can be gleaned from these extracts about how the children responded to their experience of the game, demonstrating a range of emotive responses. Their comments are divided into the subcategories shown in

Table 7.29, along with how many teams commented on each subsection. It can be seen in the table that Dissatisfaction with the game was only observed in three sources, whereas motivating team talk and rewards were observed in all, experiencing challenge was observed in seven out of eight, and a positive response to the game was observed in six groups.

Table 7.29. Relative frequencies of comments about the game experience across groups

Experience of game	Teams /8	References
Motivating team talk	8	98
Rewards	8	78
Positive response to game	6	31
Experiencing challenge	7	15
Dissatisfaction with the game	3	10

The first two categories involve comments linked to performance on tasks, whether it relates to team members motivating each other or mentioning rewards. This would suggest that during the game the children were very focused on accomplishing the tasks set before them. The breakdown for each group and their relative frequencies of subtheme is shown in Figure 7.1.

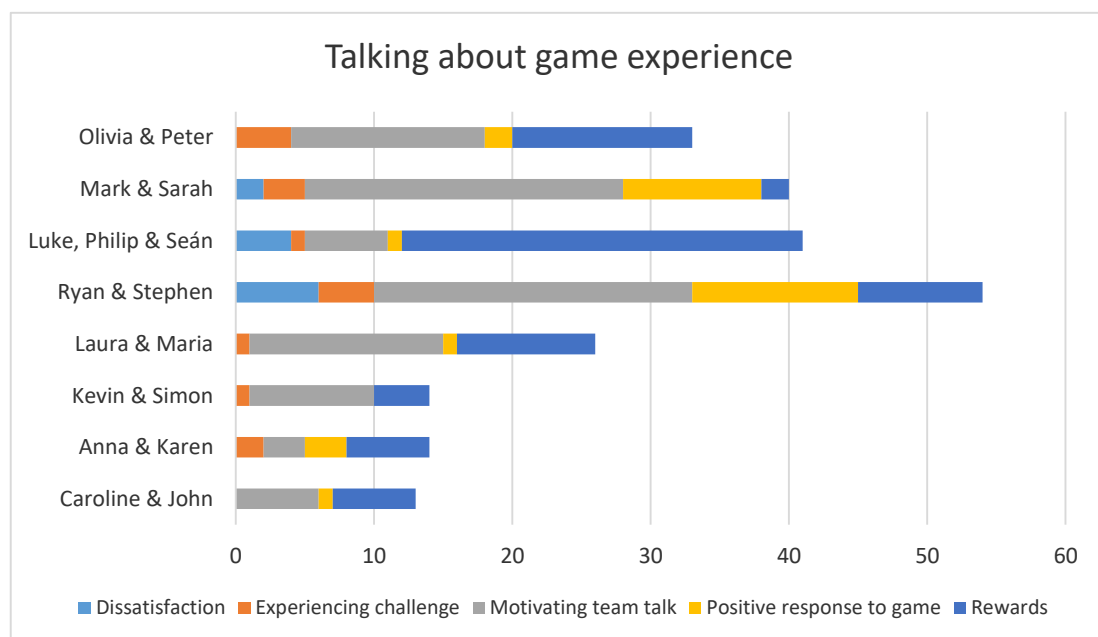


Figure 7.1. Group by group breakdown of game experience subthemes

We can see that Ryan and Stephen talked the most about the game experience, and that both their team and Mark and Sarah engaged in a lot of motivating team talk, along with responding the most positively to the game. Luke, Philip and Seán's talk about their game experience was primarily about rewards. They had at times a negative experience of the game, but the potential to earn rewards kept them involved and motivated to keep going. Each subtheme will be discussed in more detail below, with relevant extracts from each theme presented.

7.3.3.2 Motivating team talk

There were many instances of children motivating their teammates in the observational data. They used common phrases such as "come on" or "let's" in English, or "Déan deifir"/ "Brostaigí"[hurry] in Irish.

Ryan & Stephen: Here let's find the clue. We're going to have to go back
Through the roof we go
Ok go... let's find the clue over there MTT9

Olivia: Ok, now. Let's go emmm... suas suas suas [up up up]. Ar fheabhas [excellent]. Emmm tá an BF2 an Fáilte [the BF2 the reception]. Maybe. Déan deifir [hurry up]. Oh, tá. MTT7

The children were clearly conscious of time pressure to complete the tasks, and sometimes became impatient with teammates.

Mark & Sarah: S: brostaigí, brostaigí
M: we're nearly done, come on...
S: come on brostaigí... MTT4

Ryan & Stephen: come on x seriously if you want to win this... ah... seriously do you want to win this or not MTT17

7.3.3.3 Rewards

There was wide disparity among the teams in mentioning rewards during the game, as shown in Table 7.30. Of course, the direct comparison of results is difficult for data collection issues set out in Section 6.8, however they may give an indication of the general trends.

Table 7.30. Comparing references to rewards by team

Team	References to rewards
Anna & Karen	6
Caroline & John	6
Kevin & Simon	4
Laura & Maria	10
Luke, Philip & Seán	29
Mark & Sarah	2
Olivia & Peter	13
Ryan & Stephen	9

The highest frequency of reference to rewards was Luke, Philip and Seán's team, which was the team which had the most negative feedback, negative attitudes towards Irish (see section 7.3.2.2.3).

Among the conversations which touch on rewards, some comment on how many points can be earned in a particular task.

Karen: Téigh go dtí [go to] ... scríobh síos an scéal [write down the story]... what happened...
Tá sé [it is] 500 points... GRW1

Many more express a desire to earn points, or comment on the earning of points during the game.

Olivia & Peter: ok... tá ba mhaith liom cúig phointe [I would like five points] GRW2
Some children actually counting up the points that they think they have earned, and comparing with other teams.

Luke, Philip & Seán: Stephen, we have 400 points
Hold on, they've 950 we've 865 GRW7

Laura & Maria: we're in the lead six hundred and ... points
Right we need we can get more if we...
Another... and that'd make eight hundred GRW12

This ties in with an awareness of who is in the lead, and of the team's position on the leaderboard. Some children express demotivation about not earning points:

Mark & Sarah: still on misean a haon [mission one], we're going to get worst marks GRW15

There are additional conversations about winning the game or winning the daily trophy.

Mark: Sorry I need to speak more Irish if we want to win this GRW16

Olivia & Peter: right, we are definitely gonna get that trophy GRW21

The rewards structure clearly had a stronger impact on some groups than others, but the extracts show how wanting to win was a source of motivation for some children.

7.3.3.4 Positive response to game

While taking part in the game, many children made positive comments about the experience (see Appendix D). Most of the children's positive comments during their teamwork were about the 3D VE in which the game was set. There were particular places in it, or 3D models in it that they appreciated.

Anna & Karen: Caroline! Caroline are ye in the house. look it's class PR1

Caroline & John: hq is cool isn't it PR2

There were also more general comments which indicated that they were enjoying the game.

Ryan and Stephen: I love this game, it's really fun, isn't it Ryan? PR8

Laura & Maria: This is actually a really good game PR9

In PR16 we can see the link between earning points and having a positive attitude towards the game – this is in direct contrast to the negativity expressed by the children when experiencing failure or a lack of competence in the game.

Ryan & Stephen: we're on 800 points

no we're not we're on 975

...

this game is the best PR16

7.3.3.5 Experiencing challenge

The level of challenge in the game was difficult to adjust to the optimum level (see section 6.4). During the game sessions, children sometimes mentioned how they were experiencing the challenge. If they were finding it difficult, there was a potential negative emotional impact.

Laura & Maria: this is really hard [sighs] CHA5

If the children didn't know what to do, they experienced a level of frustration, and often turned to their peers for help.

Olivia & Peter: It's so complicated. Do you know what to do? Stephen do you know what to do? It's so hard. CHA8

Having to speak Irish all the time was also mentioned as challenging.

Mark: it's hard trying to say Irish all the time CHA6

There is a possible link between the challenge being too high and disengagement from the game, with some children alternating between positivity and negativity towards the game depending on whether or not they know what to do, for example in CHA10 Ryan and Stephen discuss how hard the game is and one boy says he doesn't like it, while in CHA12 the attitude changes to the game when the challenge is achieved, when they find what they're looking for.

Ryan & Stephen: This is actually really hard

I'm on the roof

I don't like this game really CHA10

Why is it always so hard to find, oh there it is. It's actually good CHA12

7.3.3.6 Dissatisfaction with the game

During the recorded groupwork, there were ten occasions where three out of eight groups indicated dissatisfaction with the game. All of these ten references to dissatisfaction with the game are shown in the appendix. Out of the eight groups, only three expressed dissatisfaction, however two of the groups did so multiple times. Mark and Sarah were frustrated with a technical problem and wanted to reinstall the software:

Mark: I hate.... why can't she reinstall it DIS4

but they didn't have any other negative comments about the game.

The other two groups had multiple negative comment, a selection of which are shown below.

Luke, Phiip & Seán: I never... i hate this game

.. blow up all of this

...Can we hack it? DIS2

Ryan & Stephen: I hate this it's terrible

I hate it so much DIS5

Ryan and Stephen make some general negative comments about the game, and others where there seems to be a link between not liking the game and finding it too hard or not knowing what to do.

Ryan & Stephen: I don't like this game

It's good but I don't know what to do

I dunno how you play it DIS8

We didn't even get one thing done, I hate this DIS10

7.3.3.7 Summary

While the game experience comments only comprised a small percentage of the total coded references (5%), the conversations that the children did have about their game experience were quite rich and can provide a deeper insight into the main areas which drew comments and observations from the different teams. The experience of working as part of a team was clearly central to the experience, with the children regularly interacting and encouraging each other to engage with the game. Rewards provided motivation for all groups, albeit to varying degrees, with the desire to win keeping the most negative group involved to the end. The design of the game environment was the focus of most of the positive responses to the game, which greatly outnumbered the reported dissatisfaction with the game. The sources of negative feedback about the game correspond with the negative feedback in the focus group interviews, and these children's perspective will be explored in more detail there. The experience of the game as hard outweighed the references to it being easy, and the effect of this can be seen in some of the emotional responses of the children. Again, this will be explored in more depth in the focus group interview results.

7.3.4 Conclusion

This section presented the results from thematic analysis of the children's game interactions. The coded interactions were divided into two main categories – Language and experience of the game. These will be explored in more detail below in relation to the focus group interviews, in addition to the themes specific to these interviews.

7.4 Focus group interviews

The focus group interviews were recorded, transcribed and analysed thematically as described in section 4.8.1. This section will first present the most common themes that were evident in the data, before exploring each of these themes in more depth. An overview of the principal themes in the interviews can be seen in Table 7.31. The databars give a visual indication of relative frequencies. It is important to note that the numbers in the figure refer to

the total number of coded references for each theme. Each reference can include one child's input or a conversation between several children about the theme. Therefore the numbers are not a direct count of individual children's responses, but may only give a general indication of comparative frequencies of occurrence of each theme.

Table 7.31 Overall prevalence of themes in focus group interviews

Overall prevalence of themes	
Attitudes to Irish	59
Experience of the game	392
Outcomes from game	176

The children's experience of the game dominated the discussion, followed by the outcomes that they believed came from their participation. The children's attitudes to Irish were also coded under the experience and outcomes themes, however given the centrality of the motivation issue for Irish, it was decided to code all the children's attitudinal references also under a separate theme. These three principal themes will be discussed in turn below. A table of extracts for each theme can be seen in Appendix D, but the discussion below will present illustrative extracts only, with reference to where they can be found in the appendix.

7.4.1 Attitudes to Irish

There were various attitudes to Irish that were apparent in the children's discussions, including their sense of frustration with Irish class, embarrassment using Irish and how this was reduced during the intervention, an increased appreciation for Irish. Some children had a negative perception of their own ability and a small number reported no interest or appreciation for the language.

One of the issues that came up when the children were discussing their experience of the game was a sense of frustration that they sometimes feel during the normal Irish class.

"It is good because if you are in a workbook, you say "Ah, Miss, why do we have to do Irish?!" GATT4

In one particular instance, the child involved has special educational and behavioural needs, and it is clearly a struggle for him to stay focused during the lesson. However, the use of computers was a great source of interest and motivation to this child, and he reported that it was much easier for him to stay on task playing the game.

“after running around and you come in and sit down at the computer after break and it is just really fun, and I was surprised...” GATT5

The problem of embarrassment in Irish class when the child doesn’t understand or doesn’t know the answer was raised by several children.

“Well I feel less embarrassed because I used to be embarrassed if I didn’t know the words and what this means and stuff.” GATT15

Most children reported an improvement in their confidence speaking Irish after the project – they now “felt able” to pronounce the words, to put a sentence together, to have a conversation, etc.

“I felt more confident and as Stephen said I felt embarrassed as well before because like you were just saying out words and you wouldn’t know what they mean.” GATT16

They also described it as more “normal” to speak in Irish and said that it had become like a second language to them.

“I find it easier, more comfortable kind of like when I speak English now because it’s so much easier.” GATT21

Some children appeared to have a negative perception of their ability in Irish – saying that they’re not that good at it.

“Yeah, I am not too good at Irish but that game helped me a good bit” GATT1

“I am not very good at Irish in the book.” GATT18

This gives an indication that these children do not regularly experience success in the language, they are more focused on their failure and what they don’t know.

Several children claimed that taking part in the project helped them to value the Irish language more. For one child in particular, it seemed to help him to take ownership of Irish, and he spoke about needing to learn your own language first before learning other languages.

“You showed how much Irish means to us.” GATT11

“Well you need to learn different languages, you need to know your own language to speak the other languages you are learning.” GATT14

The fact that he described Irish rather than English as his own language displayed how Irish had become meaningful to him. Another child suggested taking the game to London to teach people over there Irish.

One child however, said that he didn’t really care about anyone learning Irish, and another child then echoed his sentiment.

“I don’t really care if anyone learns Irish.

Yeah, they learn it themselves. It's not our problem.” GATT7

This lack of shared ownership among the more disengaged students is in stark contrast to how the other children encouraged each other and felt a kind of common mission in completing the project.

7.4.2 Experience of the game

A range of subthemes are grouped within the theme ‘Experience of the game’. These can be seen in Table 7.32, along with a visual representation of their relative frequencies.

The top three most pervasive subthemes were: the motivation of rewards; relatedness which deals with the positive impact of others and the motivation of computers/computer game. These are closely followed by the subtheme of challenge and the subtheme which encompassed all the negative experiences the children reported having during participation in the game.

Table 7.32 Experience of the game - distribution of subthemes

Experience of the game	
Active Learning	31
Challenge	46
Fun	28
Motivation of computers/computer game	52
Motivation of rewards	90
Relatedness	85
Suggestions for improvement	16
Negative experience during game	44

It was possible for utterances to be coded for more than one theme. The subthemes will be presented below, in order of decreasing prevalence and integrating any negative feedback into the results for each theme. Again, tables of representative extracts for each theme can be seen in Appendix D, and illustrative quotes will be presented below.

7.4.2.1 Motivation of rewards

The motivation afforded by the rewards in the game was the most prevalent subtheme with a total of 90 references. The rewards structure of the game was received very positively by the children. Their main source of motivation appeared to be not to solve the mystery for its own sake, but to earn the maximum amount of points and win the game.

“I just wanted to win, that is all I wanted to do.” REW8

They described how they felt they had something to work for:

“I am just saying that the whole points... they were really helpful because like we were actually working for something and you were challenged” REW13

The children could earn points both for speaking Irish and for successfully completing tasks. The possibility of earning the rewards gave motivation to most children to apply themselves. Several children associated the points with having actual goals to get to rather than just speaking Irish with no purpose.

“[what made you use Irish in the game] To know that you would get an award for speaking Irish than to just be taught to speak it and then not.” REW2

In discussing positions on the leaderboard children talked about how when they were in the lead they still felt they had to keep going to try to protect their lead, and when they were at the bottom, they felt they had to really push themselves to improve.

“I thought it motivated me a lot say when you were up on the leader boards. Just say you were second place, maybe if I try harder the next time I might be up at the top.” REW21

“The first time I saw the leader board and we were like third/fourth and it was like, okay, that’s just awful, you have to work harder.” REW22

According to the interviews, the leaderboard was instrumental in giving groups motivation to work harder and try to earn points to climb higher.

The role of team mates encouraging each other to work for points was also mentioned.

“Yeah, when we were winning and a team got in front of us I said to my partner “We have to do this” and but we were trying to get the trophy” REW8

“It was a really hard mission. We were just like together and like, okay, we are going to do this... We were going to get to the top of the leader board.” REW23

One child talked about how earning points improved her self-concept of her ability in Irish:

“Well the fact that you could get points and you just mean that you actually were kind of good at Irish.” REW19

The use of rewards in the game received an overwhelmingly positive response, with a very small number of negative comments:

“We never got the trophy” NEG11

“I didn’t really care if I won points.” NEG12

There was also an issue of the rewards system putting pressure on the children and making them stressed or worried, reported by three children.

“Yeah, I felt very worried but then we caught up on the leader board.” NEG19

7.4.2.2 Relatedness

Relatedness, the theme encompassing all references to the positive impact of others, was the second most prevalent subtheme with 85 references, narrowly behind the 90 references to rewards. A common thread in the interviews was how teammates and friends helped each other with the tasks and with the Irish.

“It is fun that is it better that you are able to play a game, not just talk...like you are able to send messages to other people and they can help you with the game and..

“TEAM2

“I think my team did really good because we all helped each other, because if I didn’t know a word I text chatted my other tea. You see I asked like the partner beside me and if she didn’t know I would ask my other team on the chat, and then they would help me.” TEAM13

Some children described how their teammates helped them with Irish that they didn’t understand.

“I didn’t really know how to read Irish that much and I didn’t really understand it, but my friend Ryan, he helped me. We were reading all of the mysteries and I learnt a lot more.” TEAM5

In addition to this, some children talked about how they learned Irish from their teammates – that they actually got ideas about how to say things from each other.

“...everyone speaking Irish, I wanted to try speaking the Irish they were using as well... It would give you ideas....say like how to say stuff.” TEAM19

On several occasions in the interviews, children praised their friends and teammates for being successful in the game and for the help that they received from them.

“Yeah, and I knew Caroline was going to win because she worked really hard and she was very good at it.” TEAM1

“I thought she was a good partner for me because she knew all the translations.” TEAM16

Another major subtheme was that of friends encouraging each other to keep going with the tasks. In most cases it was peer-encouragement that motivated groups to proceed through the game, rather than teacher-directed encouragement.

“I wanted to help my partner and get more points and stuff and then learn a lot of Irish on the way.” TEAM11

“But then like when someone said, we can’t do this and the rest of us were like...come on! We can do this.” TEAM22

While the Relatedness subtheme brought together all the positive comments about the theme, there was also some negative feedback about the experience of team by the children.

One group in particular had difficulties working together:

“The only thing we did good was fight with each other.” NEG14

One child reported feeling excluded by his partner:

“my partner... never shared and he very rarely did, so I never really got to play.”

NEG7

“I felt left out in the project.” NEG10

Most of the complaints about the team come from one particular group, however there were broader teamwork problems across all groups, albeit to a much smaller extent. Several teams had problems with turn-taking at being in charge of the mouse.

“She basically got to do everything the whole time and I never got to do anything on it” NEG4

Some children felt that their partners gave too many orders.

“She just wouldn’t let me do it... she kept giving out to me” NEG4

“She was telling me to stop, she was really bossy and I didn’t like it. I didn’t like my team.” NEG2

Others talked about how they wanted to get the task done, but their teammates weren’t focused on the task and just wanted to play with the different functionalities of the game – travelling around, text chat, etc, or else the teammates didn’t apply themselves.

“Well when I was trying to send a text chat to the other part of my team, so my team mate just kept typing random stuff and I couldn’t get my work done.” NEG15

“I thought Philip would work a bit harder because some of the time he was just kind of giving up, he was just like... and just sat there and he didn’t really do much. At some points he just kind of gave up and didn’t work.” NEG18

Despite the difficulties in team co-operation reported by different children, the vast majority of children experienced relating to others as positive. This is emphasised by one child who describes how difficult it was when his partner was out one day and he had to work alone.

“The day of the cake bake sale I was working alone and it was really hard for me because I didn’t have any partner or anyone to talk to... It was a lot better when I had my own team.” NEG17

7.4.2.3 Motivation of computers/computer game

The motivation afforded by the computers or the computer game was the third most frequently occurring subtheme with 52 references, more than half that of the most prevalent theme. All of the children indicated that using computers for Irish was a source of interest and motivation for them. They frequently referred to how the computer was more interesting and potentially more fun than the usual textbook-based activities in their Irish lesson.

“I thought it was funner than all the other books because I didn’t really like the books like. I thought it was kind of boring but I thought that the laptop was really fun.” MOTC7

“I think it is really good because some kids love like iPad and computers and well it is a better way to learn Irish because some people think it is boring just listening to Bun go Barr.” MOTC5

The impact of their experience of playing computer games outside of school was evident.

“I like [computer] games. I play a lot in my spare time.” MOTC3

“I think it’s good because the kids will have used computers and they love playing games and it’s still really fun in Irish because it’s a detective game.” MOTC16

Some children said that they preferred typing to writing, others said that it was easier to find things.

“It is just a lot better than sticking your head in a book and writing and your hand gets tired and where you get actually muscles in your fingers from typing.” MOTC11

“It is much better than books, much better than having to go to the back of the book to check the spelling and go back and write it down and it is much easier.” MOTC1

The perceived active learning on the computer was also identified as a source of motivation by several children.

“It is good because if you are in a workbook, you say "Ah, Miss, why do we have to do Irish?!" but it's good in the game because you get to move around a lot and stuff, you have another person and like you are working yourself and...

... Yeah, and you have to like go to different dimensions and look at words and find out the mysteries and it was better than writing because you are just writing out stuff but you have to find it.” MOTC12

Even though technically the class were still seated and carrying out reading, written and oral tasks, they felt that they were able to do a lot more – move around, go places, find things; all through the avatar on screen, giving evidence that they were experiencing immersion in the game.

7.4.2.4 Challenge

Challenge was the fourth most prevalent subtheme, with a total of 46 references, half that of the most popular subtheme. The feedback on how the children perceived the challenge in the game was varied. Even individual children reported a mixture of positive and negative responses to the challenge of the different tasks. Some children talked about how they experienced the more challenging tasks as stressful, and they felt like giving up. Other children spoke about how they felt motivated by the harder tasks.

When asked did they prefer the easy or the hard task, again there were mixed responses. Some children claimed to prefer the easier tasks but twelve children said that they liked the hard ones better because they felt motivated, there was a sense of achievement when they finally completed them and that they learned more when the tasks were more challenging.

“When you see a hard mission, you are like, okay, let’s do this!” C8

“When I completed it it felt good, but when it was like in the middle I was like “What is next?”C2

“Well I’d like a challenge, but sometimes the challenge can be really difficult.

And I do prefer them to be harder because you get better at Irish if they were harder, because if they were easy you’d already know the words and you wouldn’t really be able to learn them.” C8

Several children said that they were torn between wanting to give up and wanting to keep trying when the tasks were hard.

“I was in the middle, I wanted to give up but at the same time I didn’t.” C7

“I did want to try and give up at the same time.” C3

“I really got frustrated but it kind of motivated me as well (challenging tasks)... it motivated me to like keep going because I didn’t want to just give up.” C1

Other children said that it depended on what mood they were in – sometimes they were happy to face a more difficult task, but sometimes they felt more comfortable with less of a challenge.

Some children talked about how they found help in working as a group when faced with a difficult task – that they motivated each other and encouraged each other to keep going.

“Oh I was like, oh no [when task was too hard]...before I had a bad thought I just texted the others? They might give you a little clue and then I’d kind of know what I was doing.” C8

Other children described what they saw as a progression from easy to medium to hard tasks.

“Well I prefer like the hard because like it is more of... you have to be up for it. But the only way to get to the hard is by learning by the easy and then the medium. I worked from easy to very hard because I just wanted to try out every level and how hard it was.” C6

In terms of negative feedback associated with the challenge of the tasks, the experience of stress, pressure, worry and frustration were mentioned by only a small number of children.

“With the hard levels and all that, my team and me got very stressed out if it was like very hard... yeah we got stressed out a lot but we managed to do it.” C2

“So that filled me with pressure as well.” C7

7.4.2.5 Active learning

Experiencing active learning in the game was the fifth most prevalent subtheme with total of 31 references, approximately one third of the most popular subtheme. One aspect of the game that several children highlighted was being able to travel and move around as a person.

“Normally it is just stories and then like people thinking “Oh I want to go there” but in the game you can actually do it.” AL4

They reported this as a positive contrast to their usual, more passive and receptive experience of learning Irish in the book.

“Like there is one way when you are on the computer and you are only reading off a Bun go Barr, but when you are on the game you are able to move around and talk to each other like.” AL3

The mystery element of the game was mentioned by a number of children as something which encouraged them to participate. They talked about having to find different clues, having to figure things out, and this was described as making it more exciting.

“As everyone said it is different as the books like, and it is more exciting because you have to find the clues and all and it builds up to the who did it, the mystery.” AL6
“Well if you are on a book like it just tells you a question and you have to read through it, but you have to find stuff and you have to find like mysteries and pictures and other things.” AL5

This element of mystery and having to go places and find clues appears to have contributed to an experience of active learning for the children.

“Yeah, and you have to like go to different dimensions and look at words and find out the mysteries and it was better than writing because you are just writing out stuff but you have to find it.” AL8

7.4.2.6 Fun

The notion of fun was the sixth most common subtheme with 28 references in the interviews. Several children referred to the fact that they play computer games outside of school, and the new development of a game for learning was seen as very positive as it could bring “fun” to the classroom.

“I think it’s good because the kids will have used computers and they love playing games and it’s still really fun in Irish because it’s a detective game.” F11

One child saw through the use of the game as a “motivational tool”, but he still said that he enjoyed it. Several children mentioned how their experience of regular Irish class can be boring and that the game was a welcome fun alternative to this.

“Well I thought it was good because other children don’t really like Irish and writing and stuff like that and a lot of people play games so it was a good idea to have a game that is done in Irish. So you learn a lot more because you are playing.” F4

Some children also made the connection between fun and learning – they knew that the goal of the game was to help them to learn Irish, but this didn't seem to detract from the fun they derived from playing it.

“Well I thought it was fun when it was in Irish.” F3

7.4.2.7 Suggestions for improvement

This minor subtheme comprises 16 references in the interviews. The children's suggestions for improvement included adding artificial intelligence to the game, incorporating more characters and resources, providing alternative means of moving around, working on the graphics, making it faster, etc. A full list of their suggestions can be seen in Appendix D.

7.4.2.8 Negative experience of game

Overall the reported negative experience of the game was very low when compared with all the combined positive feedback from the children – comprising a mere 12% of the overall feedback both positive and negative. The principal areas of negative feedback have already been embedded in the sections above, however, there was one further source of negativity - how the text chat was misused during the game, with some children flooding the chat with nonsense.

7.4.3 Outcomes from the game

The theme of outcomes from the game was slightly less than half as prevalent as the Experience of the game, as shown in Table 7.31 above. The game outcomes described by the children can be grouped into three principal subthemes – a perceived positive impact of the game, use of Irish and a reported lack of positive outcomes. The relative frequencies of each theme may be seen in Table 7.33, which shows the total number of coded references for each subtheme.

The predominant subtheme is that of perceived positive impact of the game. Each subtheme will be outlined below.

Table 7.33. Relative frequencies of comments about outcomes from the game

Outcomes from the Game	
Perceived positive impact of game	104
Use of Irish	39
Lack of positive outcomes	5

7.4.3.1 Perceived Positive Impact of Game

This section comprises two parts - the positive affective impact of the game and the perceived positive impact on learning. The codes included under each subtheme and their relative frequencies is shown in Table 7.34. These will be discussed in greater detail below.

Table 7.34. Relative frequencies of perceived positive impact of game subthemes

Perceived Positive Impact of Game	
Affective impact	
didn't matter if you got it wrong	2
feeling able	14
feels normal to use Irish	4
more confident or less anxious speaking Irish	19
valuing language	8
Impact on learning	
help through glossary	5
help with Irish	6
help with pronunciation	6
help with vocabulary	8
improvement in reading	5
improvement in speaking	6
Irish is easier	2
knowing more	10
learning	7
understanding Irish more	2

7.4.3.1.1 Affective Impact

There are a wide range of positive affective outcomes recounted by the children. Most children described how they “felt better” about using the language after taking part in the project.

“I felt better like. Because I was able to use the words after all the stuff that we went through.” AI2

A significant number of children mention feeling embarrassed or stressed in the past when they were asked to speak Irish and they felt unable. The majority of children report a

reduction in this anxiety and an increase in confidence when speaking Irish. An important outcome is how the children describe “feeling able” to use Irish when in the past they haven’t.

“Well I feel less embarrassed because I used to be embarrassed if I didn’t know the words and what this means and stuff... I feel a lot more confident.” AI8

“I felt more confident and as Stephen said I felt embarrassed as well before because like you were just saying out words and you wouldn’t know what they mean... But now I know how to say a sentence.” AI3

“It is easier, and it is like I could say things more clearly and then have a conversation in Irish.” AI4

One child reported a freedom from pressure about getting the Irish wrong, which is a trait of successful language learners.

“And it didn’t matter if you get it wrong, you just know I will get that right now the next day.” AI9

Some children describe how it feels more natural to use Irish after the project.

“It comes to me more naturally, say when I am speaking Irish....I speak Irish at home sometimes... trying to get my my Mam... and I would be like..... I learned this with Gene now, so I can...”AI10

“I find it easier, more comfortable kind of like when I speak English now because it’s so much easier... It’s like a second language to you. ” AI10

A further outcome of participation in the project was an increased appreciation of the value of Irish.

“You showed how much Irish means to us...We weren’t really fond of Irish and all our teachers were and we were really like hoping like to speak it because it is weird and it just sounds cool and we learnt a lot from the computers and...” AI6

One child suggested the game could be brought to London to teach people Irish.

“People in London don’t even know how to speak Irish and it would be good if you brought the game there and teach them Irish.” AI5

7.4.3.1.2 Impact on learning

The coded references for how the project had a positive impact on the children's learning is one of the most frequently coded across all themes, with 85 individual references. The children talk about a variety of ways in which the game helped them with their Irish. Several children mention the glossary that was available in the tasks as helpful to learn what the new Irish words meant and to decode the tasks.

“You know, the way the words; the English of them; I thought that was an easier way to do them.” IL9

“Yeah. So I thought that helped me with number one and number two on the bottom.” IL10

Some children commented that their pronunciation improved as a result of the project.

“It helped me so much because I can't really pronounce Irish words properly. So reading it really helped me.” IL9

“I thought it helped me with my speech, like how to pronounce all the Irish words” IL10

A majority of children report an improvement in their speaking skills, some also report improvements in reading and writing.

“My Irish speaking did [improve]” IL8

“My reading because I wasn't really good at my reading and writing in Irish, but then I was having fun on the laptop and I thought it was actually really good...

It helped me with my reading and I didn't really know how to read Irish that much.” IL9

“I find it easier as well. [speaking Irish]” IL11

Another area where many children attested to improved Irish was in the area of vocabulary. They describe how their vocabulary was expanded through the project, and some children mention specific examples of new words they learned.

“I know a few more words because I didn't know what man was; and that is probably really easy like. It is fir and now I know that gun is gunna. I know more than I did...” IL2

“Really hard words [learned]” IL6

Understanding Irish better was also mentioned by several children.

“Yeah and when I was typing stuff down and then when I was like doing text chat, I knew what they meant and I probably didn’t know them before.” IL1

“It helped me with all of them [speaking, reading, writing, listening], especially understanding the Irish as well, because like I’d look at a word and be like, what does that mean? And like then it would come up again and like ah yeah I know what that means...” IL1

Some children just reported a general perception of having improved in Irish.

“If you didn’t come to this school, on a scale of one to ten I would be around fifty but now I would say I am around eighty.” IL3

“Yeah, I mean I feel I know a lot more now.” IL5

7.4.3.2 Use of Irish

The children were quick to observe that the game forced them to use Irish – they couldn’t play it without reading, writing, text chatting and speaking Irish.

“You can’t really do the game unless you use Irish because it is all in Irish. So that is what made me do it.” USE2

“You had to do Irish. Like you can’t answer in English so you have to do it in Irish.” USE3

The children also mentioned various aspects of the game that encouraged them to use Irish.

They mentioned how the reward structure of the game required them to use Irish.

“Yeah, we had to talk in Irish to get points.” USE1

One of the principal ways that the children reported Irish use was through text chat.

“...with the text chat I was using Irish a lot and you’d be reading the clues and stuff.” USE11

One child mentions the importance of feeling free to drop out if he liked, that this encouraged him to use Irish.

“It is kind of knowing that you are not forced to do it and you can drop out, but I didn’t.” USE2

“Yeah, and me and Ryan were trying to use the new words, and like I was texting Irish to Mark and Sarah to tell them directions.” USE7

As some children highlighted, some English was used in the text chat, however most children

encouraged each other to use Irish as much as possible.

“Everyone sort of used a tiny bit in English but no one really minded and everyone texted back in Irish and more and more Irish.” USE8

Several children describe how they were motivated to use Irish when they saw their friends using it.

“My friends kind of want... like they kind of got me into it like. and Caroline and John like and Anna, they started to use Irish and I kind of just talked about English for stars, but then when you held up them cards I actually started to use a bit of that.” USE9

“It motivated me as well that when everyone in the.. and everyone speaking Irish, I wanted to try speaking the Irish they were using as well.” USE13

One child talks about how she has transferred that knowledge to her home, where she has begun speaking Irish with a parent, as previously mentioned above.

“Yeah, it comes to me more naturally, say when I am speaking Irish....I speak Irish at home sometimes... trying to get my my Mam... and I would be like..... I learned this with Gene now, so I can...” USE14

7.4.3.3 Lack of positive outcomes

Out of the 17 children who took part in the project, three reported no positive learning or affective outcomes from the game. All the reported lack of positive outcomes came from one particular focus group.

“No [Irish did not improve]” LPO1

“No [didn’t learn any new Irish]” LPO2

“I don’t feel that confident.” LPO3

7.4.4 Summary

This section presented the themes and subthemes from the focus group interviews.

The interview interactions could be broken down into 63% relating to the children’s experience of the game, 28% relating to outcomes from the game and 9% relating to attitudes to Irish. Within the game experience theme, the most prevalent subthemes were the motivation afforded by rewards and relatedness. Within the Game outcomes theme, the most popular theme was the perceived positive impact on learning, followed by use of Irish with only 5 references to a lack of positive outcomes from the game.

7.5 Conclusion

This chapter presented the findings from the school intervention grouped according to research instrument. The AMTB questionnaires highlighted the broadly positive attitude children had towards the language, but demonstrated a lack of motivational intensity to learn it. The exit questionnaires provided an overview of the hugely positive response that most children had to the game, and how it supported their motivation to use Irish and progress through the game. The game interactions demonstrate that most children were willing to communicate through Irish, and in the focus group interviews most children reported a reduction in anxiety while speaking Irish as a result of the intervention. Analysis of the focus group interviews and the game interactions illustrated a range of factors which impacted on whether or not the children had a positive or negative game experience, notably the experience of rewards and the supportive experience of the team, active learning and the correct level of challenge along with the children's self-perceptions of their Irish language ability. These important findings will be critically discussed in the next chapter in order to specifically answer the research questions outlined in section 4.2.

8 Discussion

8.1 Introduction

The discussion chapter will be structured according to the four research questions listed below:

1. What are the children's attitudes to Irish, and does the intervention have any impact on these attitudes?
2. What were the characteristics of children's use of Irish during the intervention?
3. Is there evidence of language learning gains after participation in an intervention using the 3D VE tool? Does an additional element of focus-on-form in the 3D VE contribute to language gains?
4. What impact did the projected affordances have on the learning experience?

Each research question will be discussed in turn, highlighting key findings and comparing them to the relevant literature.

8.2 Attitudes to Irish

8.2.1 Introduction

This section will discuss the first research question about children's attitudes to Irish, and how the intervention affected change to these attitudes. While the AMTB and the exit questionnaire were not directly linked as pre and post intervention tests (see section 4.7.3), similar themes were apparent in both relating to key aspects of children's attitudes to Irish and how the intervention impacted these attitudes. These themes were echoed in the focus group interviews, and to a lesser extent in the interactional data. The important findings will be discussed below under the headings below, and contrasted with the relevant literature.

- Overall attitude to Irish
- Reduction in Irish lesson anxiety
- Increased motivation for Irish

- Irish language community

8.2.2 Overall attitude to Irish

The overall results from the AMTB show a generally positive attitude to Irish, which echoes the trend in the literature among children and adults (Committee on Irish Language Attitudes Research (CILAR), 1975; Harris & Murtagh, 1999; Ó Laoire, 2007; Ó Riagáin & Ó Gliasáin, 1984, 1994). However Ó Laoire remarked that this positivity is a “passive stance rather than a proactive attitude” (Ó Laoire, 2007, p. 181) as there is no indication of motivation to actively engage with the language and take responsibility for learning it. The idealistic valuing of Irish without application or investment of time and energy to learning the language may be reflected in the AMTB results in this study. The majority of children state that they value Irish as a school subject, however a significant proportion would rather spend school time on other subjects, aligning with a recent study by Devitt *et al* (Devitt et al., 2016), which demonstrated an excess disengagement that primary school children have with Irish when compared to Maths or English.

Learner attitudes and self-concept can predict language learning success, as the literature demonstrates affective variables of language learning are “at least as important as language aptitude for predicting L2 achievement” (Noels, Pelletier, Clément, & Vallerand, 2003, p. 35). In this study, there was a sizeable minority of children who claimed to be “not very good at Irish” in the focus group interviews, or in the interactional data. Five boys in particular made repeated negative comments about their Irish ability. This perceived lack of competence will be discussed below.

In the AMTB most children showed a positive self-concept for Irish, with the exception of feeling able to ask for directions in the Gaeltacht. The majority of children reported an improvement in their Irish ability self-concept after the project, with only three claiming no change in their attitudes to Irish. Several children reported valuing the language and taking ownership of it (see section 7.4.1). This is particularly interesting as it relates to

the child's self-concept and identity. As Dörnyei and Ushioda point out "if proficiency in the target language is part and parcel of one's *ideal* or *ought-to* self, this will serve as a powerful motivator to learn the language because of our psychological desire to reduce the discrepancy between our current and possible future selves." (Dörnyei & Ushioda, 2009, p. 4) Therefore, in this study if the participants are identifying Irish with their "selves" in a new way, this could have an important impact on their motivation to continue with their second language studies. Instead of Irish being something separate and apart, with which they have no real connection, it can now be integrated and become part of their identity.

This is a very promising outcome from the project, as how learners perceive language and experience identity transformation in learning language will have an enormous impact on language learning outcomes. This was previously supported by research on Hungarian secondary school students (n=202) in a study carried out by Csizér and Kormos where they found that identifying English language proficiency with the ideal self was a major contributor to motivated language learning behaviours. While the research study presented in this thesis did not set out to directly measure and compare L2 ideal selves and related motivational intensity, and therefore cannot draw conclusions such as Csizér and Kormos, the presence of indicators of inclusion of the Irish language in the children's sense of self is very encouraging. The negative side of this is described in a recent study of 849 secondary school students in Wales where Pearse reports that those students who did not value the language and did not think it important to keep Welsh a living language were much more likely to dislike the language (Pearse, 2015).

As previously mentioned, instrumental orientation was not a key focus of this study as it was not deemed very relevant to younger children (as described in section 4.7.3, Harris & Murtagh, 1999). However, 14 out of 15 children agreed with the only instrumental item on the AMTB questionnaire, which referred to learning Irish being important in getting a good job someday. This is a higher proportion in agreement than in Harris and Murtagh's study (Harris

& Murtagh, 1999). Perhaps children are more aware of career choices at a younger age than was the case in the 1980s when Harris and Murtagh's research was carried out. However, this theory would need further investigation through a representative study. In summary, the findings of this study align with the literature on attitudes to Irish in primary school and furthermore indicate a positive orientation of children in both integrative and instrumental aspects of motivation.

8.2.3 Reduction in Irish lesson anxiety

The construct of anxiety in language learning is a complex one, with both positive and negative aspects for L2 acquisition described in the literature (Dörnyei & Ryan, 2015). However, for the purposes of this discussion the term “anxiety” is used to refer to a negative and inhibiting anxiety that “harms learners’ performance in many ways, both indirectly through worry and self-doubt and directly by reducing participation and creating overt avoidance of the language” (Oxford, 1999, p. 60). While most children in the AMTB said that they didn't feel embarrassed putting up their hand and speaking aloud in the Irish lesson, substantial anxiety levels were apparent in the other items in this category – eight out of 15 children saying they feel nervous or mixed up when speaking in the Irish lesson, six children saying they feel unsure of themselves and that the others in the class are better than them, and five children afraid that others will laugh at them when they speak in Irish.

The anxiety that some second language learners can experience has been extensively investigated, particularly since the 1980s (Horwitz, Horwitz, & Cope, 1986, see Argaman & Abu-Rabia, 2002, for child-specific research). The considerable anxiety that many students in this study report for learning Irish is a major source of concern, as some commentators posit that anxiety can interfere with the language learning process through affecting the cognitive processing of language input (MacIntyre & Gregersen, 2012). The literature demonstrates a strong link between high anxiety levels and low achievement in the language (Dewaele, 2007; Woodrow, 2006), with anxious students more likely to drop the language (Dewaele & Thirtle,

2009). This worrying trend was also present in Harris and Murtagh's study (Harris & Murtagh, 1999), and illustrates the need for strategies and teaching approaches to ease children's Irish lesson anxiety and to address the lack of confidence speaking Irish that some children report. In the focus group interviews, several children mentioned embarrassment in the normal Irish lesson when they didn't understand something, or weren't sure of an answer. The remark was most often in contrast to the increased confidence they now reported with regard to using Irish after the intervention.

This is similar to Reinders and Wattana's findings that 30 EFL students using an online game reported a decrease in anxiety, increased perceived competence in the language and increased willingness to communicate, although their research was with university students (Reinders & Wattana, 2014). Wehner *et al* also reported a reduction in anxiety in her study with university students learning Spanish in Second Life (Wehner et al., 2011). Another interesting finding was how some children in the current study referred to a freedom to take risks without worrying about making mistakes, demonstrating a freedom from anxiety. Risk taking is a central component of making progress with language learning (P. M. Lightbown, Spada, Ranta, & Rand, 2006), the fact that some children experienced this in a new way during the project is a positive indication of how this type of game can reduce learners' anxiety. These results demonstrate that the intervention used in this study could be one way of effectively addressing the issue of Irish lesson anxiety that some children experience. A potential link between this finding and the use of the avatar will be discussed below in section 8.5.2.

In this study, the intervention clearly achieved both a reduction in children's anxiety and an increase in their confidence. One very clear link in the results from this study was how feeling competent in the language was connected to increased confidence, while a perceived lack of competence was invariably associated with a lack of confidence (see discussion on challenge level below in section 8.5). This is very similar to the findings from Reinders and

Wattana's study mentioned above, where both a decrease in anxiety and an increase in perceived competence were reported. This is comparable to findings in the literature which demonstrate a link between L2 learners' apprehension about communicating in the target language and their perceived communicative competence in that language (MacIntyre, Noels, & Clément, 1997). Self-determination theory provides one frame through which to view this phenomenon. In SDT, competence is defined as "the feeling that one has the capacity to effectively carry out an action" (Noels, 2009, p. 302). Very frequently, the children reported feeling better about the language when they had increased understanding, and when the child felt competent they reported more confidence and less anxiety (see section 7.4.3.1). Among the three children who reported that their confidence in Irish had not improved after the intervention, there is a strong emphasis of not feeling able to use the Irish necessary for the game. There may also be an interaction here with the overall self-esteem of the child, but as Dörnyei and Ryan point out, this is one area of affect and SLA that has been largely neglected (Dörnyei & Ryan, 2015).

If children's anxiety levels in the Irish lesson are to be effectively reduced, consideration needs to be given to a more differentiated approach where each child can experience competence in the tasks they are set. Nunan recommended a differentiated, learner-centred approach to L2 instruction as far back as the 1980s (Nunan, 1988), however, there are considerable challenges to implementing this in a language classroom. There is potential for using an online game like the one this study for a more differentiated and personalised language learning experience to match the competence levels of users, and thus reduce anxiety. Overall reduction in anxiety can be achieved through optimising the challenge level for each child, through the immersive nature of the environment, and through use of the avatar, as described above.

As previously mentioned, the general positivity towards Irish which mirrors that found by Harris and Murtagh (1999) does not appear to translate to a strong motivational intensity to

learn Irish in the AMTB. In this particular category of the AMTB, the majority of responses were neutral, indicating an apathy among the children towards learning the language and a lack of motivation to invest in the activities needed to learn it. Given the hard work involved in learning a language, the literature demonstrates the key role of motivation in providing the energy needed to propel language acquisition (section 3.4.2). This seems to be lacking among these children in their responses on the AMTB before the intervention. The findings of this study demonstrate that the motivational affordances of the game did have an impact on the motivational intensity of most children.

Exploring the reasons for this apparent apathy in the motivational intensity scale on the AMTB pre-intervention is beyond the scope of this study, however, the children's response to the intervention demonstrate that the online game did effectively target that lack of motivational intensity and in most cases overcome it as children became enthusiastic about using Irish to participate in the game. As noted above, motivation is a complex phenomenon and is impacted by a number of factors. The findings of this study relating to motivation will be examined within the broader framework of SDT, in particular the ARC construct, in section 8.5, which draws together the threads of discussion from this section, and those relating to the impact of the game affordances.

The children's enthusiasm about using Irish in the game gives support to the claim that educational games can provide motivation. There are numerous ways in which an educational game can be designed to be motivating, as set out in section 3.4.3. In the exit questionnaire, 14 out of 17 children stated that they would like to learn Irish using a computer game again, a definite shift away from a neutral motivational intensity. Given the lack of motivational intensity to learn Irish and the Irish lesson anxiety highlighted above, this finding is extremely encouraging.

The children's enjoyment of the game undoubtedly helped their motivation, and one factor in this was how they associated computers with fun, many of them talking about

playing computer games in their spare time. This positive association with computers was undoubtedly a benefit in trying to provide the children with a positive experience with Irish. The findings here are similar to those of O'Brien and Levy and Zheng *et al*, but the affordances relating to motivation will be critiqued in more detail in section 8.5 below (O'Brien & Levy, 2008; Zheng et al., 2009). It is likely that there is a novelty effect of using computers instead of books (see section 4.10), and it would presumably diminish with time, however the computers remained attractive to the children for the duration of the project.

8.2.4 Irish language community

The positive attitude shown by most children towards Irish speakers and towards visiting the Gaeltacht or speaking with local Irish-speaking families gives an indication that relating to a speech community and seeing opportunities for speaking Irish outside of school may be a source of motivation for children to speak Irish (see section 7.2.1).

The role of the community in supporting a desire to speak Irish is also seen in the strong positive response of the children to the integrative questions, underlining how the children prioritised relatedness in learning and using Irish. In the open ended question about what motivates the child to speak Irish, hearing others speak Irish was mentioned in six of the 13 responses – whether it was friends, the school principal, other people or TV. Clearly, the experience of Irish as a living language in a community is central to the children's motivation to use the language, but the language can be “sealed off” in the Irish lesson in school (Harris, 2008, p. 63). Lacking an experience of language community is one of the most significant challenges facing the Irish language at present (Murtagh, 2007b; Ó Laoire, 2005). In Pearse's study on the Welsh language mentioned above, he found that the students who lived in Welsh speaking areas were more likely to be positively disposed towards the language than those who didn't (Pearse, 2015), supporting the emphasis on community by the children in this current study. In the exit questionnaires after the intervention, there were indications that the children had experienced a type of language community in the computer game. A strong

emphasis on relatedness can be seen in their responses to what helped them to speak Irish, the most popular response being friends' encouragement, with hearing the team speaking Irish also featuring strongly. This finding is important, especially in light of a recent study on attitudes of immigrant secondary school students towards the Catalan language. Ianos *et al* found that the students' attitudes improved over a two year period. The authors hypothesised that this was due to the experience of the language in the community and how the students gradually became more integrated in that community through the language and experienced identity transformation (Ianos, Huguet, Janés, & Lapresta, 2015). Clearly, the experience of community is central to how students will view a language. In the research presented in this thesis, some children, when observing their friends using Irish, were really motivated to join in and be part of the group that was trying to speak Irish. This is exactly for the intention in trying to create that Irish language community for the children. As Baker states "there is no language without a language community" (Baker, 2011, p. 66), and this intervention was successful in creating a localised language community for the children.

8.2.5 Summary

This section addressed the first research question discussing the children's attitudes to Irish and how the intervention made a positive impact on these attitudes. THE AMTB findings built on Harris and Murtagh's original study in the Irish context (Harris & Murtagh, 1999) and the intervention was shown to have helped promote positive attitudes towards the language, reducing anxiety and providing an opportunity for the children to experience language community. The importance of these findings is demonstrated by recent research in the minority language context (Ianos *et al.*, 2015; Pearse, 2015). The next section will discuss the second research question, which deals with the particular characteristics of the children's Irish language use over the course of the intervention.

8.3 Irish language use

8.3.1 Introduction

This section will address the second research question about the characteristics of Irish language use in the intervention through exploring:

- how the pushed output design of the intervention worked in practice
- the children's willingness to communicate using Irish
- how the children drew on their pre-existing language resources in their interactions
- the impact of the cognitive load of the game on their Irish language use

These characteristics will be juxtaposed with the relevant SLA literature in order to situate the findings in the context of current research.

8.3.2 Pushed output

Swain and Lapkin's theory of "pushed output" emphasises the importance of creating a classroom environment where children have to produce their own language. They assert that in doing so, the children notice the linguistic problems they encounter and are forced to modify their output, thus facilitating language acquisition (Swain & Lapkin, 1995). The intervention reported here aimed to "push" children's output by requiring target language interaction, through the game structure, instructions and reward system. The necessity of using Irish is referred to on multiple occasions by the children, both in the interactional data and in the focus group interviews. Evidently, the intervention design was effective in pushing the children's output.

Swain claims that it is when learners have to try communicate meaning they encounter the limits of their language and recognise what they need to learn (Swain, 1985). In the exit questionnaire, the children described where they felt most challenged using Irish - writing the story, talking, texting, reading and trying to give instructions in Irish. The structure of the

intervention and the necessity of using Irish to progress through the game clearly created an environment where children were pushed beyond their level of competence. This relates to Vygotsky's concept of Zone of Proximal Development – “the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers.” (Vygotskiĭ, 1978, p. 86) According to Vygotsky's ZPD, children learn when pushed beyond their level of competence if there is sufficient scaffolding provided. The children's experience of being stuck was not necessarily a bad thing, as it can raise children's awareness of what Irish they need and if they have the resources to access this new language, this can be a fruitful environment for language acquisition. One child made reference to progressing in competence when he referred to the missions going from easy to medium to hard (section 7.4.2.4), indicating that perhaps the scaffolding provided was enabling him to learn and move on from his initial level of competence. In this study, the scaffolding was provided through the language resources in the game and in the game instructions, through peer interactions and through teacher support. The children interacted with the language and with their peers in order to solve the problems, sometimes having to negotiate meaning with peers and with the teacher. Negotiation of meaning can be defined as “interaction between speakers who make adjustments to their speech and use other techniques to repair a breakdown in communication” (P. Lightbown & Spada, 2006, p. 203). Long describes this as a central force in language acquisition ((Long, 1985, 1996). Therefore, it is desirable to push the learners beyond their perceived competence, however there is a need to find the correct balance of challenge as if it is perceived as too difficult the learners may disengage (see section 3.4.2 for discussion of the role of competence). In this study this was demonstrated as the children were required to use Irish and were motivated to push themselves, but it was only effective at the appropriate challenge level. Furthermore, the fact that the children were able to identify their areas of difficulty is also a positive indication for

making progress in language learning, as reflection is a key element of language learner autonomy (Little, 2007) and can lead to learners making language learning goals and potentially taking ownership of the language learning process.

8.3.3 Willingness to communicate

During the intervention, most children showed a willingness to communicate using Irish. Willingness to communicate (WTC) may be defined as “readiness to enter into discourse at a particular time with a specific person or persons, using a L2” (MacIntyre, Dörnyei, Clément, & Noels, 1998, p. 547). Anxiety and a low perceived competence in the L2 may have a negative impact on learners’ WTC (Chu, 2008; Clément, Baker, & MacIntyre, 2003). This is particularly relevant in this study, as the attitudinal research demonstrated substantial anxiety among the children with regard to Irish, and a perceived lack of competence reported by a considerable minority of the group (see section 7.3.2.2.1). It was projected that leveraging the game affordances could help to address these barriers to Irish language use, and encourage WTC among the children. It was found in this research that most children were quick to use the Irish they already knew from school (see section 7.3.2.3.2.1), and also willing to try out the new language they encountered in the game. The vast majority of children used the Irish terminology from the game and the instructions and pushed their language output to communicate meaning, even if they were unsure of sentence structure or had to mix languages to communicate effectively (see section 7.3.2.3.2). The game structure and instructions provided scaffolding for the new language, particularly the game terminology and task-based vocabulary and phrases which were reinforced through frequent repetition (see section 8.4.3 below for discussion of frequency effects on acquisition). These findings echo those of Reinders and Wattana, who found that using a game for learning English as a second language had a significant positive impact on the WTC of the 30 Thai university students who participated in the study (Reinders & Wattana, 2014). Their study aimed to break new ground in connecting WTC with game affordances, and builds on previous literature reporting how

elements of WTC can be associated with 3D VEs for language learning, such as decreased anxiety, decreased inhibition and increased confidence and relaxation using the language (Peterson, 2011a; Rama et al., 2012; Wehner et al., 2011; Zheng et al., 2009). These findings are supported by the WTC demonstrated by the children in this current study.

This willingness to interact with the language is of central importance in an interactionist view of language learning. As Ellis asserts: “Interaction provides learners with input containing the data they need for acquisition. It also affords opportunities to experiment through production and to receive feedback on these attempts, thereby making the ‘facts’ of the L2 salient” (R. Ellis, 2008, p. 205). Long’s contribution to interactional theory was mentioned in section 3.4.2, and more recent usage-based and emergentist theories also recognise the fundamental importance of interaction in language acquisition. From this viewpoint, learners build up knowledge of the language through the data input received through interaction, and the evidence of language use which is collected through input and interaction may be used probabilistically to generate new utterances (Beckner et al., 2009). In addition to this, Varonis and Gass argue that actually learner interactions can be a non-threatening environment for learners to practice using the language (Varonis & Gass, 1983). In the past, it was widely accepted that learners needed interaction with native speakers in order to facilitate acquisition. This was refuted by Long and Porter, who found no difference between learner speech with other learners and with native speakers, and that in fact learners can provide each other with the opportunities for communicative production and negotiation of meaning (Long & Porter, 1985). On this basis, the fact that the children willingly engaged in conversations with and through Irish indicates favourable conditions for language acquisition.

8.3.4 Codemixing

Some of the more able students in the class managed to communicate largely through Irish. Even if their language contained many errors, it still demonstrated developing language

fluency. Others interchanged English and Irish frequently, some managing to use predominant Irish phrases with English word insertions while other children mainly used English sentences using Irish word insertions (usually the high frequency words from the game – see section 8.4.3 for discussion). In all cases the children frequently used language chunks – a “unit of language that is often perceived as a single unit” for example “téigh go dtí” (go to) or “déan deifir” (hurry), and mixed these with English words.

The intra-sentential mixing of L1 and L2 is known as codemixing (Bhatia & Ritchie, 2008) and is a well-recognised feature of learner language. In a study of an all-Irish school setting, Mac Fhlannchadha found that the majority of English language use in code-mixing involved noun/verb/adjective insertion when the children did not have the vocabulary in Irish (Mac Fhlannchadha, 1999). This finding was also true in this present study, where the majority of English insertions involved content lexical items. Ó Duibhir, on the other hand, in a study involving a larger sample of older primary school children in both Gaeltacht schools and Gaelscoileanna, found that the majority of English language insertions were discourse markers (Ó Duibhir, 2009) (these were also present in the current study, for example, “so” or “ok”). He posited that this could be due to the age and language development difference between the two samples, as codemixing is reported to decrease with increasing bilingual fluency. While the context for this current study is different from both Mac Fhlannchadha and Ó Duibhir, it is of note that there are similarities in the non-immersion L2 context. What is different from both these studies is the presence of English sentences with Irish noun/verb/adjective insertions, which may be an indication of an earlier stage of language acquisition. There may also be an attitudinal link here. The two groups that had the fewest All-Irish utterances were the groups with the most negative outlook on their ability in Irish. It is possible that this indicates a lack of competence in Irish, but it is also possible that their own perception of a lack of competence was a limiting factor for them (see section 8.5.3 for discussion). In a study involving L2 learners of Italian, Worth claimed that using L1

insertions in the L2 production could actually be a sign of resistance towards immersion in the target language (Worth, 2006 in Swain & Deters, 2007). Antón and DiCamilla claim that use of the L1 can be beneficial in L2 learning as it can play “a strategic cognitive role both in scaffolding and in establishing intersubjectivity” (Antón & DiCamilla, 1998, p. 319). Therefore, the presence of English intermixed with Irish language use in this study does not necessarily indicate a negative condition for language acquisition, but rather an expected and natural stage in the learners’ language development. Furthermore, it echoes the findings of Piirainen-Marsh and Tainio who reported a type of hybrid game language when two 13 year old boys used a combination of the English terminology from the Final Fantasy game and their native language (Finnish)(Piirainen-Marsh & Tainio, 2009a).

8.3.5 Cognitive load

In order to benefit from the learning affordances in an educational game, sufficient working memory must be available to the player. The cognitive load of the game and the game activities will dictate how much working memory is available (Kiili, 2005). When the utterances with Irish were classified into task-oriented and social, it became clear that the majority of interactions using Irish were directed towards the tasks. This confirms the efficacy of the TBLT approach as giving focus to the children and providing an authentic context for target language interaction. However, when compared to the social language use, the task-based interactions were more likely to be mixed English-Irish than All-Irish (see section 7.3.2.4). It may be the case that the cognitive load of the game impacted on the children’s ability to maintain conversations in Irish while engaged in game tasks. This is a concern as it directly clashes with the goals of the intervention. This problem was previously highlighted by deHaan and colleagues in their study of vocabulary acquisition in a video game, where they found the university student participants who played the game recalled less vocabulary than those who merely sat and watched (deHaan et al., 2010). The instructional design of the game is crucial to ensure that the cognitive load does not overload working memory

(Kirschner, 2002). This is something that could prevent language acquisition and would need to be explored in more detail to achieve the correct balance in future iterations. However, in a longer intervention the negative impact of cognitive load could potentially decrease as children become more accustomed to the game demands, freeing up working memory for the language tasks.

8.3.6 Summary

This section outlined the main characteristics of children's Irish language use during the intervention, under the categories of willingness to communicate, pushed output, codemixing and cognitive load. The pushed output setup of the game and the children's willingness to communicate are favourable indicators for language acquisition. The presence of codemixing demonstrates children interacting with the language, which again is a facilitating condition of language acquisition. The issue of cognitive load as a limiting factor for Irish use is a negative indicator of language acquisition. The next section will build on these indicators to explore any evidence of language gains during the intervention.

8.4 Language gains

8.4.1 Introduction

In this section, the third research question, which relates to language gains in the intervention will be discussed according to the gains self-reported by the children, vocabulary gains and the acquisition of the copula form, evaluating the intervention for language learning effectiveness and contrasting with the relevant literature.

8.4.2 Self-reported general language gains

This section will discuss the self-reported language gains of the children, which were not measured. 14 out of 17 children self-reported language gains in the focus group interviews, highlighting vocabulary gains, improved pronunciation, improved spoken Irish and improved reading. This is similar to Rankin *et al*'s study involving adult players of Everquest 2 (Rankin et al., 2006). Several children in this current study also reported

improvements in their language comprehension, which was also reported by Rankin and colleagues in a later study (Rankin et al., 2009)

The children's emphasis on spoken Irish rather than the written elements of the intervention (through written tasks, written input) demonstrates how they interpreted the conversations with their peers as the principal component of the project, and also how they saw text chat as an expression of spoken rather than written Irish. This is substantiated by the literature on computer-mediated communication (CMC), which reports that CMC has similar benefits to oral communication (C. Blake, 2009; R. Blake, 2000).

Some children directly linked their ability to pronounce Irish words to the confidence or anxiety they experienced speaking Irish – in several cases the reported improvement in pronunciation is followed by an explanation of how this helped increase confidence (see section 7.4.3.1). It also raises the issue of Irish as a spoken language. While the children are exposed to written language input very regularly in school, there appears to be a breakdown in the transfer of written input to oral production as the written forms are used in spoken language. This related to the children's experience in Irish language reading. There is currently no formal teaching of Irish phonics in English medium schools, and this could be contributing to the children's confusion about pronunciation. This issue has already been raised by Hickey, who calls for more emphasis on decoding skills for L2 learners of Irish, as the orthography of Irish is significantly different to that of English (Hickey, 2011). Furthermore, the children's problems with pronunciation also raise the question of just how text-based their interaction with the language is – if there is a preponderance of reading and writing, then it isn't surprising that while children may be familiar with a word in print, they don't necessarily know how it sounds. In this study, some content was multimodal, with some written input also available as audio, and of course the teacher modelling of the game terminology pronunciation would have acted as input for the children. As they interacted with

and in the language with their peers, this repetition would also have reinforced their pronunciation of the different new words and phrases.

Of the 17 children, only two reported that their Irish had not improved during the project. These two children were among those with the most negative self-perception of ability, and the potential impact of attitude on learning is emphasised by their negative responses (see sections 8.2.2 and 8.5.3 for discussion).

8.4.3 Evidence of vocabulary gains

The interactional data can give some indication of language gains during the intervention. The majority of children demonstrate vocabulary acquisition, as they fluently use the game terminology and some terms from the instructions. In the literature, vocabulary gains are the most frequently reported language gains, as seen in Berns, Gonzalez-Pardo, & Camacho, 2013; Chen & Yang, 2013; Ranalli, 2008; Turgut & Irgin, 2009; Wang, Calandra, Hibbard, & Lefaiver, 2012. The children's frequent use of common classroom phrases from their normal Irish class (see section 7.3.2.3.2.1) demonstrated how these particular language chunks had been integrated into their language and could be used effortlessly. This aligns with an interactionist view of language learning that sees language input as the probabilistic data from which learners predict language utterances. Ellis describes how "sequential patterns of sounds... are acquired as a result of chunking from repeated usage... In building up these sequences, learners bind together the chunks they already know, with high-frequency sequences being more strongly bound than lower-frequency ones" (N. C. Ellis, 2009, p. 142). In addition to the language chunks they already knew, the frequency of new "chunks" in the language input has an impact on the rate of acquisition. This is validated by how the children readily used the high frequency vocabulary and phrases that they encountered in the game and in the instructions. The game terminology such as place names and team names became seamlessly integrated into the children's language, as evidenced by the fact that they never referred to the teams or the place names by the English translations. The frequent use of the

game terminology and the words from the instructions illustrated how they learned the high frequency vocabulary and phrases best. This has implications for future iterations of the game, to make the input rich in the language features to be taught, as Ellis points out “learners analyse the language input that they are exposed to” (N. C. Ellis, 2002, p. 178). It also provides an explanation for why there was no concrete evidence of copula acquisition – the language input did not have a high frequency of copula use. Furthermore, it could explain why the phrases on the prompt sheet given as support to the children at the start of the project did not seem to permeate their interactions (see section 7.3.2.3.2.1), as intended: the input wasn’t rich in these phrases, therefore they were not acquired to the same extent as the high frequency phrases and expressions in the game. However, as Ellis points out, while frequency is key, there are other factors involved that will determine acquisition – “effects of salience and learned attention entail that, broadly, it is not until a representation has been noticed and consolidated, that the strength of that representation can thereafter be tuned implicitly during subsequent processing” (N. C. Ellis, 2016, p. 247). Therefore, the language to be taught must not only be high frequency but it must also be salient, and drawing learners’ attention to the language will promote acquisition. In the case of the prompt sheet, the language information was not salient and was not used by most children. Frequency, salience and consciousness-raising would all need to be considered for future iterations of the game.

8.4.4 No evidence of acquisition of copula

It is unclear in the interactional data whether or not the children gained significant understanding of the construction of the copula. All children were exposed to copula use in the game instructions and in the game itself, however, with much lower frequency than the particular vocabulary gains mentioned above. There is limited evidence of receptive comprehension of the copula when the groups are completing quizzes involving that form - in the data available it seems that one of the groups has an understanding of which copula construction is appropriate for a man and which for a woman while answering the quizzes,

whereas the other group does not demonstrate an awareness of the difference between the masculine and feminine forms. This evidence is not sufficient to make any general claims about whether or not the children made progress with understanding use of the copula and more detailed further study would be required to investigate this further.

As mentioned above, the frequency of the copula form in the input is one potential reason for the failure of most children to effectively acquire the form, as it was present in a much lower frequency than the vocabulary successfully acquired by the children. Furthermore, another potential issue could be related to how the children were so focused on task completion that they gave minimal attention to the language form, thus ignoring the focus on form elements. This may be related to cognitive load, as discussed above.

In the language assessments, there is no evidence of consistent production of the copula form following the intervention, except for the one copula usage with which the children were previously familiar from introducing themselves – *Laura is ainm dom* (my name is Laura). However, despite the lack of evidence of copula acquisition, the language assessments showed a change in the type of sentence used by some children. Some children showed a broad shift away from using verb initial sentences to an alternative sentence structure, as will be described below. This shift away from sentences beginning with *Tá* could indicate an increasing awareness among the children of alternative sentence structures to the typical VSO structure using *Tá*. This may have come from the children's exposure to the copula in the game, but perhaps more importantly to the exposure to the new structure in the questions. This shift was more evident among the intervention control group – i.e. the children who took part in the game, but did not receive form-focused support (see section 7.2.3). Perhaps the focus on form element had a negative impact on children's understanding of the copula, or perhaps in the control group the children noticed the form more. Further investigation and repetition of the procedures with larger sample size would be needed to clarify these results.

The language assessments of the external control group demonstrate a similar trend, albeit to a lesser extent. This possibility was mentioned in section 4.7.4 and according to Doughty, this indicates either a maturational process or a test effect (C. J. Doughty, 2008). In this case there may have been a test effect whereby the language tests increased the children's awareness of alternatives to sentences using Tá.

There is some research on Irish language acquisition which looks at the copula (Hickey, 1992; Ó Conchubhair, 2003). Owen's case study looking at her young daughter's acquisition of Irish describes the emergence of the copula in the child's speech, however, the research only covered a year-long period in her acquisition (Owens, 1992). Difficulties with copula acquisition in all-Irish schools have been reported by several researchers (O Cathain, 2001; Ó Duibhir, 2009) However, there is a shortage of longitudinal research looking at stages of acquisition of the copula among second language learners. As a result of this, no firm conclusions can be drawn about the changes that took place in the children's responses from the first to the third test. It could be a test effect, a frequency effect or a developmental effect, but more longitudinal research would be needed to shed light on the process of copula acquisition. Some researchers would support more emergent data on language acquisition, rather than merely testing for an "end-point" (Larsen-Freeman & Long, 2014). This is connected to the language acquisition vs use debate discussed in Section 2.3. This study aimed to look at both, as described in the conceptual framework in section 2.7. This is an area for future research, as the language assessments from this study cannot provide conclusive evidence for emergence or acquisition of the copula structure.

8.4.5 Summary

The children reported substantial language gains after the intervention, in language production and comprehension. Vocabulary gains were also evident in the interactional data as the children used the new language from the intervention frequently and meaningfully. There was no evidence of acquisition of the copula form, however, there was a change in the

children's sentence production over the course of the intervention, which could indicate a greater awareness of alternative language structures, or could be linked to a test or developmental effect. This would need further research in order to make any reliable assertions about the process. The next section will deal with the fourth and final research question.

8.5 Impact of affordances

8.5.1 Introduction

The final research question will be discussed according to the projected affordances as set out in section 6.4. These affordances are strongly linked to the 3D VE affordances outlined in section 3.4.3, but in some cases the affordance was situated between the game and the classroom environment, and thus was a blended experience of technology and classroom. The affordances will be treated below according to their impact on either the interaction or the motivation of the children. The specific findings will be contrasted to the relevant literature.

8.5.2 Interactional affordances

The main impact of the affordances on interaction comprised the pushed nature of the output due to game set up and the affective promotion of interaction through a reduction in anxiety, enhanced willingness to communicate and a more immersive learning experience. These positive impacts of the game affordances have already been discussed in sections 8.2 and 8.3, so the discussion in this section will be limited to identifying the individual game elements that promoted these positive results.

The affordances of goal orientation and teamwork undoubtedly had a positive impact on promoting interaction. This is most clearly evidenced by the children's language use, as discussed in section 8.3. While the technology provided the possibility of teamwork and goal orientation, it was the game design, and more specifically the pedagogical approach that leveraged these affordances. The use of task-based language teaching in a collaborative way

proved an extremely effective means of “pushing” Irish language interactions among the children as previously discussed in section 8.3.2.

In addition to these structural elements, there were a number of factors that impacted children’s interactions in an affective way. These included the goals of the game giving children meaning and reason to communicate, how they experienced language community, the use of the avatar associated with a reduction in anxiety, and the experience of active learning that made the experience more authentic. One adverse affective impact was the negative emotions experienced by some children during the game. These factors and their impact on interaction will be treated in turn.

The goals of the game gave the children a framework for meaningful and authentic Irish language use. This was mentioned in the focus group interview, children asserting that having goals to get to, and having something to work towards provided authenticity – they actually saw and understood why they were performing the tasks in Irish in order to progress in the game rather than just practicing Irish for its own sake. At present, the communicative approach to Irish language teaching in T2 schools involves rehearsal of conversations based on tourist-type interactions. These are more relevant for learners of modern foreign languages such as French or German, as ordering food in a restaurant through French is a more realistic scenario than through Irish. Ó Laoire points out that students learning Irish “are asked to suspend disbelief” to rehearse these scenarios, and he feels that many students “have seen through the ruse” and do not find these language conversations meaningful (Ó Laoire, 2005, p. 1723). A TBLT approach in the Irish language classroom can provide the means to a more authentic language interaction, as demonstrated by this project. The team affordance also had a positive impact on most children’s interactions. This is evidenced by the strong emphasis on the team throughout the focus group interviews and the interactional data. Many children mentioned how they were encouraged to use Irish when their friends and teammates were using Irish. This aligns with the findings in section 8.2.4 which demonstrated the central place

of community in making Irish meaningful for the children and encouraging them to interact in the language.

Another positive impact on interaction was the reduction in Irish lesson anxiety and increase in willingness to communicate displayed by the children. This may be linked to the immersion afforded by the avatar, as previously mentioned in section 8.3.3. Peterson indicated a link between avatars and lower anxiety and increased risk taking with 4 university level EFL students in Japan (Peterson, 2012b) and also Deutschmann reported a decrease in shyness and inhibition due to avatar use in a research study involving 6-7 doctoral students using Second Life for language learning (Deutschmann, Panichi, & Molka-Danielsen, 2009). In this current study, the avatar that the children had in the game was not explicitly mentioned, but this indicates that perhaps the avatar facilitates a seamless immersion process where the avatar became invisible to the children as they themselves felt immersed in the game and identified themselves and their peers as the avatars. This notion is validated by the evidence that the children spoke in the first person about being able to move around, and travel, to go through portals and find things, speaking in the first person, demonstrating that they were indeed experiencing immersion in the environment. Interestingly, the children also connected this experience to a perspective of being active in their learning. This was related to the immersive nature of the game and the use of the avatar which gave the children the impression of being able to travel around and do things. In their comments about active learning, the children frequently contrast it to the normal Irish lesson, which they perceived as less active. This is evidence to support how immersive 3D environments can be used to simulate active learning experiences – the children were still sitting at their desks, speaking, listening, reading and writing Irish, but they experienced it in a transformative, active way. This is not to say that the Irish lesson cannot be an experience of active learning for the children. In fact, active learning is a key recommendation in the 1999 Irish language curriculum for primary school, advocating that the children should be active in the lesson and

in practicing the four skills of reading, writing, listening and speaking (Coiste Curaclaim Ghaeilge, Ireland, Department of Education and Science, & National Council for Curriculum and Assessment (Ireland), 1999). Whether or not school children experience their Irish lesson as active and experiential will depend on how the curriculum is delivered in individual schools, but there may be a disconnect between the recommendations and practice, as highlighted in the recent Chief Inspector's report which found that the quality of teaching was unsatisfactory in one in five Irish lessons (Inspectorate, Department of Education and Skills, 2013), indicating that good practice is not always implemented in the classroom.

One area of concern in terms of affective factors in interaction was the negative emotions experienced by some children during the game, perhaps as a result of a perceived lack of competence or even just through experiencing the game criteria as stressful. The negative emotions experienced by some children clearly had a negative impact on their interaction in Irish. There is currently a growing awareness of the potential negative psychological impact of the experience of negative emotions in immersive gaming. The so called "liminal spaces" of these games mean that the user is somewhere between reality and the virtual reality of the game, but the emotions they experience are very real. This issue was recently raised by Jakobsson in his research on using "mean game mechanics" – the use of aggression, betrayal, lies and other anti-social forms of behaviour in games (Jakobsson, 2015). The game used for the purposes of this thesis differs from Jakobsson as there are no "mean mechanics" in the game, rather supportive teamwork is encouraged, however the issue he raises of the impact of negative emotions is relevant to the current study given the children's self-reported negative experiences. This may also relate to the use of competitive rewards systems where some children experience the negative emotions of failure and stress. This raises ethical concerns particularly as children are involved, and there is a need for the psychological impact of gameplay to be further explored so that children do not experience negative psychological consequences of participation in this type of game.

8.5.3 Motivational affordances

For most children, participation in the game was a very positive motivating experience in learning and using Irish. The major motivating factors were found to be the goal orientation of the game, the rewards system, the experience of relatedness through teammates, and the “fun” experience of the game. Challenge was the affordance which received the most mixed response, some children finding it motivating, others demotivating, indicating that the correct level of challenge was not found for all children. These individual factors and their impact will be discussed in turn below.

The goal orientation in the game had a positive impact on children’s motivation. In developing the tasks for the game, it was decided to use the lens of mystery in an attempt to sustain children’s interest throughout. It would appear that this attempt was successful, as indicated by how the children described how solving the mystery was a source of motivation for them. In the exit questionnaires the affordance of goal orientation was not explicitly mentioned in the questionnaire, however, it is supported by how the children described their enjoyment of having goals to achieve in the game – finding out who was guilty, travelling, doing quizzes. The specific goals were connected to earning rewards. In this study, the affordance of rewards was found to have the most obvious positive impact on the children’s motivation.

As previously mentioned in section 3.4.3, there is some controversy about the use of rewards as motivational tools in computer games. The dispute is linked to the debate on how appropriate it is to “gamify” learning tasks. Gamification is a term that has come to mean using game-like features in non-game settings in order to encourage motivation and engagement. One broad societal example of this is a loyalty card in the supermarket, where one earns points and rewards for spending money in the shop, another example would be a coffee shop offering a free coffee after getting ten stamps on a rewards card. These incentives provide extrinsic motivation to users to engage in a particular activity. However, there are many critics of this trend, who say it has very little to do with actual games. Robertson calls it

“pointsification” and highlights that “when this upward escalation [rewards on a loyalty card for example] is based only on accumulation of points, rather than on expressions of my choices and my skills, then this further strips out the sense of agency and competence, so crucial to the emotional and neurological buzz we get from gaming.” (Robertson, 2010). A major problem with the use of external rewards in a gamified experience is that “it can reduce the internal motivation that the user has for the activity, as it replaces internal motivation with external motivation” (Nicholson, 2012, p. 223). This would go against the ARC framework of supporting intrinsic motivation, and indeed several ARC proponents argue that rewards should not be necessary if the game is engaging enough and supports the autonomy, relatedness and competence of the user (Ryan et al., 2006; Squire, 2003). However, it is widely accepted that rewards are an essential component part of most game set-ups (Gee, 2003; Prensky, 2001).

In this study, the gamification debate was not seen as central, as the learning tool used was an actual game, rather than a gamified activity. Furthermore, while the use of external rewards for motivation through gamification may be construed as “exploitation” (Bogost, 2011), in an *actual game*, rewards are an intrinsic component, therefore this concern is not quite as pertinent to this research as in gamified learning scenarios. In the particular game used in the research study reported here, the initial intention was for the rewards system to be integrated into the game platform, using the points and leaderboard in the online game. Unfortunately, during the development process it became apparent that this was not feasible due to the software and budget constraints. As a result of these constraints, the rewards had to be external to the game, as previously mentioned, through a leaderboard in the classroom and the opportunity to earn points and a trophy. While some may argue that this constitutes inappropriate use of external rewards, in fact these rewards were central to the game itself, which took place between the computer and the classroom, where children interacted with the materials and each other both on the computer and face to face. This means that the rewards

system was not experienced by them as something external and imposed, but as a central part of the game itself, supporting the argument that this was not a gamified experience with the imposition of extrinsic rewards, rather a game where rewards were an integrated component of the whole experience. Even Bogost, who argues against gamification as exploitation acknowledges the difference between gamification and actually using real games, saying gamification is “the easy answer for deploying a perversion of games as a mod marketing miracle” in comparison to “using games earnestly” (Bogost, 2011)

This study found that the use of rewards had both positive and negative impacts, contrasting with Filsecker and Hickey’s study which found that rewards could be used without negative impact on motivation (Filsecker & Hickey, 2014). Their study was specifically designed to compare an experimental group which received rewards with a control group who didn’t, whereas all students participating in the 3D VE game in this study received rewards. While the presence of negative impact of rewards in the research presented in this thesis diverges from Filsecker and Hickey’s findings, their overall conclusions of the positive impact of rewards were supported by this research as the positive impact outweighed the negative. This is demonstrated in the focus group interviews where the motivation afforded by the rewards structure of the game was the most prevalent subtheme in the game experience theme, the children describing how they wanted to win, how the possibility of earning points encouraged them to use Irish. Ronimus *et al* found that in an eight-week intervention with 138 children, the motivational impact of rewards disappeared over time (Ronimus et al., 2014). This contrasts with the research in this thesis, which involved more gameplay over a four week period, but was in a 3D VE compared to the more basic game platform used by Ronimus and colleagues (their game was a basic letter matching activity). It is possible that the children lost interest in the very basic game platform in Ronimus *et al*’s study, and the rewards system couldn’t address this lack of interest. After spending longer in the game than those in Ronimus *et al*’s study, a majority of children in this current study

reported in the exit questionnaire that earning points and climbing the leaderboard were sources of motivation to work harder. In fact no children reported that earning points didn't motivate them, and only one child stated that being high on the leaderboard didn't motivate them. This would indicate that a majority of children experienced this affordance in a positive way. Furthermore, in the interactional data all teams made reference to the rewards system while playing the game, albeit to varying degrees. Clearly the affordance of rewards was experienced by all children, however they experienced it as motivating to a greater or lesser extent, and a very small minority may have experienced it as demotivating.

There were some reports of negative emotions experienced as a result of the rewards system – for example pressure, stress, worry, demotivation. The difficulty a competitive type of rewards system is that some children will inevitably be at the bottom of the table and feel disappointed, even feel a sense of failure. This ties in with the debate above about how appropriate rewards are in a game or a gamified system, when they are merely providing external motivating power rather than supporting intrinsic motivation. This problem is raised by Black *et al* in their consideration of formative assessment. They posit that “if a learning exercise is seen as a competition, then everyone is aware that there will be losers as well as winners, and those who have a track record as losers will see little point in trying” (Black, Harrison, & Lee, 2004, p. 18). They propose than instead of a competitive rewards based system, a feedback-based system that doesn't compare students with each other, but rather compares individuals with the success criteria of the game, can prove more useful in motivating all students, not merely those with high ability. They report that when feedback addresses what can be done to improve that this encourages students to remain task-focused, compared to a grading system which encourages ego satisfaction for the successful and self-esteem issues for the unsuccessful. While rewards are traditionally associated with games, Black and colleagues recommendations for non-competitive feedback may have potential for application in games for learning. This could be applied through integrating success criteria

into the game platform and ensuring that the criteria for success depend on performance relative to the game structure rather than compared to other students. This will be discussed further in Chapter 9 in recommendations for future work.

The affordance of teamwork and collaboration also had a very strong positive impact on children's motivation. The children reported how friends and teammates supported and encouraged each other in the game, and described how they worked together to complete the tasks. The intervention and game design necessitated group co-operation and to a large extent the children experienced this in a positive way. This experience of collaboration is strongly linked to the concept of relatedness from SDT, which "refers to a sense of warmth, security, and connection between the learner and other people in that social context." (Comanaru & Noels, 2009, p. 135). The children's positive experience of relatedness was confirmed in the exit questionnaires when the children mentioned the problem solving strategies they used when stuck – such as asking their partner or sending a chat to their friend. Furthermore, a friend's encouragement was the most commonly reported source of motivation to speak Irish.

In the interactional data, the affordance of collaboration and teamwork is evidenced by the large proportion of interactions that involved motivating team talk – where individual team members encouraged and motivated each other to keep going in the game, to stay on task and to get the work completed. This experience supports the findings from the focus group interviews where children described how team members helped and encouraged each other.

Given the importance of relatedness to motivation, the problems encountered by some teams are a source of concern. Not all children experienced the affordance of teamwork in a positive way, due to issues with fighting over the computer, varying levels of commitment, etc. More scaffolding and support for teamwork could help to reduce this problem. The co-operative learning model of the Johnson brothers offers a comprehensive approach to

supporting students in developing the skills of interdependent teamwork (D. W. Johnson & Johnson, 1999).

This affordance is particularly important for Irish, given how being part of a language community can be beneficial for children's attitudes to Irish and their language learning (see section 8.2.4), and the 3D VE intervention can help to support this sense of participation in a language community. The technological tool can provide a framework for designed learning experiences that support the experience of language community, particularly where co-operative models of teamwork are used, for example co-operative learning (D. W. Johnson & Johnson, 1999).

While Rigby and Ryan may not consider "fun" as a useful concept in game design (see section 3.4.3), in this study the affordance of fun had a positive impact on the learning experience, as demonstrated by how frequently the children used this term in the focus group interviews, while in the exit questionnaire all of them reported having fun during the intervention. This is similar to O'Brien and Levy's study with 43 university students in an immersive world for learning German, where the most common response from the students was that it was "fun". In the research presented in this thesis, when asked in the focus group interview about using a computer game to learn Irish, fun was the adjective of choice for the majority of the children. All of the children indicated that using a computer or a computer game to learn Irish was motivating for them. This seemed to be connected to the children's experiences of playing computer games outside of school, as they transferred that positive association of playing and fun to the context of the game for Irish. A similar effect was found by Zheng *et al* in their intervention using Quest Atlantis for 12 year olds learning English. In the research study presented in this thesis, the children clearly linked the experience of fun to the computers, as the majority children said in the exit questionnaire that similar activities without the computers would not be fun. This raises the issue of a potential "novelty effect" as described in section 4.10.

Importantly, in this study the fact that it was an educational game did not appear to detract from the children's perception of it as fun, one child even commenting that they learned more because they were playing. This supports the concept of integrating TBLT with a gaming platform. The language learning goals were aligned with the gaming goals, which gave the children an experience of gaming which was fun even though it was focused on using Irish. This corresponds to Purushotma *et al*'s proposal of integrating gaming and language learning goals so that the language becomes a resource for achieving the gaming goals.

The impact of the affordance of challenge was mixed. Children reported negative emotions when the challenge level was too high, but many said they found the challenging tasks to be motivating. This indicated the delicate balance required in setting the challenge level of the tasks. This finding corresponds with Chen and Yang's study with university students, where the students were split between finding the challenge motivating and finding the challenge too high and the tasks too time-consuming as a result (Chen & Yang, 2013). As Gee points out "good games are learning machines" – for a game to be effective, the design needs to facilitate learning of the game and mastering of the challenge – in the commercial setting Gee highlights that "game designers have no choice, they have to make games that are very good at getting themselves learned"(Gee, 2007, p. 2). This was one of the most difficult goals to achieve in this project, and would need significant further work to optimise. It proved very difficult to choose the correct level for challenge for the series of missions the children were set. This was important as if the level was too low, the game would not leverage the motivational potential of challenge (as described by Thorne, Black, & Sykes, 2009) and if it was set too high, they could get demotivated, perceiving it as too difficult, as described by many students in Chen and Yang's study.

The key role of competence in motivation is a central part of SDT. In this field, competence may be defined as "the feeling that one has the capacity to effectively carry out

an action” (Noels, 2009, p. 302). Ryan and Deci maintain that if the psychological need for competence is met, the learner will experience motivation, but if the learner does not feel capable of carrying out the required action, this will result in demotivation and potential disengagement (Ryan & Deci, 2012).

This position is supported by this research presented here, where the interactional data demonstrated a link between the challenge being too high and the child disengaging. The reverse was also true, with one particular interaction illustrating the rapid shift in a child’s attitude from negative to positive when they overcame the challenge and figured out what to do.

In this intervention, the difficulty level was standard across all groups, although each child experienced the level of challenge differently. Given that not all children have the same levels of competence or of perceived competence, this standardised approach to setting the challenge level could prove problematic. This was in fact the case - in the exit questionnaire, when asked if difficult tasks motivated them to work harder or not, there was a split among the children. Nine children said that the challenge motivated them, while seven did not, and one was neutral. How each child experienced the challenge depends on their perceived competence to meet the task requirements. When the same level of challenge is given to a group of children with varying ability, it is inevitable that each child will experience it a different way. In order to maximise each participant’s perceived competence and correctly select the appropriate level of challenge, a more personalised set of tasks may prove helpful. This will be discussed further in the recommendations in Chapter 9.

One additional impact of the intervention affordances on motivation was in the area of Language Learner Autonomy (LLA), which was supported by the task-based and collaborative nature of the game. Promoting LLA is one of Dörnyei and Csizér’s ten commandments for motivating language learning (Dörnyei & Csizér, 1998). Little describes LLA as “the ability to take charge of one’s own learning” (Little, 2007, p. 15) and posits that

the language teacher needs to gradually give more control to the student over how and what they learn, encouraging them to take responsibility for their own learning. In the results of this study, there is evidence for the children experiencing LLA and also encountering situations where they were not in control and felt frustrated. Some examples of LLA include how the children had the glossary to look up new words, and how they felt confident using problem solving strategies when unsure what to do. Examples of the opposite experience principally relate to issues with the technology that they needed the teacher to solve, and they expressed frustration that they were dependent on the teacher who may or may not have been immediately available. This highlights when LLA is not present, the negative experience the students may have. More consideration needs to be given to promoting learner autonomy in future iterations of the project, as learner autonomy can predicate learner success. As Dickinson points out:

enhanced motivation is conditional on learners taking responsibility for their own learning . . . and perceiving that their learning successes and failures are to be attributed to their own efforts and strategies rather than to factors outside their control.(Dickinson, 1995, pp. 173–174)

This is also closely related to the SDT concept of autonomy as concerning “the difference between behavioural engagement that is congruent and fitting with one’s values, interests and needs (i.e., with one’s self) versus alienated, passively compliant, or reactively defiant.” (Ryan & Deci, 2004, p. 450). The authors identify the experience of autonomy as central to having the motivation to engage with particular tasks. Perhaps the child who withdrew from participation in the game did so because it did not fit with his values, interests and needs. If this is the case, then from an ethical point of view it was important that he had the opportunity to withdraw. However, this does raise the question of how to support student voice and SDT autonomy while maximising participation. Nevertheless, the majority of students in the study engaged enthusiastically and appreciated the opportunity for active and self-directed learning. This confirms the overall premise of the game design to support learner autonomy.

The discussion of the motivational affordances to this point aligns with the SDT frame of ARC. While the term “fun” is widespread in children’s feedback about why they enjoyed the game, Rigby and Ryan’s model of need satisfaction may help to identify why and how the children experienced it. They propose the SDT needs of competence, autonomy and relatedness as the keys to understanding enjoyment of games (Rigby & Ryan, 2011). In this research study, the children reported that working with their team, earning points, solving the mystery, finding clues and using Irish to do the missions helped them to have fun in the game and were sources of motivation to use Irish. Teamwork is an expression of relatedness, earning points and solving the mystery are associated with competence, and finding clues and using Irish to do the missions are connected with autonomy. In this way, Rigby and Ryan’s proposed need satisfaction is a framework for understanding the dynamics of motivation among children learning Irish, and could be leveraged to increase their engagement with the language through directly targeting the needs for autonomy, relatedness and competence.

8.5.4 Summary

The projected affordances of the intervention had a predominantly positive impact on the learning experience for the children. For promoting interaction, the goal-oriented and team-based TBLT approach was particularly effective. The immersion and active learning aspects of the game also supported interaction and may have contributed to an increased willingness to communicate through Irish for most children. In terms of motivation, again the goals were a key factor in motivating the children, along with the rewards structure of the game, the positive experience of teamwork, the fun element of the experience and the appropriate pitch of the challenge of the tasks. The SDT framework of ARC encompasses these experiences and can provide an important paradigm for future planning for Irish in the primary classroom, with or without technology.

8.6 Conclusion

This chapter has explored the important findings in this study relating to each research question, and positioned the findings relative to the literature. The small scale and numerous limitations of this study make it difficult to make substantive claims about the findings. However, the very positive indications suggest that this research could provide valuable insight to policy makers and support them in their attempts to improve the efficacy of Irish language teaching in schools. Participation in the intervention transformed most children's experience of Irish language learning. In light of the frequent negative trends reported on the Irish language in schools, this is a very positive and encouraging finding. It is hoped that this research can make a positive contribution towards the ongoing discussion about how to improve student engagement with the language. Experiencing real language community, having authentic reasons to communicate and feeling motivated to use the language are goals of every language teacher. These goals were achieved in this project, so that despite its limitations, this research has an important contribution to make to Irish pedagogy.

The next chapter will provide an overall summary of the implications of this research, along with some recommendations for policy, practice and future work.

9 Conclusion

9.1 Introduction.

The first chapter of this thesis outlined the principal aims of this research:

- To develop and evaluate a language learning intervention using a three-dimensional virtual environment to support children learning Irish as a second language in primary school.
- To explore how current best practice in language teaching could be coupled with the latest technological advances in order to reverse the downward trend in achievement of Irish fluency in primary school.
- To contribute to broader policy and practice in school-based language learning and minority languages.

The previous chapter demonstrated how this aim has been achieved in this thesis. The 3D VE was successfully developed through two Design Based Research iterations and a user consultation process. A language learning intervention for Irish was developed using TBLT and a mystery game narrative in the 3D VE and trialled in a 4th class in a rural primary school. The findings from the research demonstrate that yes, this type of approach can be very effective at providing the context for meaningful interaction in the language and can be very helpful in supporting most children's motivation to use Irish. Can this help to address the substantial challenges faced by the Irish language in education at present? While the range of factors influencing Irish in schools is broad and complex, this research demonstrates that yes, this approach could indeed help through creating a language community in the classroom, supporting children's motivation and giving them reason to communicate through Irish. Unfortunately, at time of writing, not all schools can access this type of 3D VE for Irish due to lack of access to computers or high speed internet. However, even in the absence of technology, the findings from this research demonstrate a clear way forward for Irish in the primary school, through using a task-based and co-operative approach to create an authentic

language learning experience in the classroom. The remainder of this chapter will outline the major contributions of this thesis, before reporting the recommendations arising from this thesis for policy and practice in the Irish primary classroom. Finally, a brief overview will be given of the direction of future work.

9.2 Thesis Contributions

This thesis makes a number of important contributions to the field of CALL in general and to the Irish education context in particular. These are listed below:

- Rare instantiation of ecological research in a primary school context, exploring attitudinal, attainment factors through a range of data sources (see section 2.7)
- Evidence and theory-based taxonomy for classifying 3D VEs according to a continuum of goal orientation (see section 5.8 and also Dalton & Devitt, 2016)
- Application of Student Voice methodology to Design-Based Research user consultation (see section 4.6)
- Successful realisation of an authentic context for language use and a nascent language community for a minority language through the use of a 3D VE (see section 8.2.4)
- Evidence for efficacy of a TBLT approach to Irish teaching in primary school (see sections 8.3 and 8.5)
- In-depth examination of children's motivation in relation to Irish that combines validated quantitative tools with a qualitative analysis within the SDT ARC framework. Provides a greater insight into the dynamics of children's motivation for learning Irish according to the principles of autonomy, relatedness and competence that could be exploited to improve Irish language pedagogy. The in-depth, qualitative analysis of children's experience, and the suggestions for how to address the problems identified that are presented here

can offer key insights to policy makers and language educators in the primary education sector.

9.3 Recommendations for policy and practice

Some important recommendations for policy and practice arise from this research study:

1. Significant investment is needed for ICT resources in primary schools. As previously mentioned, a lack of suitable resources was a limiting factor in the sampling for this research, and while the results of the 3D VE intervention were hugely positive, at present this could only be made available to a limited number of schools because of the problem with accessing up to date technological resources. This echoes Johnston's previous findings (Johnston, 2014) and concerns raised by Benini at second level (Benini, 2015), even though there has been a more concerted effort to update secondary schools' technology, issues still remain, and the primary sector is even further behind. To a large extent an emphasis has been placed on providing broadband for schools, however the hardware infrastructure is just as important in order to access high end technological resources such as 3D VEs and realise the potential of the broadband.
2. Even without the technology used in this project, the success of the intervention can provide insight to those involved in Irish-pedagogy decision making for the primary sector. The TBLT approach was shown to be an effective way of encouraging language production in an authentic context, rather than decontextualized conversation rehearsals that are at the core of current communicative practice in the classroom (Ó Laoire, 2005).
3. The positive impact of participation in a language community was evident in the data. The current situation with the Irish language is that authentic speech community is not a regular experience for children outside the Gaeltacht in T2 schools. This is a broader

societal issue, but schools can make a difference by becoming a speech community.

This could be achieved through adopting the TBLT approach taken here and applying it outside the Irish lesson. This could be achieved through a CLIL (Content and Language Integrated Learning) approach where the Irish language would be integrated with the subject content for other curricular areas - for example doing Science tasks through Irish, participation in Art, Drama, and P.E. through Irish. This is not a new suggestion (Harris & Mac Giollabhuí, 1998a, 1998b), however, this thesis demonstrates its potential positive impact in giving children a reason to use Irish.

4. The excess disengagement of children with Irish has been evidenced in the nationally representative GUI study (see Devitt et al., 2016). There is a need to explore this phenomenon both qualitatively and quantitatively, and the Student Voice approach offers a powerful methodology to access children's opinions and could increase their sense of ownership and involvement in the process of education. As demonstrated in this thesis, using an ARC model of motivation provides an insightful frame for this type of exploration (Comanaru & Noels, 2009; Noels et al., 2003), and the ARC model could help to identify what positive strategies could be used to support children's motivation, as evidenced in this research study.

9.4 Future Work

As this research was a DBR cycle, the next step would be to carry out a third iteration, based on the findings from the second. The research methodology of the third iteration would aim to:

1. increase duration of intervention in order to reduce any potential novelty factor and embed the approach within the children's school experience.
2. broaden the scope of enquiry and involve a larger sample size in the study.
3. improve data collection procedures to limit data loss and allow for tracking of each individual child.

In terms of 3D VE and intervention design, the third iteration would:

1. integrate gaming goals and rewards into the game platform in order to achieve a success criteria based rewards system rather than a competitive one that may alienate some children
2. provide more scaffolding of task and group related vocabulary before the intervention and throughout
3. increase the level of autonomy in the game experience so that each team could move through the game at their own pace
4. provide a range of challenge levels in terms of linguistic demands so that no one is excluded through feeling a lack of competence
5. create an online partnership between different schools so that children from each school could work together in the game, communicating through text chat
6. adjust the input to directly target certain vocabulary and grammar through high frequency input. Different modules/levels within the game could focus on different language features through providing high frequency input of these features.

After this third iteration it is envisaged that the 3D VE intervention would be a viable proof of concept that could be commercialised with a focus on robustness and accessibility, which could make the game available to every primary school in the country, and potentially have application for Irish learners abroad, or indeed other languages.

Another exciting area of future work is applying the pedagogical principles taken in this intervention and applying them to non-ICT based teaching. As mentioned above, the TBLT approach to learning Irish could be applied both within and outside of the Irish lesson, and this approach could have more immediate positive benefit in Irish schools as it would be accessible to all, regardless of the school's technological resources.

9.5 Conclusion

This chapter has summarised the importance of this research in the Irish education sector and in the broader field of call, giving valuable recommendations for policy and practice for Irish primary schools and indicating several avenues of research to make progress in contributing to a solution to the multiple challenges facing the Irish language in schools today.

While the study described in this thesis was small in scale, the depth of insight into children's experience and efficacy of teaching approach for Irish reported here has the potential to make a worthwhile contribution to ongoing efforts to revitalise the Irish language in the primary school.

10 References

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