

Digital Literacy for Individuals with Intellectual and
Developmental Disabilities in Education: A Systematic Literature
Review

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Declaration Page

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A handwritten signature in black ink, appearing to read 'B. K. Rignood', followed by a period.

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Abstract

This systematic review of the literature research study aims to explore how digital literacy and digital competencies are being defined and utilised within the research for people with intellectual and developmental disabilities. The review focused on both educational and health-based databases for this process. Through a rigorous selection where rules for inclusion and exclusion were defined, a final tally of forty-five articles were selected from an initial set of nine hundred and eighty-eight. Findings show that the term digital literacy is ill defined in the research literature. There is a broad range of other terminology used to define digital literacy, ranging from computer skills to technology skills. Some technological barriers to digital literacy are highlighted within the literature and most of these barriers are external factors, situated outside of the person. Further, many of the barriers to digital literacy and integration that existed twenty years ago persist today. In conclusion many researchers working within intellectual and developmental disability are not defining the term digital literacy within the research literature and this needs to be considered within future research.

Summary

In this dissertation, the research seeks to examine how the terms digital literacy and digital competency are used and defined for people with intellectual and developmental disabilities (IDD) from the age of 10 years and older.

The rationale for this research was based on wider research, both nationally and internationally, in relation to educational opportunities for people with IDD. With the advent of new educational opportunities for people with IDD, digital literacy and competencies need to be considered along with all other educational opportunities that can be provided for these students. Having a clear understanding of how terminology such as digital literacy and competency have been utilised in the research related to education and other areas can support educational development and research planning for the future.

Throughout the course of this research study, it has become clear that the term digital literacy, although used within some research related to people with IDD, is lacking a definition within many of the studies. Only two studies provide a definition within their paper with some other papers using the term but not clarifying its meaning. There has been a wide variety of other terminology found across the literature such as computers skills or technological skills, with authors moving between different terminology even within their own research. Overall, the use of terminology around digital literacy and competencies is found to be mixed, inconsistent and unclear, leaving it open to interpretation and making it difficult to draw strong conclusions. Research could and should provide evidence for and guide the development of digital literacy and competency pathways for people with IDD. This is the focus of this research study.

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Table of Contents

<i>Digital Literacy for Individuals with Intellectual and Developmental Disabilities in Education: A Systematic Literature Review</i>	<i>i</i>
Declaration Page	ii
Abstract	iii
Summary	iv
Acknowledgements	v
List of Appendices	viii
List of Figures	ix
List of Tables	x
List of Abbreviations	xi
Chapter One: Introduction	12
1.0 Introduction	12
1.1 Background to Research	12
1.2 Overview of Research and Methodology	12
1.3 Outline of Dissertation	13
1.4 Conclusion	14
Chapter Two: Literature	15
2.0 Introduction	15
2.1 Intellectual and Developmental Disability (IDD)	15
2.1.1 Intellectual and Developmental Disability and Education	16
2.2 Digital Literacy	17
2.2.1 Digital literacy and IDD	18
2.3 Digital Competence	19
2.3.1 Irish Context	20
2.3.2 Digital Competency Frameworks	21
2.4 Barriers to Digital Engagement	22
2.5 Conclusion	23
Chapter Three: Methodology	24
3.1 Introduction	24
3.2 Rational or Purpose of the Study	24
3.3 Research Questions	26
3.4 Ethical Considerations	26
3.4.1 Consent	26
3.4.2 Capacity	27
3.4.3 Time Restrictions	28

3.5 Method.....	28
3.5.1 <i>Systematic Literature Review</i>	28
3.5.2 <i>Search Strategy</i>	29
3.5.3 <i>Databases</i>	31
3.5.4 <i>Search Terms</i>	31
3.5.5 <i>Inclusion Criteria</i>	31
3.5.6 <i>Exclusion Criteria</i>	32
3.6 Data Gathering and Management Process.....	33
3.6.1 <i>Literature Search Findings</i>	33
4.2.1 <i>Initial Literature Screening</i>	36
3.5.7 <i>Document Management</i>	38
3.5.8 <i>Studies Included in the Review</i>	40
3.5.9 <i>Review of Coding Process of Included Articles</i>	42
3.6 Conclusion.....	42
<i>Chapter Four: Findings and Discussion</i>	44
4.1 <i>Introduction</i>	44
4.2. <i>Digital Literacy</i>	44
4.2.1 <i>Definition of Digital Literacy</i>	44
4.2.2 <i>Other Terminology Used Within the Research</i>	47
4.3 <i>Digital Competency</i>	49
4.4 <i>Barriers</i>	51
4.4.1 <i>First Order Barriers</i>	54
4.4.2 <i>Second Order Barriers</i>	54
4.5 <i>Conclusion</i>	55
<i>Chapter Five: Conclusion and Implications for Practice</i>	56
5.1 <i>Conclusion</i>	56
5.2 <i>Research Implications</i>	57
5.3 <i>Limitations of the Research</i>	57
<i>References</i>.....	58
<i>Appendix A – Literature Applied within the DigComp Framework</i>	68

List of Appendices

Appendix A Literature Applied within the DigComp Framework

List of Figures

- Figure 1 Sample PRISMA Chart
- Figure 2 PRISMA Chart of Literature

List of Tables

Table 1	Databases Used
Table 2	Database Search Results
Table 3	Forty-Five Studies Included in Review
Table 4	Coding of Selected Articles
Table 5	Cited Definitions of Digital Literacy in the Studies
Table 6	No Definition of Digital Literacy Provided
Table 7	Other Terminology Used
Table 8	Literature Applied to the DigComp Framework
Table 9	First Order Barriers
Table 10	Second Order Barriers

List of Abbreviations

EPSEN	Education for People with Special Education Needs
GOI	Government of Ireland
ICT	Information Communication Technology
ID	Intellectual Disability
IDD	Intellectual and Developmental Disability
LMS	Learning Management System
NCSE	National Council for Special Education
OECD	Organisation for Economic Co-operation and Development
PRISMA	Preferred Reporting Items for Systematic-Analysis
REAMS	The Research Ethics Application Management System
SDGs	Sustainable Development Goals
SEN	Special Education Needs
SLR	Systematic Literature Review
TCPID	Trinity Centre for People with Intellectual Disabilities
UK	United Kingdom
UNCRPD	United Nations Convention on the Rights of Persons with Disabilities
USA	United States of America

Chapter One: Introduction

1.0 Introduction

This systematic review of the literature was undertaken during the 2023/2024 academic year. Its aim was to gain an understanding how digital literacy and digital competency has been investigated and used within the research for people with intellectual and developmental disabilities (IDD).

1.1 Background to Research

Students with intellectual and developmental disability have been attending post-secondary education programmes for over twenty years (Hasegawa, 2019; O'Connor et al., 2012).

Initially many of these programmes have only been within a select few countries across the globe, particularly in the United States of America (USA) (Grigal et al., 2013; Hasegawa, 2019). However, with governmental and policy developments providing sustainable and growth options for the progress and long-term running of these programmes there is a need to consider educational policies, practices, and curriculum development for these programmes (HEA, 2022). One area of growth within education relates to digital literacy and competency at third level education opening up questions related to how digital literacy and competency can be integrated at third level for people with IDD (Spante et al., 2018; White, 2019; White et al., 2020).

1.2 Overview of Research and Methodology

The focus of this dissertation is on examining how digital literacy and digital competency are viewed within the research literature for people with IDD. It aims to explore how and in what context the terminology digital literacy and digital competency are used.

The research will also highlight the barriers in the research related to digital literacy and competency and to identify any gaps that may exist within the research for this cohort, students with intellectual disabilities.

This dissertation aims to examine the intersection of digital literacy and competency for people with intellectual and developmental disability within the literature across the last twenty years. A thorough search and examination process was used on the literature on the topic and was completed to convey a response to the research questions that were asked.

Using a desk-based methodology, this research sought to answer the research questions using a Systematic Literature Review (SLR). This method of review was chosen as it allows for a thorough assessment of existing research on the chosen topic and will be discussed further in Chapter 3. The systematic literature review process involved developing the research question and sub questions, completing a search of the literature databases, extracting, and then analysing the data from the final literature selection. This methodology was chosen for its systematic and thorough approach of working through the literature and to fit within the circumstances surrounding this dissertation.

1.3 Outline of Dissertation

This dissertation has been divided into five chapters: introduction, literature review, methodology, findings and discussion, and conclusion. Each chapter provides an introduction and overview of the chapter, then proceeds to detail the research process, including a breakdown of the topic being discussed, development of an understanding of each topic, an outline of the research process methodology, the findings along with an analysis and what this means in terms of implications and recommendations for future research and practice.

In the literature review, the concepts of digital literacy and digital competency are discussed within the context of research and education. The methodology chapter provides an outline of the SLR, and the steps taken throughout the process of this research. The findings and discussion chapter draws together the key themes and concepts prevalent in the selected literature in relation to the research questions. these chapters provide an overview of the literature related to this topic, the methodology process employed and the findings and conclusions that can be taken from the existing literature.

1.4 Conclusion

This introductory chapter outlined the rationale for this study along with an overview of the research process used and a synopsis of the dissertation.

Chapter Two: Literature

2.0 Introduction

With the growing educational opportunities at third level for people with IDD, there is an ongoing need to keep abreast of curriculum development, educational policies, educational practices, and current research to inform the structure and set-up of the programmes on offer (HEA, 2022). One area of growth taking place across the education sector both nationally and internationally is digital, with the changes taking place, both inside and outside of the classroom (Farias-Gaytan et al., 2023; McGarr, 2009; McGarr et al., 2021; Spante et al., 2018). This has opened up a discussion questioning how digital learning and digital teaching can be integrated across the curriculums for the third level courses currently being set up for students with intellectual and developmental disability looking at these programmes as stepping stones onto further education or work opportunities (Shevlin et al., 2020).

2.1 Intellectual and Developmental Disability (IDD)

Intellectual disability is defined as having difficulties with intellectual and adaptive functioning before the age of eighteen years (Barr, 2018). Developmental disability refers to a broader range of disabilities including physical and mental health conditions (Haertl, 2014). Intellectual and developmental disabilities (IDD), are often brought together in the educational and research context due to the complex nature and support needs required by both groups (Haertl, 2014; Schalock & Luckasson, 2021). This has led to the development of organisations working to progress knowledge, research, policies and effective practices for people with IDD internationally, which also includes a focus on education (AAIDD, 2024; IASSIDD, 2024).

2.1.1 Intellectual and Developmental Disability and Education

Students with IDD are often situated within education policies, documents and research related to primary and post-primary education under the heading Special Education Needs (SEN) (Cosgrove et al., 2014; Riddell et al., 2018). This SEN heading however has not carried over into third level education primarily due to the lack of third level or further education opportunities for this cohort leading to them not being considered within policies (Kubiak et al., 2021). Historically, there have been a number of higher education or tertiary programmes running across Europe, Asia, the Middle East, and the USA (Buchner et al., 2020; Butler et al., 2016; Coleman & Shevlin, 2019; Corby et al., 2012; Hasegawa, 2019; Lifshitz, 2020; O'Brien et al., 2009).

Since the Education of Persons with Special Education Needs (EPSEN) Act 2004 which called for children with special education needs to be provided with inclusive learning environments, there have been further calls for inclusive education and the right to access education through the United Nations Convention on the Rights of People with Disabilities (UNCRPD) (Buchner et al., 2020; Shevlin & Banks, 2021). More recently the Sustainable Development Goals (SDG), a group of globally agreed goals working toward ending poverty, protecting the planet and ensuring peace and prosperity for everyone (Government of Ireland, 2024), has shifted the specific focus from education as an individual human right to the broader global perspective with SDG goal four emphasising quality and equitability in education, not just within educational institutes, but across the lifespan (Buchner et al., 2020; Government of Ireland, 2022b). Riddell et al., (2018) pointed out the challenges faced with the growth and contrasts across both the developed and developing world in coming to a consensus on how to move forward toward inclusion in education, while also highlighting the changing nature of the language related to inclusive education moving from a focus on inclusion to a focus on participation.

Despite the complexities that are now presenting themselves as mentioned, Ireland has in the meantime been progressing its plans to meet the Sustainability Goals by continuing to publish its plans through government publications (Government of Ireland, 2022b). This includes a focus on Sustainable Development Goal number four inclusive and equitable education for everyone across the lifespan (Government of Ireland, 2022b). Where previous government policies and research literature has predominantly focused on primary and secondary education for people with IDD, there was recently a significant step taken toward the recognition of people with IDD in tertiary education within government policy in Ireland (Higher Education Authority, 2022; Shevlin & Banks, 2021). PATH 4 of the National Access Plan (2022), turned the attention toward people with intellectual disabilities by highlighting them as a priority group with the goal of implementing strategies to support integration at the university level through a universal design approach (Higher Education Authority, 2022). The Higher Education Authority has also released funding to support the development of ten programmes in universities nationally across Ireland opening up opportunities for participation in higher education for this cohort of people (Higher Education Authority, 2022). Given that this is an imminent change across Ireland with the launch of many of these programmes in 2024, consideration will now have to be given to how these future students with IDD will be supported in their transition and integration into university (Higher Education Authority, 2023).

2.2 Digital Literacy

Digital literacy was first introduced by Paul Gilster in his book ‘Digital Literacy’ (Gilster, 1997). At the time of writing Gilster (1997) argued that technologies were replacing landlines, televisions, and newspapers as the primary source of information and entertainment. He provided a definition of digital literacy as *‘the ability to understand and use information in multiple formats from a wide range of sources’* (Gilster, 1997, p.1).

Continuing from 1997, with the growth of digital technology, the internet and its encroachment into our everyday lives, many authors such as Bawden (2001), Koltay (2011) and Jones and Hafner (2021) have grappled with the concept of digital literacy and its meaning providing their own definitions in their studies (Pangrazio et al., 2020). Bawden (2001) reviewed digital literacy concepts and argued that its meaning should not be reduced to skills and competences, stressing the importance of context (Pangrazio et al., 2020). Koltay (2011), considers its meaning alongside information literacy in the context of library studies, while Jones and Hafner (2021) produced a whole book on '*Understanding Digital Literacies*' arguing that digital literacies is more than the technology that is being used and that is about the process of mediation, how the person and the technology interact. Overall, the concept of digital literacy is viewed as a contested term with many studies trying to reach a consensus on its meaning across different contexts (Farias-Gaytan et al., 2023; Gapski, 2007; Pangrazio et al., 2020; Spante et al., 2018; Tinmaz et al., 2022).

2.2.1 Digital literacy and IDD

Digital literacy related studies for people with IDD have been found across education and health-based research (Aquirre-Martínez et al., 2018; Baxter & Reeves, 2023; Khanlou et al., 2021). Aquirre-Martínez et al. (2018) completed a case study on digital literacy for people with intellectual disability in Mexico. Although the study was completed in an educational environment, the aim of the study was to assess communication skills using an electronic medium with the authors findings centring on media literacy in the results. There was no definition of digital literacy provided within the study for the reader (Aquirre-Martínez et al., 2018). Khanlou et al. (2021) consider digital literacy in relation to access to technology for people with IDD providing an overview of technology, barriers, and access across the

lifespan. They do not provide a definition of digital literacy but do provide examples of what they mean when discussing digital technology. Baxter and Reeves (2023) argue for digital literacy skills to be considered as part of transition planning for students with IDD. They do not provide a definition for digital literacy but do provide examples of what is meant by digital literacy skills, referring to sending and receiving emails, accessing documents, and using social bookmarking. The three studies mentioned above have approached digital literacy in three different ways, the first examines digital literacy related to media literacy, the second focuses digital literacy in the context of barriers and access to technology, while the third considers it in relation to a set of skills needed for transition. This demonstrates that the concept can be broad in its meaning and would warrant further investigation to determine how it is considered overall in the literature for people with IDD (Aquirre-Martínez et al., 2018; Baxter & Reeves, 2023; Khanlou et al., 2021; Pangrazio et al., 2020).

2.3 Digital Competence

Hatlevik and Christophersen (2013), noted that digital literacy and digital competence can often be used interchangeably within research and literature due to their similarities. However, when comparing their differences they use digital and technological skills as the comparison eventually deciding that both the term digital literacy and digital competence are broad in meaning and incorporate critical reflections, skills and understandings (Hatlevik & Christophersen, 2013; Pangrazio et al., 2020). Søby (2013) concludes that digital competence has a double function, one as an agenda setter in policy and educational reform and the second is as a pedagogical objective in schools (Pangrazio et al., 2020). Overall Pangrazio et al. (2020) arrive at the conclusion that digital competence “*refers to the specific set of skills required to be digitally literate whereas digital literacy refers to skills as well as dispositions*” (p. 454), and that given ‘digital competence’ is seen as an agenda setter this

may explain why the term is used more in educational policy (Pangrazio et al., 2020; Søby, 2013).

2.3.1 Irish Context

Ireland has also been working toward digital competence both in education and across other sectors as shown in two recent reports (Government of Ireland, 2022a, 2023). It's report 'Digital for Good: Ireland's Digital Inclusion Roadmap' was produced by the Department of Public Expenditure with the aim of making Ireland a leading digitally inclusive state within the EU (Government of Ireland, 2023). It plans to achieve this through the implementation of a digital strategy for schools with the aim of embedding digital technologies across the teaching, learning and assessment in school. The report does not go into specific detail about how these plans will reach and address the needs of specific groups within society particularly those with IDD (Government of Ireland, 2023). There are questions related to Irelands ability to stand strong on fulfilling intended promises laid out in reports as is shown by a report released by the Department of Education and Science (1997) titled 'IT 2000' (McGarr, 2009). 'IT 2000' aimed to integrate Information and Communication Technology (ICT) into teaching and learning across primary and secondary level schools (Education & Science, 1997). However, a review of its development by McGarr (2009) found that the project took a different direction than expected leading to most of the education related to ICT taking place in classes when the students were learning about the technology not with it.

2.3.2 Digital Competency Frameworks

There is a growing recognition of the need for digital competency frameworks as it aims to provide a focus for young people throughout their developing lives (Vuorikari & Punie, 2019). A digital competency framework supports the growth of knowledge, skills and attitudes for the integration and use of digital technology in everyday life (Vuorikari & Punie, 2019). Post-secondary education is one such area that has had to consider how digital literacy and competencies can be integrated within the structure of the educational institutes but also within the curricula (Lea, 2013; Spante et al., 2018).

In Europe countries such as Spain and Ireland are now planning for the growth in digital competencies (Basilotta-Gómez-Pablos et al., 2022; Government of Ireland, 2022a, 2023). There are often assumptions made related to modern day life and the attainment of digital competencies as is shown in a study by Bergson-Shilcock (2020) who found that many people felt confident in their digital competency based on their digital engagement at home not considering the diverse types of digital competencies required in other areas such as, in this case, employment (Basilotta-Gómez-Pablos et al., 2022; Trifonas, 2011). This situation alone provides an argument for a competency framework to support many people trying to navigate through the growing complexities of life, especially with the ever pervasive presence of digital technology (Bergson-Shilcock, 2020; Vuorikari & Punie, 2019; White et al., 2020). Vuorikari and Punie (2019) made such an argument when presenting the DigComp, a digital competency framework developed by the European Commission.

A digital competency framework aims to support people to *‘overcome the challenges that arise from digitization in almost all aspects of live’* (Vuorikari & Punie, 2019, p.1). There have been a few in development at the global level such as ‘Digital Competence Framework for Citizens’ and the United Nations Educational, Scientific and Cultural Organization’s (UNESCO, 2024) ‘Media and Literacy Framework’ (Vuorikari & Punie, 2019). Given that

not long ago, the Teaching & Learning National Forum of Ireland had released ‘A Roadmap for Enhancement in a Digital World’ 2015-2017, for higher education, further research would be required to investigate how this has progressed and where it sits in relation to the newly published ‘DigComp 2.2’ digital competency framework for Europe and more importantly how might this impact students with IDD (NFETL, 2015; Vuorikari, 2022)

2.4 Barriers to Digital Engagement

When it comes to supporting students with IDD in the classroom, educators often have difficulty knowing what the digital literacy capabilities of their students are and how to support students to become digitally literate (White et al., 2020). Khanlou et al. (2021), mapped out the barriers to digital inclusion across four different domains that young people with developmental disabilities face as part of transition from adolescence to adulthood. These include limited opportunities to learn how to use and interact with technology (Aspinall & Hegarty, 2001), lack of training and knowledge for staff that support people with intellectual disability (Khanlou et al., 2021; Priest & May, 2001), technology user guides and software designed by companies being inaccessible (Abbott & Cribb, 2001; Khanlou et al., 2021; Li-Tsang, 2005) and concerns related to safety and also a lack of research on digital access specifically for this population (Desbrow et al., 2023; Khanlou et al., 2021). Transition planning with students with IDD has been explored in the research (Baxter & Reeves, 2023; Shevlin et al., 2020). Baxter and Reeves (2023) argued in favour of digital literacy needing to be considered for people with IDD as part of any transition plan into tertiary education. They acknowledged that technology is now an essential part of third level education and that there is now an expectation that all students will be able to use technology and have the necessary digital skills required when commencing their studies (Baxter & Reeves, 2023). This again

reinforces the need for tertiary educational institutes to consider digital literacy on all levels and access points, including for students with IDD (Farias-Gaytan et al., 2023).

2.5 Conclusion

A considerable amount of research leans towards an understanding of digital competencies in schools and post-secondary education for educators and students engaged in education (Basilotta-Gómez-Pablos et al., 2022; Farias-Gaytan et al., 2023; Krumsvik et al., 2016; Røkenes & Krumsvik, 2014). However, a brief review of the literature would lead one to believe that there is little in the way of research related directly to digital literacy and competency for the population of students with IDD engaging in secondary and post-secondary education. This has led to the research question and sub questions outlined in the next chapter of this study.

Chapter Three: Methodology

3.1 Introduction

This chapter will outline the methodology approach that was used for this systematic review of the literature. It will start with an outline of the rational for this study followed by the research questions. It will then go on to discuss the ethical considerations taken when deciding on how to approach this study and why this particular methodology was chosen. This will be followed with an outline describing what a systematic review of the literature is, why it was chosen, the search strategy that was employed and the data bases chosen for the literature search. The PRISMA system used within this process will be described along with the reasoning for the inclusion and exclusion criteria used when screening the literature. Finally, it will discuss the software used for this process, how it was used and the coding approach that was taken when reading through the literature.

3.2 Rational or Purpose of the Study

The researcher was interested in this area of digital literacy and competency because it forms a large part of researcher's role as an occupational therapist when supporting students with IDD into university, through university, and out of university into employment. Supporting students' transition pathway into university involves identifying the skills and capabilities that they already have but also identifying where there may be a lack of skills or understanding (Baxter & Reeves, 2023). A good example of this is around the expectations that already exist for any student wanting to apply for a university course and completing registration through an online computer system (Trinity College Dublin, 2024). Following

Covid-19 Learning Management Systems (LMS) or online learning platforms for courses have become one of the primary ways to access course content and collaborate with educators and classmates (Fibriasari et al., 2023; Masalimova et al., 2022). Most if not all assignments also require a student to have a good level of digital skill ability or to at least have any assistive technology that is required set up to facilitate course engagement (Gutierrez-Angel et al., 2022). Students with IDD will have varying degrees of digital literacy skills requiring assessment at the beginning of their course so that any skill gaps can be identified at the beginning of their student journey and plans can be made to support where there may be gaps or barriers to learning (McNicholl et al., 2021). The question of digital literacy also arises at the point of transition into a work internship as the employer would like to know at what level the role identified needs to be supported and whether the learner would be able to meet the demands of the workplace internship role (Shevlin et al., 2020).

The aim of this research is to gain an understanding of how digital literacy and digital competencies has been defined within the literature for people with IDD, and to understand what the barriers and gaps are to accessing digital literacy and digital competency to support engagement in education. This led to the following research questions.

3.3 Research Questions

The research questions are as follows:

Main research question

- What are the gaps in the literature that have been identified in relation to definition of digital literacy and digital competency for people with intellectual and developmental disabilities?

Sub research questions

- How is digital literacy defined in the literature for people with intellectual disabilities?
- What are the barriers identified in relation to the acquisition and use of the terms digital literacy and digital competency within the research for people with intellectual disabilities?

3.4 Ethical Considerations

An empirical research approach was considered with this population as a means of understanding their experiences, understanding and use of the term digital literacy and competencies in post-secondary education. However, this was not possible because the group were already involved in other research projects at the time raising ethical concerns related to consent therefore the researcher chose not to pursue this pathway.

3.4.1 Consent

People with IDD are classified as a vulnerable population due to the nature of their disability and its impact on intellectual functioning and reasoning. The Research Ethics Application Management System (REAMS) used by the university requires that a researcher

undergoes a data protection review in the case of adults at risk of vulnerability and children. Valid consent needs to meet three criteria to be considered as consent. These include the person having capacity to consent, that the decision to consent must be made voluntarily and without coercion, and that the person must be provided with sufficient knowledge about the research and what it involves, the outcomes and any future use of the data (Barr & Gates, 2018). There is a growing argument to provide opportunities for those in which the research involves being heard (Hammersley, 2017; Bryan, 2022). Calls are being made to ensure inclusive practices are put in place to promote inclusion. Some of these include, adapting materials into accessible formats and developing workshops to develop skills and understanding (Sadler, 2023). Given the short duration of the Masters programme, ethical approval needed to be truncated to ensure the research was conducted within the final year of the Masters programme. Currently the ethical procedures require every piece of information to be provided in an accessible format and the consent process requires more time and possibly more workshops with this group to ensure they fully understand what is being asked of them at each stage of the research process (Bryan, 2022). This was outside the remit of the current research, but would be a relevant consideration for other researchers conducting research with such a cohort.

3.4.2 Capacity

At the time of completing this research study, the population that were considered where already involved in several other research projects, two taking place within two modules on their programme and one other study related to their engagement in the programme overall. Bryan (2022) argues that it is a requirement to adhere to ethical principles which includes the protection, safety, and well-being of the participants in any research involving human subjects.

3.4.3 Time Restrictions

The researcher also needed to consider the time restrictions for the research as it was to be completed within one academic year leaving a limited amount of time to complete the ethics process and ensure adequate time for an appropriate inclusive consent process and research plan to be developed and completed ahead of the students finishing their college year. Any future research with this population would need to allow for adequate time for the ethical application, an extended consent pathway including workshops to support understanding of the proposed student population and time to complete the research.

3.5 Method

This research will follow a Systematic Literature Review process. There are many types of literature reviews that were reviewed before a SLR was chosen. These include a narrative review, a scoping review, or a systematic literature review. A narrative review is often used to provide an overview of a topic. Often the research question is not clearly defined, and it does not follow a specific search criteria or methodology. A scoping review in contrast does follow a clearly defined review question and methodology however, the focus is broad (Dickson et al., 2023).

3.5.1 Systematic Literature Review

A systematic literature review consists of a rigorous, defined literature searching and reviewing process that can be duplicated by other researchers (Fink, 2019; Roche, 2022). It is designed to find, evaluate, and bring together the best available evidence to answer a specific set of research questions (Dickson et al., 2023). The benefits of completing a systematic literature review are that the researcher documents all the steps taken within the research

process for transparency so that the study could be replicated to assess its rigor by other researchers. It is viewed as the best type of literature review when compared with other methods such as scoping reviews or narrative reviews as a systematic literature review examines the literature to a greater depth (Dickson et al., 2023).

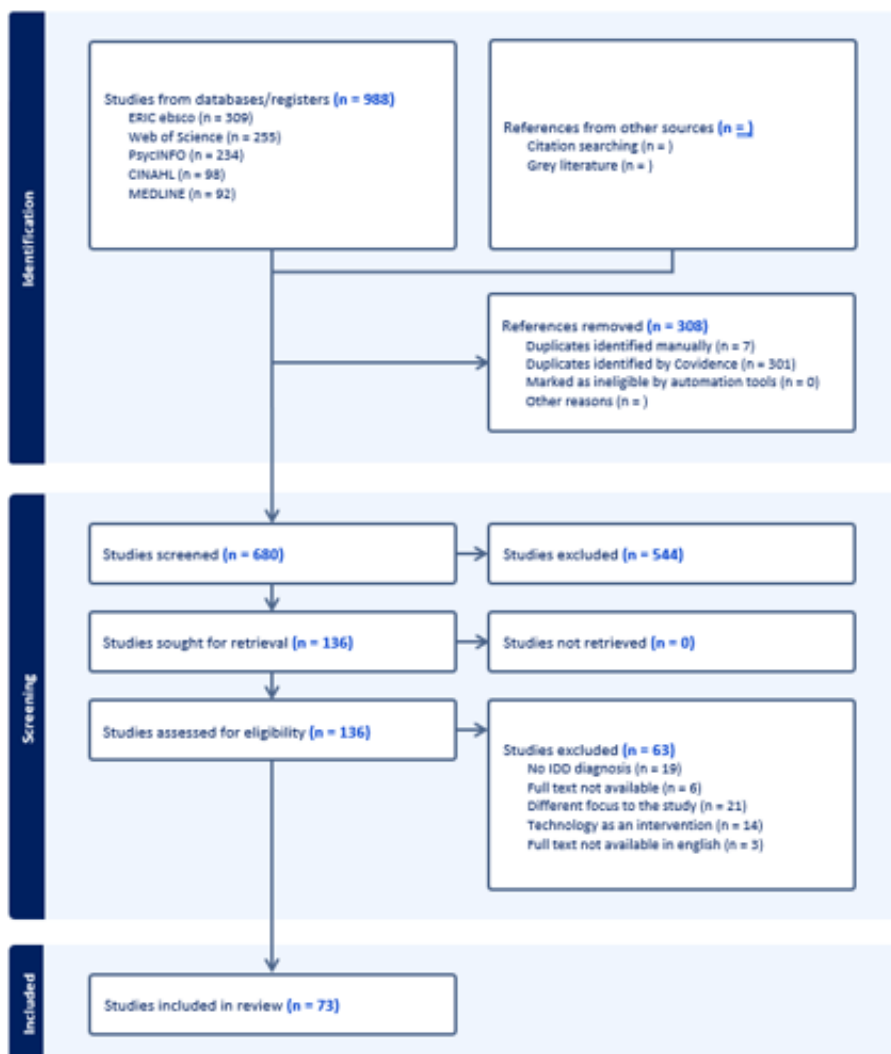
The researcher has instead chosen to complete a systematic review of the literature with the aim of finding out what has already been researched and what is known from the research for this population in relation to digital literacy and competency (Cohen et al., 2002; Dickson et al., 2023; Fahie & Bergin, 2022). A systematic review will take a deeper look at the literature and provide a more definitive answer about the knowledge gaps that could more likely benefit this population in the future when they are approached for empirical research in this area (Cohen et al., 2002; Dickson et al., 2023; Fahie & Bergin, 2022). Initial reading of the literature carried out prior to the beginning of this study revealed that there appeared to be a lack of a definition within the literature relating to digital literacy and competency with studies discussing both digital skills and assistive technology as meaning one and the same (Aquirre-Martínez et al., 2018; Gapski, 2007; Khanlou et al., 2021; Pangrazio et al., 2020; Tinmaz et al., 2022).

3.5.2 Search Strategy

Research with this population can be found in both educational and health related databases as much of the research with this population is often completed by both health professionals and educators due to the environments, institutions and professionals that work with this cohort across the lifespan (Baxter & Reeves, 2023; McCausland et al., 2023; Murphy et al., 2021). The search strategy chosen is based on the Preferred Reporting Items for Systematic Reviews and Meta-analysis or PRISMA (PRISMA, 2024).

PRISMA has been developed as an evidence-based set of standards for completing systematic reviews. It can be used by researchers to support the systematic review reporting process and by Journal Peer reviewers to assess the quality and standard of systematic reviews (Pilkington & Hounsome, 2017; PRISMA, 2024). A PRISMA flow chart provides a visual standardised reporting method on the amount of studies that were included or excluded throughout the screening and review process (Pilkington & Hounsome, 2017).

Figure 1: Sample PRISMA chart



3.5.3 Databases

Table 1: Databases Used

Bibliographic Databases
American Psychological Association (PsycINFO)
The Cumulative Index of Nursing and Allied Health Literature (CINAHL)
ERIC
PubMed
MEDLINE
Web of Science

3.5.4 Search Terms

The following search terms will be used:

- (1) ((disab* NEAR/3 (learning OR intellectual OR developmental*) OR “mental retard*”))
- (2) (((Digital* OR technol* OR comput*) NEAR 3 (competen* OR skill* OR litera*) OR digcomp))

Expanders within each database. The search strings and expanders used in each database can be found in Table 3 below.

3.5.5 Inclusion Criteria

- Literature that mentions intellectual or developmental disabilities.
- Literature focused on a population from 11 years of age and older this is to gain a clearer focus on research related to secondary and post-secondary education.

- Literature on digital literacy and digital competency within the last twenty-five years.
This is due to the fact that the first definition of digital literacy was provided in 1997 (Gilster, 1997). Would be good to capture its progression across this time.
- Literature that relates to digital engagement, digital skills, technological skills, computer skills and digital competency.
- Literature that includes reference to access to technology, accessing learning through technology, learning about computers.
- Literature that includes attitudes, beliefs and internal feelings related to technology.
- All literature must be accessible in the English language.
- All literature where the full text is available.
- Be published in a peer-reviewed journal.

3.5.6 Exclusion Criteria

- All Literature that is more than twenty-five years old.
- Anything that does not mention or refer to digital literacy, digital competency, computer skills, intellectual and developmental disability.
- Any literature that does not relate to the population of people with an intellectual disability.
- Focused on individuals from 11 years and older. This could give an indication as to whether this has been researched in an educational context but at a level just before post-secondary education level.
- Any literature in a language other than English.
- Any unpublished literature.
- Any papers where a full publication is not available.

- Descriptive, theoretical or review papers.
- Any papers focused on the use of technology as a therapeutic intervention.
- Conference papers where the full text of the study is not available.

3.6 Data Gathering and Management Process

3.6.1 Literature Search Findings

A search of the databases was completed on 16th March 2024 with the following results. Table 2 below outlines the search strings used within each of the five databases. A total of 988 publications were found with a total of 301 publications being removed due to duplication. The software tool used for the data management process is discussed under section 3.5.8 Document Management below.

Table 2: Database Search Results

Date	Database	Search string	Total
16.03.24	Web of Science	(disab* NEAR/3 (learning OR intellectual OR developmental*) OR "mental* retard*" AND (((Digital* OR technol* OR comput*) NEAR/3 (competen* OR skill* OR litera*) OR digcomp))	255
16.03.24	ERIC ebSCO	(((disab* N3 (learning OR intellectual OR developmental*) OR "mental* retard*")) OR AB ((disab* N3 (learning OR intellectual OR developmental*) OR "mental* retard*"))	309

		OR Expanders "Intellectual Disability" OR DE "Down Syndrome" OR DE "Mild Intellectual Disability" OR DE "Moderate Intellectual Disability" OR DE "Severe Intellectual Disability" AND ((((Digital* OR technol* OR comput*) N3 (competen* OR skill* OR litera*) OR digcomp))) OR AB (((Digital* OR technol* OR comput*) N3 (competen* OR skill* OR litera*) OR digcomp))) OR Expanders "Digital Literacy" OR "Computer Literacy"	
17.03.24	PsycINFO ebSCO	((disab* N3 (learning OR intellectual OR developmental*) OR "mental* retard*")) OR AB ((disab* N3 (learning OR intellectual OR developmental*) OR "mental* retard*"))) OR Expanders MM "Intellectual Development Disorder" OR MM "Anencephaly" OR MM "Crying Cat Syndrome" OR MM "Down's Syndrome" OR MM "Tay Sachs Disease" AND ((((Digital* OR technol* OR comput*) N3 (competen* OR skill* OR litera*) OR digcomp))) OR AB (((Digital* OR technol* OR comput*) N3 (competen* OR skill* OR litera*) OR digcomp))) OR	230

		Expander "Digital Literacy"	
17.03.24	CINAHL ebSCO	((disab* N3 (learning OR intellectual OR developmental*) OR "mental* retard*")) OR AB ((disab* N3 (learning OR intellectual OR developmental*) OR "mental* retard*"))) OR Expanders (MM "Persons with Intellectual Disabilities") AND ((((Digital* OR technol* OR comput*) N3 (competen* OR skill* OR litera*) OR digcomp))) OR AB (((((Digital* OR technol* OR comput*) N3 (competen* OR skill* OR litera*) OR digcomp)))) OR Expanders (MH "Computer Literacy") OR (MH "Digital Technology") OR "Digital literacy"	98
17.03.24	MEDLINE ebSCO	((disab* N3 (learning OR intellectual OR developmental*) OR "mental* retard*")) OR AB ((disab* N3 (learning OR intellectual OR developmental*) OR "mental* retard*"))) OR Expanders (MH "Persons with Mental Disabilities") OR (MH "Education of Intellectually Disabled") OR (MH "Learning Disabilities") OR (MH "Intellectual Disability") OR (MH "Developmental Disabilities") AND	92

		((((Digital* OR technol* OR comput*) N3 (competen* OR skill* OR litera*) OR digcomp)))) OR AB ((((Digital* OR technol* OR comput*) N3 (competen* OR skill* OR litera*) OR digcomp)))) Expanders “digital competence” OR “digital literacy”	
		Uploaded to Covidence	984
		Duplicates 301 removed.	301 –
		Total remaining for screening	683

4.2.1 Initial Literature Screening

Initial screening involved eliminating duplicates based on titles and abstracts. A total of three hundred and one duplicates were removed at the initial upload to the Covidence software and another seven duplicates were identified manually.

- 680 studies were screened through the Title and Abstract section of the Covidence platform. 555 of these studies were found not to fit the inclusion and exclusion criteria for the study.
- 125 studies were assessed for full-text eligibility for which 80 of these studies were excluded as follows:
 - 22 of the studies related to digital or technology however the focus of the studies was not related to the research question.
 - 19 studies did not appear to include students with Intellectual and Developmental Disabilities.
 - 14 studies used technology as a therapeutic intervention.
 - 9 wrong study design (discussion article, opinion piece)

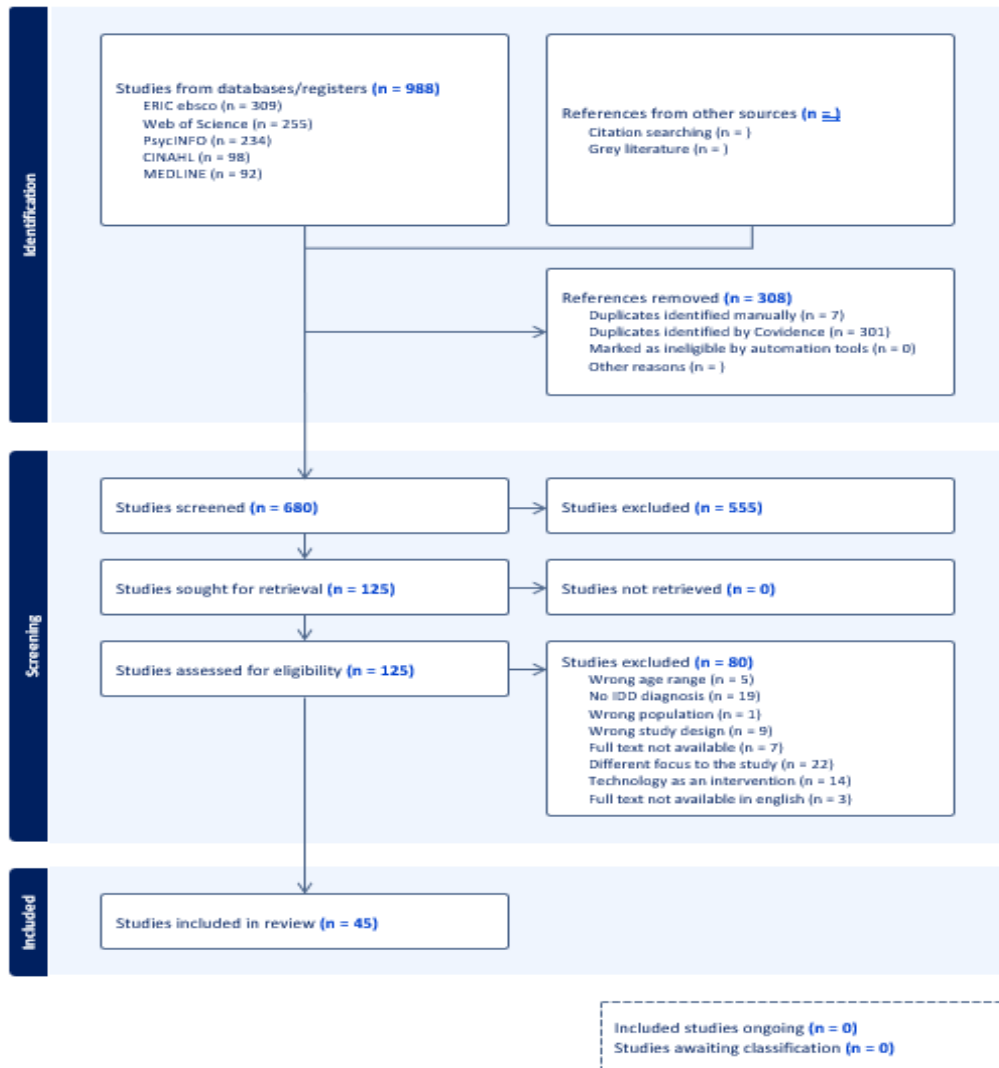
- 7 were found not to have full text availability to the author at the time of the study.
- 5 wrong age range.
- 3 texts were not available in English.
- 1 was not the target population arising out of the fact that the term learning disability has different meanings depending on the country that it is used. In a UK based context it refers to a person with an intellectual disability however in the Irish context it could be confused with the term specific learning disability which refers to a person with a specific learning difficulty such as dyslexia or dysgraphia (Department of Health and Social Care, 2001; Enable Ireland, 2024, August 18).

A total of 45 studies remained to be extracted from Covidence for analysis.

Figure 2: PRISMA Chart of Literature

(Covidence, 2024)

Digital Literacy and Digital Competency for Persons with Intellectual and Developmental Disabilities



3.5.7 Document Management

A number of software management tools were used in the document and reference management process of this review, as software tools can support the management of the large volume of data required for the systematic literature review process (Pilkington & Hounscome, 2017).

Covidence is a secure internet based systematic review tool that requires a password to enter the software and is used to support screening, data extraction and analysis of the bibliographic texts (Covidence, 2024). It is a software that has been set up to support a

Systematic Literature Review process as it tracks the screening process of the systematic review with the option of downloading a PRISMA chart to aid demonstration of the process within the thesis (Covidence, 2024; Pilkington & Hounscome, 2017). This software management tool provided the researcher an accurate way of managing the data screening process of the large amount of literature while the researcher completed the overall reading and screening required to exclude and include any literature relevant to the study (Covidence, 2024; Pilkington & Hounscome, 2017) .

The bibliographic reference management system called Zotero (2024) was initially used to manage the literature as it supported the transfer of data from the databases into the reference management system and between Zotero and Covidence for the purposes of screening and filtering through the literature based on the inclusion and exclusion criteria (Covidence, 2024; Zotero, 2024). After the literature screening process was completed, Zotero allowed the author to transfer the full text literature back to Zotero for reading and to allow the author to analyse the literature (Zotero, 2024).

The author switched to a different reference management system called EndNote at the point in the research process when it was required to insert references into the dissertation and to create a bibliography (EndNote, 2024; Roche, 2022). The author found EndNote a better tool than Zotero for editing and managing the references (EndNote, 2024; Zotero, 2024). Both Covidence and EndNote software packages were supported and made available by the university, where Zotero was free to download and to use (Trinity College Dublin, 2024a, 2024b).

Another software tool used for the analysis and synthesis process of this dissertation was Microsoft Excel. Microsoft Excel supported the researcher in organising the data and it also provided an overall view of the literature (Pilkington & Hounscome, 2017; Roche, 2022).

3.5.8 Studies Included in the Review

The forty-five literature pieces selected all met the criteria for selection. A list of the articles, year of publication and country of origin can be found in Table 3 below.

Table 3: Forty-Five Studies Included in Review

Year of Publication	No. of articles	Country of origin	Selected Article
2000	1	Australia	Moni (2000)
2004	4	UK/Ireland	Abbott et al. (2004)
		USA	Davies et al. (2004)
		Sweden	Harrysson et al. (2004)
		China	Li-Tsang et al. (2004)
2005	1	China	Li-Tsang et al. (2005)
2006	5	UK	Hegarty and Aspinall (2006)
		China	Li-Tsang et al. (2006)
		Australia	Lloyd et al. (2006)
		USA	Stock et al. (2006)
		USA	Wehmeyer et al. (2006)
2007	3	USA	Jerome et al. (2007)
		China	Li-Tsang et al. (2007)
		Canada	Moisey and van de Keere (2007)
2009	1	China	Wong et al. (2009)
2011	1	USA	Whitaker and Albertson (2011)
2012	1	Egypt	Al-Gawhary and Kambouri (2012)
2015	2	USA	Cihak, McMahon, et al. (2015)
		USA	Cihak, Wright, et al. (2015)
2016	2	Portugal	Rocha et al. (2016)
		Spain	Salmerón et al. (2016)
2017	2	USA	Rivera et al. (2017)
		South Korea	Seok and DaCosta (2017)
2018	3	USA	Jimenez and Alamer (2018)
		USA	Pandya et al. (2018)
		USA	Raspa et al. (2018)
2019	4	Australia	Bayor (2019)
		Spain	Delgado et al. (2019)
		USA	Koushik and Kane (2019)
		USA	Smith et al. (2019)
2020	3	Sweden	Ågren et al. (2020)
		Portugal	Barbas et al. (2020)
		Germany	Heitplatz (2020)
2021	7	Spain	Chiner et al. (2019)
		Australia	Glencross et al. (2021)
		Canada	Khanlou et al. (2021)
		South Korea	Kim and Lee (2021)
		Canada	Lewchuk et al. (2021)
		Italy/Spain	Mezzalana et al. (2021)
		UK	Caton and Landman (2021)
2022	3	Australia	Balasuriya et al. (2022)
		South Africa	Marnewick et al. (2022)
		Turkey	Özler and Akçamete (2022)
2023	2	UK	Chadwick et al. (2023)
		Spain	Desbrow et al. (2023)

3.5.9 Review of Coding Process of Included Articles

Each article was coded based on five categories of analysis. To organise and synthesise the information, the research captured the findings in an Excel spreadsheet (Pilkington & Hounscome, 2017). The researcher decided to use the coding criteria used by Claro et al. (2024) and Spante et al. (2018) as is shown in Table 4 below.

Table 4: Coding of Selected Articles

Coding of selected articles
1. Name and Year of publication. 2. Definition of digital literacy used within the research. 3. Other terminology used within the research related to digital literacy. 4. Barriers related to the acquisition or engagement with digital literacy within the research. 5. Theoretical framework of digital competency, DigComp (Vuorikari, 2022)

3.6 Conclusion

This chapter has provided an overview of the systematic literature review methodological process used for this study. A definition for a systematic literature review has been provided, along with a rationale for the study. This desk based SLR was selected as a method for this research due to several factors. The first consideration was the fact that the population chosen for the research had been approached for another research project. For ethical reasons related to consent, capacity, and research time constraints, it was deemed inappropriate to approach them for another research project at the time of the study.

The systematic review process was broken down using a PRISMA diagram to provide an overview of how the articles were screened and eliminated through using the Covidence software tool mentioned above to support the volume of literature that was being reviewed.

The data gathering and management employed for this research has been outlined. A table of the selected literature for analysis was presented along with the five themes used within the coding process so that the findings can be presented in the next chapter.

Chapter Four: Findings and Discussion

4.1 Introduction

Taking the literature from chapter two, along with the data gathered using the methodology described in chapter three, this chapter will aim to present an analysis of the findings. Commencing with the concept of digital literacy and how it has been used alongside other terminology in the studies. Secondly, a digital competency framework will be presented in which the research literature has been integrated and reviewed. Finally, the barriers that have been found to digital engagement for people with IDD will be presented and analysed.

4.2. Digital Literacy

4.2.1 Definition of Digital Literacy

The initial focus of the data analysis focused on the concept of digital literacy and how it was used and presented within the research for people with IDD. Each article was screened to identify whether the term digital literacy was used within the article or not. Each time the term was used was noted within an Excel spreadsheet alongside the literature reference. Specific attention was provided to identify whether any of the research studies had provided a definition of digital literacy within their article. During this process the researcher chose to capture any time digital literacy was used as a concept in the literature including any other terminology that was used. Out of the forty-five studies only two cited definitions of digital literacy. See Table 5 below.

Table 5: Cited Definitions of Digital Literacy in the Studies

Heitplatz (2020)	<i>"The ability to understand and to use information from a variety of digital sources.....is called digital literacy and according to Bawden (2008), comprises competencies like internet searching, hypertext navigation, knowledge assembly, and content evaluation" (Bawden, 2008; Koltay, 2011).</i> <i>Digital literacies describe concrete competencies of a person, media literacy is an umbrella concept "the ability to access the media, to understand and to critically evaluate different aspects of media and media context to create communications in a variety of contexts" (Koltay, 2011. p213)</i> (Heitplatz, 2020, p.201)
Cihak, Wright, et al. (2015)	<i>"The concept of digital literacy was first introduced in 1997, described as 'the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers' (Gilster, 1997, p.l).</i> <i>Many variations in the definition of digital literacy have since emerged, with job-specific applications ranging from the technical aspects of operating in digital environments to the cognitive and socio-emotional aspects of a computer-driven environment (Eshet, 2004).</i> (Cihak, Wright et al. 2015, p. 156)

Table 6: No Definition of Digital Literacy Provided

Term Used	Not defined in the study
Digital Literacy	Barbas et al. (2020); Chadwick et al. (2023); Delgado et al. (2019); Kim and Lee (2021); Lewchuk et al. (2021); Pandya et al. (2018); Rivera et al. (2017); Salmerón et al. (2016)

Eight other articles use the term digital literacy within their studies. Pandya et al. (2018) make reference to the term digital literacy but do not provide a clear definition. They imply that it refers to assistive technology, instructional technologies, and programs to support children to learn and develop skills (Pandya et al., 2018). Delgado et al. (2019) and Rivera et al. (2017) discuss digital literacy in relation to skills such as sourcing skills and the manipulation of technological devices with Rivera et al. stressing its importance for people

with developmental disabilities and the need for students to attain these skills. Barbas et al. (2020) refers to the pluralistic nature of digital literacy as a concept due to how it supports students with IDD to engage in several levels of learning but does not define it as a concept within their study. Kim and Lee (2021) argues that digital literacy supported greater use of the internet but does not provide any other meaning to the concept. Overall, out of the forty-five articles, two cited a definition of digital literacy while eight articles discuss digital literacy in relation to the context of their research but do not provide clarity as to its meaning.

It appears that the concept digital literacy has been used in the research for people with IDD however there is a clear lack of a definition when it is utilised (Delgado et al., 2019; Kim & Lee, 2021; Pandya et al., 2018; Rivera et al., 2017). The definitions that are cited in the literature are over twelve years old with Koltay (2011) being the most recent one cited in an study published in 2020 (Cihak, Wright, et al., 2015; Heitplatz, 2020). Given the rapidly evolving nature of the digital technology and the digital skills required by students today a question would be raised as to why a more current definition is not being used (White et al., 2020). Could it be that the authors chose to strip the definition back to one that appears simplistic in its presentation such as Gilster (1997) original definition or perhaps it is a question of having confidence in its meaning given how complex current definitions appear to be such as the one below:

‘Digital literacy involves the confident and critical use of a full range of digital technologies for information, communication and basic problem-solving in all aspects of life. It is underpinned by basic skills in ICT: the use of computers to retrieve, assess, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet.’

(UNESCO, 2024)

Fortunately, White et al. (2020) took the time to map the meaning of Digital Literacy as a concept. Their carefully constructed book chapter aims to assist educators to understand the digital literacy capabilities of their students, particularly those with an intellectual disability (White et al., 2020). White et al. (2020) argued the need for a carefully constructed definition to guide assessment of student capabilities that should in turn aid educators in the classroom. Essentially the concept of digital literacy has evolved over time due to changing demands and needs with its initial meaning stemming from the traditional concept of literacy but applying this to information technology toward a more complex understanding of being situated in a sociocultural constructivist framework (White et al., 2020). This confirms and parallels other studies into digital literacy as an ambiguous concept that can be difficult to define and may provide a just reason for choosing to return to Gilster's original definition (Gilster, 1997; Heitplatz, 2020; Pangrazio et al., 2020; Spante et al., 2018; Tinmaz et al., 2022; White et al., 2020).

4.2.2 Other Terminology Used Within the Research

It was clear from analysing the literature that there are many similar terms being used either independently or interchangeably within the literature. See Table 7 below.

Table 7: Other Terminology Used

Terminology	References
Digital Communication Skills	Smith et al. (2019)
Digital Skills	Desbrow et al. (2023)
Human-Computer Interaction (HCI)	Wong et al. (2009)
Operation Skills	Li-Tsang et al. (2005); Li-Tsang et al. (2006); Li-Tsang et al. (2007)
Information Communication and Technology (ICT) Skills	Li-Tsang et al. (2004); Seok and DaCosta (2017); Setchell et al. (2021)
Technology Skills	Li-Tsang et al. (2006); Özler and Akçamete (2022); Raspa et al. (2018)
Technology Literacy	Whitaker and Albertson (2011)
Digital Learning	Jimenez and Alamer (2018)
21 st Century Literacy	Cihak, Wright, et al. (2015)
Digital participation	Bayor (2019)
Computer Literacy	Kim and Lee (2021)

The broad range of terminology used within the literature demonstrates that there are a multitude of directions and interpretations that can be taken from the research. For example, the authors in these studies refer to skills related to digital engagement in many ways, ‘operation skills’, ‘digital skills’, ‘digital communication skills’, ‘technology skills’ and ‘Information Communication and Technology Skills’(Desbrow et al., 2023; Li-Tsang et al., 2005; Raspa et al., 2018; Setchell et al., 2021; Smith et al., 2019).

Further analysis of these concepts within these studies would support an understanding of how much these concepts are the same and how much they differ. It does support the argument for the development of a competency framework to support the different areas and types of skills that are being developed across a person’s educational journey and to support transition planning for people with IDD into education and out into work (Baxter & Reeves, 2023; Vuorikari & Punie, 2019).

4.3 Digital Competency

Thirty-one out of the forty-five studies were mapped across the DigComp framework (Vuorikari, 2022). This is because fourteen out of the forty-five papers were either literature reviews or qualitative based research related to digital literacy leaving them unable to be applied to the competency framework.

The DigComp 2.2 framework has five sections:

1. Information & Digital Literacy
2. Communication & Collaboration
3. Digital Content Creation
4. Safety
5. Problem Solving

(Vuorikari, 2022)

The author chose to incorporate the competence area 0. Devices and Software Operations section of the proposed competence areas and competencies for the Digital Literacy Global Framework to capture any research that has been completed with people with IDD related to devices and software operations (United Nations Educational, Scientific and Cultural Organisation, 2018). Please see Table 8 below:

Table 8: Literature Applied within the DigComp Framework (Vuorikari, 2022)

	Devices & Software operations		1. Information & Data Literacy			2. Communication & Collaboration						3. Digital Content Creation				4. Safety				5. Problem Solving			
Digital Competency Framework	0.1	0.2	1.1	1.2	1.3	2.1	2.2	2.3	2.4	2.5	2.6	3.1	3.2	3.3	3.4	4.1	4.2	4.3	4.4	5	5.2	5.3	5.4
Moni (2000)			1.1			2.1																	
Davis et al. (2004)	0.1																						
Harrysson et al. (2004)			1.1																				
Li-Tsang et al. (2004)	0.1		1.1																				
Li-Tsang et al. (2005)	0.1	0.2	1.1																				
Li-Tsang et al. (2006)	0.1	0.2	1.1																				
Lloyd et al. (2006)			1.1																				
Stock et al. (2006)		0.2																					
Jerome et al. (2007)			1.1																				
Li-Tsang et al. (2007)	0.1		1.1																				
Moisey and van de Keere (2007)			1.1			2.1																	
Wong et al. (2009)			1.1																				
Al-Gawhary and Kambouri (2012)	0.1		1.1		1.3							3.1											
Cihak, McMahon, et al. (2015)		0.2	1.1																				
Cihak, Wright, et al. (2015)		0.2	1.1		1.3	2.1																	
Rocha et al. (2016)			1.1																				
Salmeron et al. (2016)						2.1												4.3					
Rivera et al. (2017)	0.1		1.1																				
Jimenez and Alamer (2018)	0.1																						
Pandya et al. (2018)												3.1											
Raspa et al. (2018)	0.1		1.1																				
Bayor (2019)																3.4							
Delgado et al. (2019)				1.2																			
Koushik and Kane (2019)																3.4							
Smith et al. (2019)						2.1																	
Agren et al. (2020)																		4.3					
Barbas et al. (2020)					1.3	2.1	2.2																
Chiner et al. (2021)																	4.1						
Lewchuk et al. (2021)																		4.3					
Marnewick et al. (2022)					1.3	2.1				2.5							4.1	4.2	4.3				
Özler & Akçamete (2022)	0.1				1.3																		

The studies mapped across the competency framework range in timeline from Moni (2000) to Özler and Akçamete (2022). Upon viewing Table 8 there is a clear focus on research related to the Devices and Software Operations and Information & Data Literacy between 2000 – 2018. There then appears to be a gap between 2019-2022. This may be due to

the fact that these competence areas are skill focused and would require the researcher to be present beside the participant during this time which aligns with the Covid-19 pandemic (Chadwick et al., 2023). There is a notable shift in the type of research being completed from 2007, with studies now appearing under Communication & Collaboration, Digital Content Creation and Safety (Al-Gawhary & Kambouri, 2012; Marnewick et al., 2022; Moisey & van de Keere, 2007; Salmerón et al., 2016).

Given the search terms used for this study focused on digital literacy, digital skills, computer skills etc., this may account for the lack of research displayed across all sections of the digital competency framework. It is likely that the search criteria excluded many research articles related to internet safety or digital content creation. Another review of the literature would be warranted to explore this future. This may also explain why digital competency was only discussed in depth in one of the forty-five studies overall (Ågren et al., 2020). What can be gained from the mapping exercise is an understanding of where research could go next. As mentioned, another literature review exploring safety or research developed to target those competency areas.

4.4 Barriers

An analysis of the studies has identified many barriers that have been raised in relation to people with IDD acquiring digital literacy skills. Ertmer (1999) framework of first order and second order barriers has been used to present the barriers as they have come up within the literature. Please see Table 9 and 10 below:

Table 9: First Order Barriers

First Order Barriers	
<i>These sit external to the person including access to the tech and accessing the learning of the skills for the technology (Ertmer, 1999).</i>	
Access to technology	Chadwick et al. (2023); Lewchuk et al. (2021); Özler and Akçamete (2022)
Time and Resources	Chadwick et al. (2023); Hegarty and Aspinall (2006); Li-Tsang et al. (2006); Li-Tsang et al. (2004); Moisey and van de Keere (2007)
Staff/Family level of digital literacy	Hegarty and Aspinall (2006); Heitplatz (2020); Jimenez and Alamer (2018); Li-Tsang et al. (2007); Özler and Akçamete (2022)
Access to devices	Hegarty and Aspinall (2006); Kim and Lee (2021); Özler and Akçamete (2022)
Inappropriate software	Harrysson et al. (2004); Hegarty and Aspinall (2006); Khanlou et al. (2021); Li-Tsang et al. (2006); Li-Tsang et al. (2004); Stock et al. (2006); Wong et al. (2009)
Lack of research	Delgado et al. (2019); Cihak, McMahon, et al. (2015)
Education opportunities	Delgado et al. (2019); Khanlou et al. (2021); Kim and Lee (2021); Li-Tsang et al. (2006); Li-Tsang et al. (2004); Li-Tsang et al. (2007)
Staff/Family attitudes	Heitplatz (2020); Li-Tsang et al. (2005); Li-Tsang et al. (2007); Moisey and van de Keere (2007); Özler and Akçamete (2022)
Safety concerns	Chadwick et al. (2023); Heitplatz (2020); Kim and Lee (2021); Li-Tsang et al. (2005); Moisey and van de Keere (2007); Özler and Akçamete (2022)
Finances	Özler and Akçamete (2022); Moisey and van de Keere (2007); Khanlou et al. (2021); Kim and Lee (2021),
Organisational structure	Moisey and van de Keere (2007); Heitplatz (2020)
Assessment of need	Smith et al. (2019)
Steps to access	Stock et al. (2006)
Hardware design	Stock et al. (2006); Chadwick et al. (2023)

Table 10: Second Order Barriers

Second Order Barriers	
<i>Are related to internal feelings in relation to the technology, attitudes to the technology (Ertmer, 1999).</i>	
Socio-cognitive characteristics of the person	Delgado et al. (2019); Li-Tsang et al. (2007); Moisey and van de Keere (2007); Özler and Akçamete (2022); Salmerón et al. (2016)
Student capacity	Al-Gawhary and Kambouri (2012); Delgado et al. (2019); Harrysson et al. (2004); Harrysson (2004); Jimenez and Alamer (2018); Li-Tsang et al. (2006); Li-Tsang et al. (2004); Özler and Akçamete (2022); Stock et al. (2006)
Lack of skills within the person	Chadwick et al. (2023); Cihak, Wright, et al. (2015); Li-Tsang et al. (2007); Moisey and van de Keere (2007)
Language barriers (spoken)	Li-Tsang et al., (2006), Li-Tsang et al., (2007)
Attitudes of persons with IDD	Kim, K. M., & Lee, C. E. (2021)

Tables 9 and 10 above shows that barriers to digital literacy and technology have been discussed across most of the reviewed literature. Ertmer (1999) framework was chosen as it provides a clear outline of where the barriers are situated. When comparing Table 9 to Table 10 above, Table 9 is displaying more barriers than Table 10.

Ertmer (1999) first used these barriers over twenty years ago in relation to strategies for the integration of technology into education by dividing the barriers into two categories, first order and second order barriers. Brickner (1995) was the first person to discuss first and second order barriers in his PhD case study dissertation on the effects of barriers to change on computer usage of mathematics teachers. Ertmer (1999) took Brickner's work and applied it to strategies for technology integration with the aim of highlighting the differences in relation to the barriers while also providing an overview of how they could be overcome and integrated into the classroom by teachers in the educational context.

4.4.1 First Order Barriers

First order barriers have been defined as those barriers that sit external to the educator or person (Ertmer, 1999). These barriers are outside the control of the person but situated within the environmental context that the person must work within. An analysis of Table 9 shows that first order barriers mentioned in the literature up to eighteen years ago, such as access to devices (Hegarty & Aspinall, 2006) continues to be presented as a barrier in 2022 (Özler & Akçamete, 2022). Despite many authors highlighting inappropriate software in the early to late 2000's (Harrysson, 2004; Hegarty & Aspinall, 2006; Li-Tsang et al., 2006; Li-Tsang et al., 2004; Stock et al., 2006; Wong et al., 2009), Khanlou et al. (2021) sheds light on the barrier again. The Covid-19 pandemic also brought to attention many of the barriers faced by persons with IDD at a time when digital skills, abilities and technology became the only source of social and educational engagement for many (Chadwick et al., 2023).

4.4.2 Second Order Barriers

Second order barriers are found to be intrinsic and sitting within the person, such as the person's beliefs, attitudes to the technology or an unwillingness within the person to change in relation to using the technology (Ertmer, 1999). It is not surprising that socio-cognitive barriers appear within the literature given that the nature of the disability for people with IDD is socio-cognitive in nature (Barr, 2018; Haertl, 2014; Schalock & Luckasson, 2021). There may be a number of reasons related to the complex nature of IDD and co-occurring conditions as to why student capacity has been raised as a barrier (Barr, 2018; Schalock & Luckasson, 2021).

Although some of the barriers presented above are related to the capabilities and capacities of the individuals with IDD, there is a significant number of them that would be managed at either a policy or organisational some examples would be at staff training and development and access to technology (Lewchuk et al., 2021; Özler & Akçamete, 2021). Barriers such as software would be more difficult to resolve (Harrysson, 2004; Khanlou et al., 2021). Further research would be required

to examine why policies such as the 'IT 2000' (Education & Science, 1997) were unsuccessful and the likely impact that AI could have across educational institutes overall (Bukartaite & Hooper, 2023).

4.5 Conclusion

In this chapter the findings from the literature search described in chapter three are presented alongside an analysis of the findings. Literature from chapter two and other literature are presented as part of the discussion that follows the findings within each section. The first section starts off by exploring the concept of digital and how that has been presented within the studies found as part of the literature screening process. It has been found that there is a clear lack of a definition within the research, and this has been discussed in relation to the other terminology that formed part of the studies.

The chapter then proceeded to move onto to discuss digital competency making note of the fact that digital competency and digital competency frameworks are not discussed in the literature with only one study discussing in any depth (Vuorikari, 2022). The literature is then presented within a digital competency framework bringing attention to the research that has been completed to date while also highlighting areas for further research. Gaps in research are also noted to the timeline and arguments are put forward as to possible circumstances.

The third and final part of the chapter presents the findings related to barriers to digital literacy for people with intellectual and developmental disabilities (IDD). These barriers are presented within Ertmer (1999) framework on First Order and Second Order barriers. Challenges and possible solutions are discussed arguing that there is also a need to consider the future landscape.

Chapter Five: Conclusion and Implications for Practice

5.1 Conclusion

This research set out to answer what the gaps were that had been identified in relation to digital literacy and digital competency for people with intellectual and developmental disability. The first gap identified was related to the concept of digital literacy. With only two studies providing a definition, with a total of ten out of the forty-five studies using the concept overall leads to questions related to its use within research for people with intellectual and developmental disabilities. The findings related to other terminology used demonstrated that there is variation in terminology across all the literature suggesting that a framework of terminology for digital literacy would be worth considering supporting the development of education policies, curriculum and for research related to education and intellectual and developmental disability. Given that all material provided for people with intellectual and developmental disability also backs up the need for clarification on the meaning of terminology used.

Secondly, mapping the literature into the DigComp (Vuorikari, 2022) and UNESCO (United Nations Educational, 2018) competency framework highlighted gaps in areas for further research such as further literature reviews focused within each competency section or as a guide for focused research that sit outside what has traditionally been researched for example in the area of content creation.

Thirdly the findings related to barriers show that a large portion of them sit outside the person leading to questions related to organisational structures and training for the educators and support people that work closely to support the learning and development of digital literacy for people with IDD.

5.2 Research Implications

This research has provided evidence on the broad and often confusing nature of the terminology used in relation to digital literacy for people with IDD. It has also highlighted the need for a framework for terminology related to digital engagement for future research development and participatory research in this area. Digital competency frameworks are being employed in Europe and across the globe due to a global shift related to the SDGs (Vuorikari, Kluzer & Punie, 2022). There would be an opportunity to employ the DigComp framework and explore how it could be integrated across a third level programme for people with IDD so that they can be rewarded for any competency development that takes place within and across the programme (Vuorikari, 2022).

5.3 Limitations of the Research

Limitations that need to be considered in this study begin with a look at the potential for research bias. The researcher has been working with people with IDD in third level education for some years now resulting in the potential for biases to creep into how the study is presented. Time limits placed on the study due to the nature of it being completed as part of a Master in Education meant there was no room for consideration, literature comparisons and depth within the study. Another limitation is the fact that this is the first systematic review of the literature that the researcher has completed leaving it open to novice mistakes.

References

- AAIDD. (2024). *American Association on Intellectual and Developmental Disabilities*.
<https://www.aaidd.org/>
- Abbott, C., & Cribb, A. (2001). Special schools, inclusion and the World Wide Web—the emerging research agenda. *British Journal of Educational Technology*, 32(3), 331-342.
- Abbott, L., Austin, R., Mulkeen, A., & Metcalfe, N. (2004). The global classroom: advancing cultural awareness in special schools through collaborative work using ICT. *European Journal of Special Needs Education*, 19(2), 225-240.
<https://doi.org/10.1080/08856250410001678504>
- Ågren, K. A., Kjellberg, A., & Hemmingsson, H. (2020). Internet opportunities and risks for adolescents with intellectual disabilities: a comparative study of parents' perceptions. *Scandinavian Journal of Occupational Therapy*, 27(8), 601-613.
<https://doi.org/10.1080/11038128.2020.1770330>
- Al-Gawhary, W., & Kambouri, M. (2012). The Impact of ICT as Another Route to Overcome Learning Barriers for Students with SEN: A Case Study in an Egyptian Context. *International Association for Development of the Information Society*.
<https://files.eric.ed.gov/fulltext/ED542659.pdf>
- Aquirre-Martínez, R., de Casas-Moreno, P., & Paramio-Pérez, G. (2018). Digital literacy in young people with mild intellectual disability. A case study in the city de Saltillo, Mexico. *Universitas: Revista de Ciencias Sociales y Humanas de la Universidad Politécnica Salesiana del Ecuador*, XVI, 28, 39-59.
<https://doi.org/https://doi.org/10.17163/uni.n28.2018.02>
- Aspinall, A., & Hegarty, J. R. (2001). ICT for adults with learning disabilities: an organisation-wide audit. *British Journal of Educational Technology*, 32(3), 365-372.
- Authority, H. E. (2023). *PATH Strand 4 Phase 2: Enhancement of Course Provision in Higher Education for Students with Intellectual Disabilities*.
<https://hea.ie/assets/uploads/2023/06/PATH-4-Phase-2-Overview-of-Courses-subject-to-change.pdf>
- Balasuriya, S. S., Sitbon, L., & Brereton, M. (2022). A Support Worker Perspective on Use of New Technologies by People with Intellectual Disabilities. *Acm Transactions on Accessible Computing*, 15(3), Article 21. <https://doi.org/10.1145/3523058>
- Barbas, M., Matos, P., & Silva, A. (2020). STUDY OF THE INNOVATIVE TRAINING MODULE "COMMUNICATION AND CUSTOMER SERVICE" IN A PIONEER TRAINING COURSE: "DIGITAL LITERACY FOR LABOUR MARKET". INTED Proceedings. INTED Proceedings,
- Barr, O., & Gates, B. (Eds.). (2018). *Oxford handbook of learning and intellectual disability nursing*. Oxford University Press, USA.
- Basilotta-Gómez-Pablos, V., Matarranz, M., Casado-Aranda, L.-A., & Otto, A. (2022). Teachers' digital competencies in higher education: a systematic literature review. *International journal of educational technology in higher education*, 19(1), 8.
<https://doi.org/https://doi.org/10.1186/s41239-021-00312-8>
- Bawden, D. (2001). Information and digital literacies: a review of concepts. *Journal of documentation*, 57(2), 218-259.
- Bawden, D. (2008). Origins and concepts of digital literacy. *Digital literacies: Concepts, policies and practices*, 30(2008), 17-32.

- Baxter, A., & Reeves, L. M. (2023). Inclusion of Digital Literacy Skills in Transition Planning for Students With Intellectual Disabilities. *Journal of Special Education Technology*, 38(3), 384-391. <https://doi.org/10.1177/01626434221120416>
- Bayor, A. A. (2019). HowToApp: Supporting life skills development of young adults with intellectual disability. Proceedings of the 21st International ACM SIGACCESS Conference on Computers and Accessibility,
- Bergson-Shilcock, A. (2020). The New Landscape of Digital Literacy: How Workers' Uneven Digital Skills Affect Economic Mobility and Business Competitiveness, and What Policymakers Can Do about It. *National Skills Coalition*. <https://eric.ed.gov/?id=ED607391>
- Brickner, D. L. (1995). *The effects of first and second-order barriers to change on the degree and nature of computer usage of mathematics teachers: A case study*. Purdue University.
- Bryan, A. (2022). Researching Children and Other 'Vulnerable' Groups. In D. F. a. S. Bergin (Ed.), *Doing Research in Education: A Beginner's Guide*. University College Dublin Press 2022
- Buchner, T., Shevlin, M., Donovan, M. A., Gercke, M., Goll, H., Šiška, J., Janyšková, K., Smogorzewska, J., Szumski, G., & Vlachou, A. (2020). Same Progress for All? Inclusive Education, the United Nations Convention on the Rights of Persons With Disabilities and Students With Intellectual Disability in European Countries. *Journal of Policy and Practice in Intellectual Disabilities*.
- Bukartaite, R., & Hooper, D. (2023). Automation, artificial intelligence and future skills needs: an Irish perspective. *European Journal of Training and Development*, 47(10), 163-185.
- Butler, L. N., Sheppard-Jones, K., Whaley, B., Harrison, B., & Osness, M. (2016). Does participation in higher education make a difference in life outcomes for students with intellectual disability? *Journal of Vocational Rehabilitation*, 44(3), 295-298.
- Caton, S., & Landman, R. (2021). Internet safety, online radicalisation and young people with learning disabilities. *British Journal of Learning Disabilities*, 50(1), 88-97. <https://doi.org/10.1111/bld.12372>
- Chadwick, D. D., Buell, S., Burgess, E., & Peters, V. (2023). "I would be lost without it but it's not the same" experiences of adults with intellectual disabilities of using information & communication technology during the COVID-19 global pandemic. *British Journal of Learning Disabilities*, 51(2), 148-162. <https://doi.org/10.1111/bld.12522>
- Chiner, E., Gómez-Puerta, M., & Mengual-Andrés, S. (2019). Opportunities and Hazards of the Internet for Students with Intellectual Disabilities: The Views of Pre-Service and In-Service Teachers. *International Journal of Disability, Development and Education*, 68(4), 538-553. <https://doi.org/10.1080/1034912x.2019.1696950>
- Cihak, D. F., McMahon, D., Smith, C. C., Wright, R., & Gibbons, M. M. (2015). Teaching individuals with intellectual disability to email across multiple device platforms. *Research in Developmental Disabilities*, 36, 645-656. <https://doi.org/10.1016/j.ridd.2014.10.044>
- Cihak, D. F., Wright, R., Smith, C. C., McMahon, D., & Kraiss, K. (2015). Incorporating Functional Digital Literacy Skills as Part of the Curriculum for High School Students with Intellectual Disability. *Education and Training in Autism and Developmental Disabilities*, 50(2), 155-171. <Go to ISI>://WOS:000355019700003
- Claro, M., Castro-Grau, C., Ochoa, J. M., Hinostroza, J. E., & Cabello, P. (2024). Systematic review of quantitative research on digital competences of in-service school teachers. *Computers & Education*, 215. <https://doi.org/10.1016/j.compedu.2024.105030>

- Cohen, L., Manion, L., & Morrison, K. (2002). *Research methods in education*. routledge.
- Coleman, M. R., & Shevlin, M. (2019). Postsecondary Educational Opportunities for Students with Special Education Needs / Mary Ruth Coleman, Michael Shevlin. In (pp. 2-29).
- Corby, D., Cousins, W., & Slevin, E. (2012). Inclusion of adults with intellectual disabilities in post-secondary and higher education: A review of the literature. *Lifelong learning community development*, 7, 69-86.
- Cosgrove, J., McKeown, C., Travers, J., Lysaght, Z., Bhroin, Ó. N., & Archer, P. (2014). Educational experiences and outcomes for children with special educational needs. *Dublin: National Council for Special Education*.
https://www.erc.ie/documents/nese_educational_outcomes_children_with_sen.pdf
- Covidence. (2024). *The World's #1 Systematic Review Tool*. www.covidence.org
- Davies, D. K., Stock, S. E., & Wehmeyer, M. L. (2004). Computer-mediated, self-directed computer training and skill assessment for individuals with mental retardation. *Journal of Developmental and Physical Disabilities*, 16(1), 95-105.
<https://doi.org/10.1023/b:Jodd.0000010041.13710.33>
- Delgado, P., Avila, V., Fajardo, I., & Salmeron, L. (2019). Training young adults with intellectual disability to read critically on the internet. *J Appl Res Intellect Disabil*, 32(3), 666-677. <https://doi.org/10.1111/jar.12562>
- Desbrow, J. M., Vicario-Merino, A., Criado, M. A., & Córdoba, M. G. D. (2023). Self-perception of learning basic skills in the use of information and communications technology in university students with intellectual disabilities. *Journal of Intellectual Disabilities*. <https://doi.org/10.1177/17446295231196205>
- Dickson, R., Pilkington, G., Cherry, M. G., & Boland, A. (2023). What is a systematic review? . In G. Cherry, A. Boland, & R. D. (Eds.). (Eds.), *Doing a Systematic Review: A Student's Guide*.
- Trinity College Dublin (2024a). *EndNote*. Retrieved August 29 from <https://www.tcd.ie/library/support/endnote/>
- Trinity College Dublin (2024b). *Support for Systematic Reviews*. Retrieved August 29 from <https://www.tcd.ie/library/support/systematic-reviews.php>
- Department of Education and Integration & Science. (1997). *Schools IT 2000: A policy framework for the new millennium*. Stationery Office.
- EndNote. (2024). *We help you focus on your research*. Retrieved August 29 from <https://endnote.com/>
- Ertmer, P. A. (1999). Addressing first-and second-order barriers to change: Strategies for technology integration. *Educational technology research and development*, 47(4), 47-61. <https://link.springer.com/content/pdf/10.1007/BF02299597.pdf>
- Eshet, Y. (2004). Digital literacy: A conceptual framework for survival skills in the digital era. *Journal of educational multimedia and hypermedia*, 13(1), 93-106.
- Fahie, D., & Bergin, S. (2022). *Doing Research in Education: A Beginner's Guide*. University College Dublin Press.
- Farias-Gaytan, S., Aguaded, I., & Ramirez-Montoya, M.-S. (2023). Digital transformation and digital literacy in the context of complexity within higher education institutions: a systematic literature review. *Humanities and Social Sciences Communications*, 10(1), 1-11. <https://doi.org/https://doi.org/10.1057/s41599-023-01875-9>
- Fibriasari, H., Andayani, W., Putri, T. T. A., & Harianja, N. (2023). Learning management system now and in the future: Study case from the Indonesian university students. *International Journal of Information and Education Technology (IJIET)*, 13(1), 158-165.

- Fink, A. (2019). *Conducting research literature reviews: From the internet to paper*. Sage publications.
- Gapski, H. (2007). Some reflections on digital literacy. In Proceedings of the 3rd international workshop on digital literacy Crete: CEUR-WS. org.
- Gilster, P. (1997). Digital literacy. In: Wiley Computer Pub.
- Glencross, S., Mason, J., Katsikitis, M., & Greenwood, K. M. (2021). Internet Use by People with Intellectual Disability: Exploring Digital Inequality-A Systematic Review. *Cyberpsychol Behav Soc Netw*, 24(8), 503-520.
<https://doi.org/10.1089/cyber.2020.0499>
- Grigal, M., Hart, D., & Weir, C. (2013). Postsecondary education for people with intellectual disability: Current issues and critical challenges. *Inclusion*, 1(1), 50-63.
- Gutierrez-Angel, N., Sanchez-Garcia, J.-N., Mercader-Rubio, I., Garcia-Martin, J., & Brito-Costa, S. (2022). Digital literacy in the university setting: A literature review of empirical studies between 2010 and 2021. *Frontiers in Psychology*, 13, 896800.
<https://doi.org/https://doi.org/10.3389/fpsyg.2022.896800>
- Haertl, K. (2014). *Adults with intellectual and developmental disabilities: Strategies for occupational therapy*. AOTA Press.
- Harrysson, B., Svensk, A., & Johansson, G. I. (2004). How people with developmental disabilities navigate the Internet. *British Journal of Special Education*, 31(3), 138-142. <https://doi.org/10.1111/j.0952-3383.2004.00344.x>
- Harrysson, B., Svensk, A., & Johansson, G. I. (2004). How people with developmental disabilities navigate the Internet. *British Journal of Special Education* 31(3), 138-142.
https://nasenjournals.onlinelibrary.wiley.com/doi/pdfdirect/10.1111/j.0952-3383.2004.00344.x?casa_token=0U9eTntz-bsAAAAA:c0ME99emviwVM8XzQFw9LA6y0LQRqzZ1fTvfMY9f8Qt61JJnmpaeG08NgTlZGM2XL-mUcmjVIXJQvqx_E_A
- Hasegawa, M. (2019). *Providing higher education to young people with intellectual disabilities (ID): Observations from 20 universities in nine countries including the US, Europe, Australia, and Korea*. Yusuke Tanimura.
- Hatlevik, O. E., & Christophersen, K.-A. (2013). Digital competence at the beginning of upper secondary school: Identifying factors explaining digital inclusion. *Computers & Education*, 63, 240-247. <https://doi.org/10.1016/j.compedu.2012.11.015>
- Higher Education Authority (2022). *National access plan: A strategic action plan for equity of access, participation and success in higher education 2022–2028*. Higher Education Authority, Dublin Retrieved from
<https://hea.ie/assets/uploads/2024/07/National-Access-Plan-2022-2028-FINAL.pdf>
- Hegarty, J. R., & Aspinall, A. (2006). The use of personal computers with adults who have developmental disability: outcomes of an organisation-wide initiative. *The British Journal of Development Disabilities*, 52(103), 137-154.
- Heitplatz, V. N. (2020). Fostering Digital Participation for People with Intellectual Disabilities and Their Caregivers: Towards a Guideline for Designing Education Programs. *Social Inclusion*, 8(2), 201-212. <https://doi.org/10.17645/si.v8i2.2578>
- IASSIDD. (2024). *International Association for the Scientific Study of Intellectual and Developmental Disabilities IASSIDD*. <https://iassidd.org/>
- Government of Ireland (2022a). *Harnessing Digital: The digital Ireland framework*. Retrieved from <https://www.gov.ie/en/publication/adf42-harnessing-digital-the-digital-ireland-framework/>

- Government of Ireland (2022b). *Ireland's Second National Implementation Plan for the Sustainable Development Goals 2022-2024*. Retrieved from file:///C:/Users/bringwoo/Downloads/238357_74386d7f-167d-402e-82b9-4eb71b3077db.pdf
- Government of Ireland (2023). *Digital for Good: Ireland's Digital Inclusion Roadmap*. Retrieved from <https://www.gov.ie/pdf/?file=https://assets.gov.ie/267401/a898d78c-e234-465f-bedd-7ccd0655b7d2.pdf#page=null>
- Government of Ireland (2024). *Sustainable Development Goals*. Retrieved from <https://www.gov.ie/pdf/?file=https://assets.gov.ie/247379/a199ab36-1ee6-4f1e-898b-3c308dee33ed.pdf#page=null>
- Jerome, J., Frantino, E. P., & Sturmey, P. (2007). The effects of errorless learning and backward chaining on the acquisition of Internet skills in adults with developmental disabilities. *J Appl Behav Anal*, 40(1), 185-189. <https://doi.org/10.1901/jaba.2007.41-06>
- Jimenez, B. A., & Alamer, K. (2018). Using Graduated Guidance to Teach iPad Accessibility Skills to High School Students With Severe Intellectual Disabilities. *Journal of Special Education Technology*, 33(4), 237-246. <https://doi.org/10.1177/0162643418766293>
- Jones, R. H., & Hafner, C. A. (2021). *Understanding digital literacies: A practical introduction*. Routledge.
- Khanlou, N., Khan, A., Vazquez, L. M., & Zangeneh, M. (2021). Digital Literacy, Access to Technology and Inclusion for Young Adults with Developmental Disabilities. *Journal of Developmental and Physical Disabilities*, 33(1), 1-25. <https://doi.org/10.1007/s10882-020-09738-w>
- Kim, K. M., & Lee, C. E. (2021). Internet use among adults with intellectual and developmental disabilities in South Korea. *Journal of Applied Research in Intellectual Disabilities*, 34(3), 724-732. <https://doi.org/10.1111/jar.12843>
- Koltay, T. (2011). Information literacy for amateurs and professionals. *Library Review*, 60(3), 246-257. <https://doi.org/10.1108/00242531111117290>
- Koushik, V., & Kane, S. K. (2019, May 04-09). "It Broadens My Mind": Empowering People with Cognitive Disabilities through Computing Education. [Chi 2019: Proceedings of the 2019 chi conference on human factors in computing systems]. CHI Conference on Human Factors in Computing Systems (CHI), Glasgow, SCOTLAND.
- Krumsvik, R. J., Jones, L. Ø., Øfstegaard, M., & Eikeland, O. J. (2016). Upper secondary school teachers' digital competence: Analysed by demographic, personal and professional characteristics. *Nordic Journal of Digital Literacy*, 11(3), 143-164. <https://www.idunn.no/doi/pdf/10.18261/issn.1891-943x-2016-03-02>
- Kubiak, J., Aston, D., Devitt, M., & Ringwood, B. (2021). University students with intellectual disabilities: empowerment through voice. *Education Sciences*, 11(10), 571. <https://doi.org/https://doi.org/10.3390/educsci11100571>
- Lea, M. R. (2013). Reclaiming literacies: competing textual practices in a digital higher education. *Teaching in Higher Education*, 18(1), 106-118. <https://doi.org/https://doi.org/10.1080/13562517.2012.756465>
- Lewchuk, D. R., D'Amico, M., & Timm-Bottos, J. (2021). Digital Footprints: Exploring Digital Inclusion in Adults With Developmental Disabilities (Empreintes numériques : exploration de l'inclusion numérique chez les adultes ayant une déficience développementale). *Canadian Journal of Art Therapy*, 34(2), 52-62. <https://doi.org/10.1080/26907240.2021.1982171>

- Li-Tsang, C., Yeung, S., Chan, C., & Hui-Chan, C. (2005). Factors affecting people with intellectual disabilities in learning to use computer technology. *International Journal of Rehabilitation Research*, 28(2), 127-133. <https://doi.org/10.1097/00004356-200506000-00005>
- Li-Tsang, C., Yeung, S., Chan, C., & Hui-Chan, C. (2005). Factors affecting people with intellectual disabilities in learning to use computer technology *International Journal of Rehabilitation Research*, 28(2), 127-133. https://journals.lww.com/intjrehabilres/_layouts/15/oaks.journals/downloadpdf.aspx?an=00004356-200506000-00005&casa_token=7M0-ucU-F9wAAAAA:MDlq1Hz9mpGtrDNJSK-8Epfb-zn0jrNghqMBNPXtSG0RYV5xBst3slZ0-iz-IBtl2kchLJU_km_2AHvtpnCLWR47B4pWGwQ
- Li-Tsang, C. W., Yeung, S. S., Choi, J. C., Chan, C. C., & Lam, C. (2006). The effect of systematic information and communication technology (ICT) training programme for people with intellectual disabilities. *The British Journal of Development Disabilities*, 52(102), 3-18.
- Li-Tsang, C. W. P., Chan, C. C. H., Lam, C. S., Hui-Chan, C., & Yeung, S. S. (2004). Evaluations of an information and communication technology (ICT) training programme for persons with intellectual disabilities. In K. Miesenberger, J. Klaus, W. Zagler, & D. Burger (Eds.), *Computers Helping People with Special Needs: Proceedings* (Vol. 3118, pp. 1032-1038). <Go to ISI>://WOS:000222635100152
- Li-Tsang, C. W. P., Lee, M. Y. F., Yeung, S. S. S., Siu, A. M. H., & Lam, C. S. (2007). A 6-month follow-up of the effects of an information and communication technology (ICT) training programme on people with intellectual disabilities. *Research in Developmental Disabilities*, 28(6), 559-566. <https://doi.org/10.1016/j.ridd.2006.06.007>
- Lifshitz, H. (2020). Post-Secondary Academic Programs for Adults with Mild and Moderate Intellectual Disability. In *Growth and Development in Adulthood among Persons with Intellectual Disability*. Springer, Cham. https://doi.org/https://doi.org/10.1007/978-3-030-38352-7_3
- Lloyd, J., Moni, K. B., & Jobling, A. (2006). Breaking the hype cycle: using the computer effectively with learners with intellectual disabilities. *Downs Syndr Res Pract*, 9(3), 68-74. <https://doi.org/10.3104/practice.296>
- Marnewick, C., Meda, L., Condry, J., & Phillips, H. (2022). Using an intervention programme to empower intellectually disabled learners to use WhatsApp in a special needs unit in Cape Town, South Africa. *Cogent Education*, 9(1). <https://doi.org/10.1080/2331186x.2022.2142447>
- Masalimova, A. R., Khvatova, M. A., Chikileva, L. S., Zvyagintseva, E. P., Stepanova, V. V., & Melnik, M. V. (2022). Distance learning in higher education during COVID-19. *Frontiers in Education*,
- McCausland, D., McCarron, M., & McCallion, P. (2023). Use of technology by older adults with an intellectual disability in Ireland to support health, well-being and social inclusion during the COVID-19 pandemic. *British Journal of Learning Disabilities*, 51(2), 175-190. <https://doi.org/10.1111/bld.12514>
- McGarr, O. (2009). The development of ICT across the curriculum in Irish schools: A historical perspective. *British Journal of Educational Technology*, 40(6), 1094-1108. <https://doi.org/https://doi.org/10.1111/j.1467-8535.2008.00903.x>
- McGarr, O., Mifsud, L., & Colomer Rubio, J. C. (2021). Digital competence in teacher education: comparing national policies in Norway, Ireland and Spain. *Learning*,

Media and Technology, 46(4), 483-497. <https://doi.org/https://doi.org/10.1080/17439884.2021.1913182>

- McNicholl, A., Casey, H., Desmond, D., & Gallagher, P. (2021). The impact of assistive technology use for students with disabilities in higher education: a systematic review. *Disability and rehabilitation: assistive Technology*, 16(2), 130-143.
- Mezzalana, S., Scandurra, C., Pergola, R. F., Maldonato, N. M., Montero, I., & Boichichio, V. (2021). The psychological benefits and efficacy of computer-assisted training on competency enhancement in adults with intellectual disability. A systematic review. *Mediterranean Journal of Clinical Psychology*, 9(3). <https://doi.org/10.13129/2282-1619/mjcp-3178>
- Moisey, S., & van de Keere, R. (2007). Inclusion and the Internet: Teaching Adults with Developmental Disabilities to Use Information and Communication Technology. *Developmental Disabilities Bulletin*, 35, 72-102.
- Moni, K. B. (2000). Building a Community of Literacy Practice with Young Adults with Intellectual Disabilities. <https://files.eric.ed.gov/fulltext/ED449625.pdf>
- Murphy, E., McCausland, D., Korfage, I., Oppewal, A., Flygare-Wallen, E., Koster, R., McCarron, M., & McCallion, P. (2021). Digi-ID: Accessible digital skills education to enhance health and inclusion of adults with intellectual disabilities. *Journal of Applied Research in Intellectual Disabilities*, 34(5), 1303-1303. <Go to ISI>://WOS:000668281600407
- NFETL. (2015). Teaching and learning in higher education: A roadmap for enhancement in a digital world. *The National Forum for the Enhancement of Teaching and Learning in Higher Education*. Retrieved August 30, from <http://www.teachingandlearning.ie/wp-content/uploads/2015/03/Digital-Roadmap-web.pdf>
- O'Brien, P., Shevlin, M., O'Keefe, M., Fitzgerald, S., Curtis, S., & Kenny, M. (2009). Opening up a whole new world for students with intellectual disabilities within a third level setting. 37(4), 285-292.
- O'Connor, B., Kubiak, J., Espiner, D., & O'Brien, P. (2012). Lecturer responses to the inclusion of students with intellectual disabilities auditing undergraduate classes. *Journal of Policy and Practice in Intellectual Disabilities*, 9(4), 247-256.
- Özler, N. G., & Akçamete, G. (2021). Effectiveness of Video Modeling in Teaching Computer Skills to Students with Intellectual Disabilities. *Journal of Education and Learning*, 11(1). <https://doi.org/10.5539/jel.v11n1p40>
- Özler, N. G., & Akçamete, G. (2022). Effectiveness of Video Modeling in Teaching Computer Skills to Students with Intellectual Disabilities. *Journal of Education and Learning*, 11(1), 40-53.
- Pandya, J. Z., Hansuvadha, N., & Pagdilao, K. A. C. (2018). Digital literacies through an intersectional lens: the case of Javier. *English Teaching-Practice and Critique*, 17(4), 387-399. <https://doi.org/10.1108/etpc-11-2017-0158>
- Pangrazio, L., Godhe, A.-L., & Ledesma, A. G. L. (2020). What is digital literacy? A comparative review of publications across three language contexts. *E-Learning and Digital Media*, 17(6), 442-459. <https://doi.org/10.1177/2042753020946291>
- Pilkington, G., & Hounsborne, J. (2017). Planning and managing my ReviewBoland, Cherry, G., Dickson, R.(Eds.), Doing a Systematic Review, 21-42. In: London, UK: Sage.
- Priest, N., & May, E. (2001). Laptop computers and children with disabilities: Factors influencing success. *Australian Occupational Therapy Journal*, 48(1), 11-23.
- PRISMA. (2024). Welcome to the NEW Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) website. Retrieved August 31 from www.prisma-statement.org

- Raspa, M., Fitzgerald, T., Furberg, R. D., Wylie, A., Moultrie, R., DeRamus, M., Wheeler, A. C., & McCormack, L. (2018). Mobile technology use and skills among individuals with fragile X syndrome: implications for healthcare decision making. *J Intellect Disabil Res*, 62(10), 821-832. <https://doi.org/10.1111/jir.12537>
- Riddell, S., Weedon, E., Danforth, S., Graham, L., Hjørne, E., Pijl, S.-J., & Tomlinson, S. (2018). Special education and globalisation: Continuities and contrasts across the developed and developing world. In *Special Education and Globalisation* (pp. 1-7). Routledge. <https://doi.org/10.1080/01596306.2015.1073011>
- Rivera, C. J., Hudson, M. E., Weiss, S. L., & Zambone, A. (2017). Using a Multicomponent Multimedia Shared Story Intervention with an iPad to Teach Content Picture Vocabulary to Students with Developmental Disabilities. *Education and Treatment of Children*, 40(3), 327-352. <https://doi.org/10.1353/etc.2017.0014>
- Rocha, T., Bessa, M., Melo, M., Barroso, J., & Cabral, L. (2016, Nov 24-25). Evaluating Selection, Manipulation and Navigation Tasks by People with Intellectual Disabilities Learning level comparison of user interaction performance with digital content. [2016 23rd portuguese meeting on computer graphics and interaction (epcgi)]. 23rd Portuguese Meeting on Computer Graphics and Interaction (EPCGI), Covilha, PORTUGAL.
- Roche, J. (2022). Essential skills for early career researchers.
- Røkenes, F. M., & Krumsvik, R. J. (2014). Development of student teachers' digital competence in teacher education-A literature review. *Nordic Journal of Digital Literacy*, 9(4), 250-280. <https://www.idunn.no/doi/pdf/10.18261/ISSN1891-943X-2014-04-03>
- Sadler, T. (2023). *Inclusive Methods for Engaging People With Intellectual and Developmental Disabilities in Research Practices*. Advancing Evidence. Improving Lives. <https://ktddr.org/products/info-briefs/KTDDR-EngagingPeopleWithIDD-508.pdf>
- Salmerón, L., Gómez, M., & Fajardo, I. (2016). How students with intellectual disabilities evaluate recommendations from internet forums. *Reading and Writing*, 29(8), 1653-1675. <https://doi.org/10.1007/s11145-016-9621-4>
- Schalock, R. L., & Luckasson, R. (2021). Intellectual disability, developmental disabilities, and the field of intellectual and developmental disabilities. <https://doi.org/10.1037/0000194-002>
- Seok, S., & DaCosta, B. (2017). Digital literacy of youth and young adults with intellectual disability predicted by support needs and social maturity. *Assistive Technology*, 29(3), 123-130. <https://doi.org/10.1080/10400435.2016.1165759>
- Setchell, J., Barlott, T., & Torres, M. (2021). A socio-emotional analysis of technology use by people with intellectual disabilities. *Journal of Intellectual Disability Research*, 65(2), 149-161. <https://doi.org/10.1111/jir.12796>
- Shevlin, M., & Banks, J. (2021). Inclusion at a Crossroads: Dismantling Ireland's System of Special Education. *Education Sciences*, 11(4), 161. <https://www.mdpi.com/2227-7102/11/4/161>
- Shevlin, M., Kubiak, J., O'Donovan, M.-A., Devitt, M., Ringwood, B., Aston, D., & McGuckin, C. (2020). Effective practices for helping students transition to work. In *Oxford research encyclopedia of education*.
- Smith, C. C., Cihak, D. F., McMahon, D. D., & Coleman, M. B. (2019). Examining Digital Messaging Applications for Postsecondary Students With Intellectual Disability. *Journal of Special Education Technology*, 34(3), 190-203. <https://doi.org/10.1177/0162643418822107>

- Søby, M. (2013). Learning to be: Developing and understanding digital competence. In (Vol. 8, pp. 134-138).
- Spante, M., Hashemi, S. S., Lundin, M., & Algers, A. (2018). Digital competence and digital literacy in higher education research: Systematic review of concept use. *Cogent Education*, 5(1), 1519143. <https://doi.org/10.1080/2331186X.2018.1519143>
- Stock, S. E., Davies, D. K., Davies, K. R., & Wehmeyer, M. L. (2006). Evaluation of an application for making palmtop computers accessible to individuals with intellectual disabilities. *J Intellect Dev Disabil*, 31(1), 39-46. <https://doi.org/10.1080/13668250500488645>
- Trinity College Dublin (2024). *Academic Registry, Student Registration*. <https://www.tcd.ie/academicregistry/student-registration/>
- Tinmaz, H., Lee, Y.-T., Fanea-Ivanovici, M., & Baber, H. (2022). A systematic review on digital literacy. *Smart Learning Environments*, 9(1). <https://doi.org/10.1186/s40561-022-00204-y>
- Trifonas, P. P. (2011). *Learning the virtual life*. New York: Routledge. 10.4324_9780203818824_previewpdf
- United Nations Educational, Scientific and Cultural Organisation (2024). *Digital Literacy*. Retrieved August 30 from <https://uis.unesco.org/en/glossary-term/digital-literacy>
- United Nations Educational, Scientific and Cultural Organisation (2018). A global framework of reference on digital literacy skills for indicator 4.4.2. Information Paper No. 51, UIS/2018/ICT/IP/51. Retrieved August 31, from <https://unesdoc.unesco.org/ark:/48223/pf0000265403>
- Vuorikari, R., Kluzer, S., & Punie, Y. (2022). *DigComp 2.2: The Digital Competence Framework for Citizens - With new examples of knowledge, skills and attitudes*, EUR 31006 EN, Publications Office of the European Union, Luxembourg, 2022 <https://doi.org/10.2760/115376>
- Vuorikari, R., & Punie, Y. (2019). The use of reference frameworks to support digitally competent citizens—the case of DigComp. *Digital Skills Insights*, 1-11.
- Wehmeyer, M. L., Palmer, S. B., Smith, S. J., Parent, W., Davies, D. K., & Stock, S. (2006). Technology use by people with intellectual and developmental disabilities to support employment activities: A single-subject design meta analysis. *Journal of Vocational Rehabilitation*, 24(2), 81-86.
- Whitaker, M. S., & Albertson, D. (2011). Triangulating Findings from an Instruction-Based Community Engagement Project. *Reference & User Services Quarterly*, 51(1), 49-59. <https://doi.org/10.5860/rusq.51n1.49>
- White, A. (2019). *DIGITAL LITERACY FOR STUDENTS WITH DISABILITY: RECOGNISING ABILITY AND SUPPORTING LEARNING THROUGH ASSESSMENT, EVIDENCE, AND EXPERTISE* The University of Melbourne].
- White, E. H., Pavlovic, M., & Poed, S. (2020). Understanding and mapping digital literacy for students with disability. . In *Understanding students with additional needs as learners* (pp. 131-156). <https://rest.neptune-prod.its.unimelb.edu.au/server/api/core/bitstreams/16122ce1-babf-5f4e-89e3-2a0c363cac5c/content>
- Wong, A. W. K., Chan, C. C. H., Li-Tsang, C. W. P., & Lam, C. S. (2009). Competence of people with intellectual disabilities on using human-computer interface. *Research in Developmental Disabilities*, 30(1), 107-123. <https://doi.org/10.1016/j.ridd.2008.01.002>

Zotero. (2024). *Your personal research assistant*. Retrieved August 29 from <https://www.zotero.org/>

Appendix A – Literature Applied within the DigComp Framework

	Devices & Software operations		1. Information & Data Literacy			2. Communication & Collaboration						3. Digital Content Creation				4. Safety				5. Problem Solving			
Digital Competency Framework	0.1	0.2	1.1	1.2	1.3	2.1	2.2	2.3	2.4	2.5	2.6	3.1	3.2	3.3	3.4	4.1	4.2	4.3	4.4	5	5.2	5.3	5.4
Moni (2000)			1.1			2.1																	
Davis et al. (2004)	0.1																						
Harrysson et al. (2004)			1.1																				
Li-Tsang et al. (2004)	0.1		1.1																				
Li-Tsang et al. (2005)	0.1	0.2	1.1																				
Li-Tsang et al. (2006)	0.1	0.2	1.1																				
Lloyd et al. (2006)			1.1																				
Stock et al. (2006)		0.2																					
Jerome et al. (2007)			1.1																				
Li-Tsang et al. (2007)	0.1		1.1																				
Moisey and van de Keere (2007)			1.1			2.1																	
Wong et al. (2009)			1.1																				
Al-Gawhary and Kambouri (2012)	0.1		1.1	1.3								3.1											
Cihak, McMahon, et al. (2015)		0.2	1.1																				
Cihak, Wright, et al. (2015)		0.2	1.1	1.3		2.1																	
Rocha et al. (2016)			1.1																				
Salmeron et al. (2016)						2.1												4.3					
Rivera et al. (2017)	0.1		1.1																				
Jimenez and Alamer (2018)	0.1																						
Pandya et al. (2018)												3.1											
Raspa et al. (2018)	0.1		1.1																				
Bayor (2019)															3.4								
Delgado et al. (2019)				1.2																			
Koushik and Kane (2019)															3.4								
Smith et al. (2019)						2.1																	
Agren et al. (2020)																			4.3				
Barbas et al. (2020)				1.3		2.1	2.2																
Chiner et al. (2021)																	4.1						
Lewchuk et al. (2021)																			4.3				
Marnewick et al. (2022)				1.3		2.1				2.5							4.1	4.2	4.3				
Özler & Akçamet (2022)	0.1			1.3																			