

A Mixed Methods Investigation of Effective Online Comprehension Strategy Instruction within the Irish Primary School Context

Abstract

This study was based on an embedded mixed methods design. In this study, qualitative data was embedded within a quasi-field experimental design. The researcher adopted quantitative methods to test the hypothesis that a combined New Literacies and Print Comprehension Strategy Instruction intervention positively influences online comprehension levels. The researcher used qualitative data produced by focus group sessions and reflective logs to explore results of the intervention.

The study was conducted in a large, mixed, primary school located in North county Dublin. One hundred and sixty Irish primary school pupils participated in the quasi-field experiment ($N = 160$). 84 female participants ($n = 84$) and 76 male participants ($n = 76$) partook in this study. There were 40 ($n = 40$) participants in each condition ranging from seven to ten years.

The between group independent variable was form of comprehension strategy instruction and consisted of four levels: No comprehension strategy instruction, Print Comprehension Strategy Instruction, New Literacies comprehension strategy instruction and Combined Print and New Literacies comprehension strategy instruction. The within groups independent variable was time which was measured pre-intervention (Time 1) and post-intervention (Time 2) for each condition group. The dependent variable was Online Comprehension levels which were measured using the Online Research and Comprehension Assessment (ORCA) Primary.

Condition 1 was a control condition, participants in this condition did not engage in Comprehension Strategy Instruction. In Condition 2 participants received Print based Comprehension strategy instruction. In Condition 3 participants received New Literacies Comprehension strategy instruction. Finally, in Condition 4 participants received Combined Print and New Literacies Comprehension strategy instruction.

A Wilcoxon Signed Rank Test revealed a statistically significant increase in online comprehension levels from Time 1 to Time 2 in the combined Print and New Literacies comprehension instruction condition, $z = -2.35$, $p = .01$, with a medium effect size ($r = .3$). Wilcoxon Signed Rank Tests revealed no statistically significant difference in ORCA Elementary revised scores from Time 1 to Time 2 in all other conditions.

Thematic Analysis of focus group and reflective log data identified one main theme; The application and uses of individual comprehension strategies in online comprehension and research. Within this theme three subthemes were identified; strategies used for online comprehension research purposes; strategies used for online comprehension of static texts and strategies that were ineffective for either online research comprehension or online comprehension of static texts.

The findings of this study led the researcher to conclude that while Combined Print and New Literacies Online Comprehension Strategy Instruction increased online comprehension levels, further replications are necessary to fully determine the meaning and robust nature of this increase. It is hoped that the findings of this study will have implications for classroom practice by encouraging teachers to incorporate Online Comprehension Strategy Instruction into their daily literacy teaching.

Author's Declaration

I hereby declare that this dissertation represents my own work and has not been submitted, in whole or in part, by me or another person, for the purpose of obtaining any other credit/grade. I agree that this thesis may be made available by the College to future students and for research purposes.

Signature: _____

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Abbreviations

ACARA Australian Curriculum, Assessment and Reporting Authority

CCSS Common Core State Standards

CS Computer science

CSO Central Statistics Office

DES Department of Education and Science/Skills

DL Digital literacy

HEA Higher Education Authority

ICT Information Communication Technology

IUAQ Internet Usage and Ability Questionnaire

IT Information Communication Technology

MIREC Mary Immaculate College Research Ethics Committee

NCCA National Council for Curriculum and Assessment

OECD Organization for Economic Cooperation and Development

ORCA Online Research and Comprehension Assessment

PLC Primary Language Curriculum

PRC Pew Research Centre

RCE Reading to Critically Evaluate Online Information

RCI Reading and Writing to Communicate Online Information

RIQ Reading to Define Important Questions

RLI Reading to Locate Online Information

RSI Reading to Synthesize Online Information

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Chapter One

Introduction

Introduction 1.0

‘The history of education cannot be told apart from its technology.’ Over the course of history technology has not only featured in education but has ‘defined its very nature.’ Technology ranging from the basic manuscript to today’s online texts has shaped the course of education (Ryder and Wilson, 1996: 643). Today’s Informational Communication Technologies (ICTs) have and continue to shape modern day education practices. The term ICT or ICTs

...generally relates to those technologies that are used for accessing, gathering, manipulating and presenting or communicating information. The technologies could include hardware (e.g. computers and other devices); software applications; and connectivity (e.g. access to the Internet, local networking infrastructure, videoconferencing (Toomey, 2001: 3).

It is important to note that the potential of ICT to shape modern day education practices is very much determined by a number of mitigating factors. For example, in the Irish setting The Education Research Centre (ERC) conducted an ICT census in primary and secondary schools in Ireland. The census revealed that despite additional government funding and initiatives since the previous NCTE census in 2005 a number of barriers to the integration of technology in education remained. For example, the majority of primary level principals ‘reported that a lack of funding was the most significant obstacle to the effective integration of ICT into school life’ (ERC, 2013:5). According to the ERC report other issues preventing the successful integration of technology in education include issues relating to technical support and ICT equipment maintenance, as well as issues with internet connectivity. While ICT has the potential to revolutionise education this potential will not be realised until issues relating to access, maintenance and internet connectivity knowledge are addressed.

In the early 1990’s technology in education involved the use of computer monitors, cd-roms, computer-assisted programmes and word processing. In the mid 1990’s the advent of the internet radically altered education (Harrison, Dwyer and Castek, 2014). Since then, education has been altered by the introduction of ‘interactive whiteboards, DVDs, MP3s, iTouches, iPads, video games, smart phones, smart toys, podcasts, e-book readers, tablet computers, digital storybooks, electronic learning aids, mobile learning devices and applications’ (Blanchard and Farstrup, 2011: 286).

While these new technologies have affected many facets of education perhaps the most profound impact has been felt in the area of literacy education. The advent of ICT has ‘acutely altered the nature of literacy’ (Coiro Knobel and Lankshear, 2014: 325). According to The International Reading Association (2009: 3) new technologies such as ‘mobile technologies’ (Facer et al., 2008), ‘texting’ (Thurlow and Poff, 2009), ‘gaming’ (Squire, 2005) and ‘multimodal communication’ (Hull and Katz, 2006) have permeated literacy ‘instruction, assessment, and research’. To be considered ‘fully literate in today’s world’ readers must be digitally literate (International Reading Association, 2009:3).

Background and Rationale 1.1

A recent review of primary education across ten jurisdictions revealed that equipping students with digital literacy is a key theme driving education reform (Grayson et al, 2014: 4). Northrop and Killeen (2013: 531) concur stating that today digital literacy should be a curricular goal. Since Gilster (1997) introduced the concept of ‘Digital Literacy’ to the public forum, the term has been amended, extended and discarded by other authors and scholars. Today, definitions of digital literacy fall in two main categories; standardized operationalization definitions and conceptual definitions. Standardized operationalization definitions attempt to ‘operationalize what is involved in being digitally literate’ by prescribing a set list of skills and tasks competencies that must be achieved in order to acquire digital literacy (Lankshear and Knobel 2008: 3). Conceptual definitions of digital literacy suggest digital literacy should be ‘understood as being broader than the basic mechanical skills’ listed in operational definitions (INTO, 2014). Most scholars agree that the conceptual definition of digital literacy best captures what the term aims to represent. Scholars in the area generally consider Martin’s (2006: 19) as the most accurate conceptual definition of digital literacy (Koltay, 2012:216).

Digital Literacy is the awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyse and synthesize digital resources, construct new knowledge, create media expressions, and communicate with others, in the context of specific life situations, in order to enable constructive social action; and to reflect upon this process. (Martin, 2006: 19)

A key aspect of digital literacy is the ability to read effectively online. This is reflected in the EU digital competence definition provided by The European Parliament and The Council of the European Union (2006: 15) which describes digital competence as the ability ‘to retrieve,

assess, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet.’

The ability to read effectively online is a complex process. According to the Rand Reading Study Group (2002: 4) ‘accessing the Internet makes large demands on individuals’ literacy skills’ especially during the process of online comprehension. Online comprehension places so many demands on the reader because involves ‘a process of problem-based inquiry across many different online sources, requiring several recursive reading practices’ (Leu et al, 2011: 7). The complex nature of online comprehension caused researchers to consider the best way to facilitate the comprehension of online texts. When considering how best to facilitate online comprehension theorists such as Coiro and Dobler (2007) started by investigating the application of print strategies to online texts. Findings of studies including Zhang and Duke, (2008) and Schmar-Dobler (2003) revealed that Print comprehension strategies play a role in online comprehension. Print Strategies that have been found to be effective in promoting online comprehension include; monitoring comprehension, synthesis, determining importance, questioning, inferring, and prediction (Zhang and Duke, 2008).

However, studies such as Kingsley and Tancock (2014) and Byeong-Young (2013) revealed that print comprehension strategies did not support reader’s online comprehension during the process of online research. Leu et al (2004: 1587) agree with this view stating that students must be taught ‘a new set of skills’ in order to comprehend when conducting online research. This view is consistent with the New Literacies theory. New Literacies theory suggests that ‘new technologies require new literacies to effectively exploit their potential’ (Leu et al, 2004: 1570). New Literacies theory proposes that online readers need to develop ‘additional ...skills’ to effectively comprehend when conducting online research (Leu et al, 2015: 2). These additional skills include ‘reading online to identify important questions, reading to locate online information, reading to critically evaluate online information, reading to synthesize online information and reading and writing to communicate online information’ (Leu et al 2015: 10). According to New literacies online comprehension involves both reading and writing processes. This is because online reading comprehension includes the ‘online reading and communication skills required in discussion, texting, blogs, wikis, video, shared writing spaces and social networks’ (Leu et al, 2011: 7). The theoretical and empirical

evidence presented suggests that New Literacies and print comprehension strategies must feature as part of an effective online comprehension strategy instruction programme.

Aims of Research 1.2

- In this study the researcher will conduct a quasi-field experiment to test the hypothesis that a combined New Literacies and print comprehension strategy instruction intervention positively influences online comprehension levels and to investigate if a combined comprehension strategy instruction programme is more effective at improving online comprehension levels than a print or New Literacies comprehension strategy instruction programme.
- Also as part of this study, the researcher will collect and analyse questionnaire, focus group and reflective log data to explore which individual comprehension strategies should feature as part of a combined New Literacies and print online comprehension strategy instruction programme.

Main Research Question:

This study seeks to investigate the effect of a combined New Literacies and print comprehension strategy instruction programme on the online comprehension performance of Irish primary school pupils aged 7 to 10. For the purposes of this study online comprehension levels will be measured using the Online Reading Comprehension and Research Assessment (ORCA) Primary. This study will seek to answer the following research questions (RQ):

RQ1. Does combined New Literacies and print online comprehension strategy instruction improve pupil performance on the ORCA Primary?

Hypothesis 1: New Literacies and print online comprehension strategy instruction will improve pupil performance on the ORCA Primary.

Subsidiary Research Questions:

RQ2. Is a combined New Literacies and print online comprehension strategy instruction programme more effective at improving pupil performance on the ORCA Primary than a print based online comprehension strategy instruction programme?

Hypothesis 2: New Literacies and print online comprehension strategy instruction programme is more effective at improving pupil performance on the ORCA Primary than a print based online comprehension strategy instruction programme.

RQ3. Is a combined New Literacies and print online comprehension strategy instruction programme more effective at improving pupil performance on the ORCA Primary than a New Literacies online comprehension strategy instruction programme?

Hypothesis 3: New Literacies and print online comprehension strategy instruction programme is more effective at improving pupil performance on the ORCA Primary than a New Literacies online comprehension strategy instruction programme.

Overview of Chapters 1.3

The next chapter will present literature and theory relevant to the research questions. The chapter begins with an examination of the effect of the internet on society. The emergence of a knowledge economy based on key online literacy skills will then be discussed. The impact of key online literacy skills on the professional and personal well-being of today's citizens will also be explored. Tensions in international policy relating to how online literacy skills should be taught will be discussed. New Literacies Theory will then be presented. Following this, a review of literature relating to comprehension and comprehension strategy instruction will be outlined. This will include description of key research based print based comprehension strategies and how these strategies transfer to the online environment. New Literacies online research and comprehension strategies will then be outlined. Finally empirical evidence for a combined Print and New Literacies Online Comprehension Strategy Instruction Programme will be presented. The literature review will conclude with a presentation of the research questions underpinning this study.

In Chapter 3 the researcher will present the rationale for chosen research method. The researcher will outline the embedded mixed methods design of the study and will explain how this design offered the greatest insight into the research questions. The sampling procedure utilized to recruit participants will then be detailed. The researcher will then describe the setting of the study. Then the demographics relating to the study participants will be presented. The researcher will then proceed to outline the Instructional programme used to

deliver Comprehension strategy instruction in the treatment conditions. This will be followed by a description of Data collection tools and an analysis of the reliability and validity of these tools. The researcher will then outline quantitative and qualitative data analysis techniques. Finally, the researcher will describe measures put in place to ensure this study adhered to Mary Immaculate College Research Ethics Committee (MIREC) ethical guidelines.

Chapter 4 outlines the preliminary and primary Quantitative results of data analysis procedures will be outlined. Initial preliminary analysis involved the researcher conducting a power analysis to ensure that the sample size produced sufficient power. Further preliminary analysis focused on using descriptive statistics to examine the demographic characteristics of the condition groups relating to internet access, usage and skill level. As part of the Preliminary stage of analysis the researcher also sought to investigate through regression analysis whether the extraneous variables of prior topic knowledge and internet skills ability level interfered with the dependent variable. Following the preliminary analysis stage, the researcher then started the main analysis process to test the hypothesis that a combined New Literacies and Print Comprehension Strategy Instruction intervention positively influences online comprehension levels. Analysis of the impact of gender is also to compare the performance of the males and females on each item of the Internet Questionnaire skill subsection.

In Chapter 5 a summary of quantitative findings will be presented and rejection of the null hypothesis will be considered in light of the findings presented. Then in order to interpret the overall differences between conditions the researcher will compare and contrast the individual strategy performance of participants across the four conditions. Next the researcher will present qualitative findings arising from Thematic Analysis of Focus Group and Reflective Log data. Following this, a theoretical explanation for findings relating to the research questions will be presented. The researcher will then consider differences in online comprehension performance across age and gender. Finally, the researcher will consider the effect of limitations on the results of this study.

Chapter 6 will outline a summary of findings, conclusions based on those findings, recommendations for pedagogical practice and national and international literacy policy and suggestions for future research. The summary of findings will include a synopsis of the study's quantitative and qualitative findings. The conclusion section will outline the main and subsidiary conclusions drawn from the study's quantitative and qualitative findings. This

chapter will then discuss recommendations for pedagogical practice arising from the main findings of this study. This section will also include recommendations for national and international literacy policy. Finally, areas for future research are highlighted.

Chapter Two

Literature Review

The Internet and Society 2.0

Over the course of history, society has been shaped by its technological innovations; the telegraph, telephone, radio, and computer. Today in the twenty-first century, the internet has emerged as the defining technology of contemporary society. The assimilation of the internet has been ‘rapid and widespread’ (Johnson, 2013: 487). Leu et al (2015: 1159) suggest that ‘never in the history of civilization have we seen a new technology adopted by so many, in so many different places, in such a short period of time.’ The ‘increasing ubiquity of (internet) connectivity’ is undeniable (Johnson, 2013: 503). In 1995, when the internet first entered the public domain it served 0.4 % of the world’s population. By 2015 over three billion or 46.5% of the world’s population were active internet users (Internet World Stats: Usage and population statistics, 2015). In the Western World internet usage figures well exceed the world average with 73.5% of Europeans and 87.9% of North Americans claiming to be active internet users. Statisticians predict that by 2020 ‘most of the world’s population’ will be internet users (Leu et al 2009: 265). Internet usage trends amongst children and adolescents have also revealed the ubiquitous nature of the internet in modern day society. It has been reported that in Ireland and North America 92% of adolescents use the internet on a daily basis (Pew Research Centre (PRC), 2015). Figures for internet usage under twelve also indicate the dominance of the internet in modern day society with US figures suggesting that 25% of 3 year olds go online daily, rising to about 50% by age 5 and nearly 70% by age 8 (Holloway, Green and Livingstone, 2013). These figures demonstrate the irrefutable popularity of the internet amongst a large cross section of modern day society.

The internet is essentially the ‘greatest repository of information in the history of civilization’ (Leu et al, 2009: 264). The unfettered access to information offered by the internet permits access to information and people at unprecedented speeds and across extensive distances (International Reading Association, 2009). The unprecedented access to information provided by the internet has altered all our lives. It has affected the way we access information, interact, communicate and enjoy leisure time (Tierney and Rogers, 2004:218). Hague and Payton (2010: 7) list just some examples of how the internet has become ‘embedded’ in our personal lives,

email allows instant communication between people across the world, online shopping and banking have become more prevalent and government services have become increasingly internet-based, online ...gaming feature prominently in many people's lives and... social networking sites allow people to collaborate by sharing and editing online content

Shah et al, (2001) suggest that experts in internet usage agree that the internet has transformed our personal lives. However, expert opinion on the nature of this change is somewhat divided. There is a great wealth of research that suggests that the internet can enhance personal well-being. However, there is also research to suggest that the internet can negatively impact on personal well-being. Shah et al (2001: 141) suggest that the internet negatively impacts on personal well-being because it 'weakens real-world ties, and reduces community involvement.' Others such as Anderson and Tracey (2001) suggest that the internet increases stress levels as internet access makes it virtually impossible for us to escape our working lives. While it is important to acknowledge the negative impact of the internet on one's personal well-being, the positive effects of the internet are numerous and must not be ignored. According to Leung and Lee (2005: 166) research has demonstrated that internet usage can promote 'self-sufficiency, psychological empowerment, lifelong learning, and rehabilitation.' Leung and Lee (2005: 166) claim that the internet fosters personal well-being by offering an additional social support to those who use it. For example, White et al (1999 cited in Leung and Lee, 2005) reported that a sample of elderly participants exhibited decreased loneliness levels and increased well-being scores when email and internet access was provided. Slegers, van Boxtel and Jolles (2008: 176) claim that the internet enriches personal well-being in five key ways. Firstly, the internet facilitates social interaction and communication. Secondly, the internet can enhance learning in the home. Thirdly, the internet offers its users a greater sense of autonomy by easing the 'providing access to information services and facilitation of routine tasks' (Slegers et al, 2008: 176). Fourthly, the internet has the potential to improve the health of users who have greater access to health related information and care-givers. Finally, the internet improves mental well-being by providing mental stimulation and challenge for its users (Slegers et al 2008: 176). As well as potentially enhancing personal well-being, internet usage also allows the user to live a fulfilling life.

Skilled internet users can have a more fulfilling life by accessing both the information resources and opportunities available online. Individuals who can use the internet effectively are able to enrich their lives by 'advocating for social justice, refinancing a home, selecting a university to attend, managing a medical question, purchasing books, or any one of the

hundreds of other tasks important to daily life'(Leu et al, 2013c: 1154). Bodies such as the International Reading Association (2009) and the National Council of Teachers of English (2008) claim that citizens who cannot navigate the internet successfully risk missing out on many of life's possibilities. The National Council of Teachers of English (2008) suggest that in order to be active and successful members of 21st century citizens must be able to navigate the internet effectively and efficiently. While knowing how to use the internet effectively is necessary for personal success, it also necessary for success within today's knowledge economy workforce (Schmar-Dobler 2003).

The internet has filtered into many aspects of modern day society. The internet has affected the way we access, consume and communicate information in today's society. The pervasive nature of the internet can be seen in World internet usage figures. World internet usage statistics clearly indicate that unprecedented growth in internet usage has been evident in the western World. The growth in internet usage has been particularly rapid and widespread amongst the youth of today. The popularity of the internet can be largely attributed to the unfettered access to information that it provides. Scholars such as Leu et al (2013c) and Schmar-Dobler (2003) suggest that the internet enriches the quality of the lives of its users. This is because citizens with internet access can avail of the 'information resources and opportunities' available online (Leu et al, 2013c: 1154). A review of the literature suggests that to progress in modern day society internet usage and access is of utmost importance.

The Internet and the Economy 2.1

According to OECD figures published in 2015 the primary sector contributes 1.6% of Gross Domestic Product (GDP) to the Irish economy while the tertiary sector contributes 74.3% and the industry sector including construction contributes 24.1% (OECD, 2015). These figures clearly indicate that In Ireland the majority of workers are employed within the tertiary sector. In 2015 figures published by the Nevin Economic Research Institute (NERI) suggest that the highest numbers of employees within the services sector are employed in the retail sector. Other areas within the services sector that demonstrated high employment rates include health and education. While the number of employees in the information and communication sector remains low in comparison to other service areas it is the services' area that has demonstrated the greatest growth since 2007 (NERI, 2015). The information and communication sector is largely dependent on electronic networks such as the internet which

allow companies to manage the ‘production, and distribution of goods and services... throughout the planet’ (Wellman and Haythornthwaite, 2002: 30).

For many the advent of the internet has ‘reshaped how we live and work’ (Hague and Payton, 2010:14). Some knowledge based work practices have undergone a fundamental transformation due to advances in technology. Advances in technology especially the internet have significantly altered the ‘management, production, and distribution of goods and services’ (Wellman and Haythornthwaite, 2002: 30). Large companies and organisations are re-structuring, abandoning traditional command and control structures in favour of horizontally organised workplaces (Leu et al, 2013c). A hallmark of horizontally organised workplaces is the wide distribution of authority and responsibility across the workforce (Baker et al, 2012). The internet supports this type of control structure by allowing managerial staff to co-ordinate decision making across different locations (Wellman and Haythornthwaite, 2002: 30). In the online age, companies can ‘leverage all of their intellectual capital, operate more productively, and become more competitive’ (Leu et al, 2013c: 1152). These fundamental changes in work place structure and practice have led to the emergence of a knowledge based economy (Wellman and Haythornthwaite, 2002: 30).

Today, many international economies are supported by a knowledge based economy and its input into other sectors (Powell and Snellman, 2004: 199). It is estimated that more than 50 per cent of GDP in the major OECD economies is now knowledge-based. Production and employment rates are greatest in knowledge based industries such as ‘computers, electronics and aerospace’ (OECD, 1996: 9). Other knowledge based sectors such as education, communications and information are also booming (Leu et al, 2013c). Knowledge economies are defined by a ‘greater reliance on intellectual capabilities than on physical inputs or natural resources’ (Powell and Snellman, 2004: 199). Knowledge based economies are ‘directly based on the production, distribution and use of knowledge and information’ (OECD, 1996: 9). Hirsch-Kreinsen et al (2005: 16) claim that today’s knowledge based economies are centred on ‘high-tech’ industries. Foss (2005:6) concurs proclaiming that ICT is the ‘main driver and primary characteristic of the knowledge economy.’ As such, knowledge based economies are characterised by their ‘growth in high-technology investments, high-technology industries, more highly-skilled labour and associated productivity gains.’ Knowledge based industries rely on knowledge being ‘codified and transmitted through

computer and communications networks.’ This process requires a highly skilled workforce (OECD, 1996: 7)

Knowledge based industries employ highly skilled workers who have the tacit knowledge of how to operate ICT systems and software but also the ability to process and communicate online information effectively (Powell and Snellman, 2004). This view is enforced by Leung (2010) who suggests that technological skills alone will not guarantee success in today’s workforce. Instead workers also need to develop the ability to communicate, evaluate and critique online information. Leu et al (2013c: 1151) claim that workers in knowledge based economies must be able to use the internet to

quickly identify important problems in their work, locate useful information related to the problems they identify, critically evaluate the information they find, synthesize multiple sources of information to determine a solution, quickly communicate the solution to others so everyone within an organization is informed, monitor and evaluate the results of their solutions and decisions and modify these as needed

In fact, Leu et al (2009: 40) suggest that employers seek ‘individuals who know how to read, write, and communicate on the Internet to solve problems.’ This is because the rate of internet use within the workplace is increasing at unprecedented rates. US figures reveal that in 2000 the use of the Internet at work increased by almost 60 percent among all employed adults twenty-five years and over (Leu et al, 2004:1576). More recent data has also revealed the dominance of the internet within the work place, with a 2013 survey conducted by Pew Research revealing that 94% of workers used the internet at work. The workers surveyed were employed in a variety of sectors such as technology, agriculture, health and education. This demonstrates that internet based skills are necessary for a wide variety of positions in modern day society (PEW, 2014). Theorists predict that the premium employers are placing on internet based skills will increase greatly over the coming years and decades. This predicted increase is likely to occur because ‘the availability of information resources and search technologies is expanding rapidly, increasing the importance of effective search strategies’ (Leu et al, 2004:1576). It is also the case the specific occupations related to internet usage have and are continuing to emerge. Some examples include website designer and e-commerce entrepreneur and blogging journalist. Members of the workforce who lack the necessary skills to navigate the internet successfully do not have the opportunity to pursue internet specific professions (Thompson, Teo and Simmers, 2014). With both production and employment expanding fastest in high-technology industries individuals who have these

internet based skills are much more likely to gain employment (NERI, 2015). In addition, individuals with these skills also have the potential to earn the highest wages in today's knowledge based economies. Hence, members of the workforce who acquire these skills are much more likely to enjoy 'success and fulfilment in their professional lives' (Leu et al, 2013:1153).

Technological advances have impacted greatly upon modern day work practices. The emergence of the internet encouraged some companies to restructure and become horizontally organised. Research has indicated the benefits of the horizontal work structure. According to Leu et al (2013c: 1152) companies who employ the horizontal structure 'operate more productively, and become more competitive' (Leu et al, 2013c: 1152). Today many but not all Western economies rely on a knowledge based economy. While other economies exist, the knowledge economy has become the lifeblood of many international economies. The knowledge economy is based on 'the production, distribution and use of knowledge and information' which has been greatly aided by the internet and other seminal ICTs (OECD, 1996: 9). In order to gain employment in knowledge based economies the youth of today need to develop a set of key IT skills including the ability to successfully read and navigate the internet.

The Internet and Educational Policy 2.2

With the emergence of knowledge economies and the associated need for a highly skilled workforce many countries started to 'develop public policy initiatives to ... infuse ICTs into their national curricula' (Leu et al, 2013c: 1572). According to Leu et al (2013c: 1572) a central theme underpinning these public policy initiatives, is the use of education to develop internet related skills. A review of policy in this area, suggests that while there is a 'common effort' to improve online skills 'each nation approaches the issue in its own fashion' (Leu, et al 2013c: 1582). That is, some nations have developed policy and revised curricula to include internet skills within discrete technology or computing subject areas, while others have included internet skills within literacy curricula.

Current American Digital Literacy policy is dictated largely by the Common Core State Standards (CCSS). The CCSS detail the development of higher order cognitive skills to prepare pupils for college learning and their subsequent career within a knowledge based

economy (Harrison et al, 2014: 18). Some of the key skills highlighted by the CCSS include using the internet to ‘gather, comprehend, evaluate, synthesize information’ (CCSS, 2010: 4). The standards suggest that these online skills should be taught within a literacy framework. According to the CCSS, pupils should be exposed to digital and online reading and writing representing a variety of genres, perspectives and media (Harrison et al, 2014: 162). The writing standards make numerous references to digital media but only one explicit mention of the Internet (Drew, 2012: 324). The writing standards explicitly state that students should be taught to use the internet ‘to produce and publish writing and to interact and collaborate with others’(CCSS, 2010: 4). Furthermore, the writing standards include a number of key strategies associated with online comprehension including ‘gathering relevant information from multiple print and digital sources, assessing the credibility and accuracy of each source, and integrating the information’ (Drew, 2012: 324). The Reading and Speaking and Listening standards also make reference to the integration and evaluation of content presented in different digital formats and media such as the internet. Drew (2012: 321) argues that teaching online skills through literacy will prepare American students for the new literacy demands of the 21st century.

In Canada, Curriculum content is mandated by provinces. Ontario has emerged as one of the most successful Canadian educational territories. According to Mourshed, Chijloke, and Barber (2010: 47) Ontario is among the ‘world’s highest-performing school systems.’ Ontario performance indicators consistently accomplish top-quartile mathematics scores and top-decile reading scores in PISA (Mourshed et al, 2010: 47). In 2008, the Canadian Ministry of Education recognised the need to expand their curricular definition of literacy to include print, screen-based, and electronic media (Wilson, 2008). Policy makers felt that in order to prepare Canadian pupils for the future job market they must be taught how to navigate a range of different media including websites and online texts (Johnson, 2015).

In 2008, all Canadian educational territories agreed to include media literacy as part of Language and English programs for grades one to twelve (Wilson, 2008). Media literacy, oral language, reading and writing are now the four key strands of the Ontario language curriculum. Media literacy ‘focuses on helping students develop the skills required to understand, create and critically interpret media texts’. Those texts include ‘...CD covers, clothing, billboards, television shows, magazines, newspapers, photographs, and websites’

(Ontario Language Curriculum, 2006: 14). According to Johnson (2015) the media literacy curriculum states that

Students must be able to differentiate between fact and opinion; evaluate the credibility of sources; recognize bias; be attuned to discriminatory portrayals of individuals and groups... critically interpret the messages they receive through the various media and to use these media to communicate their own ideas effectively.' More recent approaches, to online reading include Use, Understand & Create: A Digital Literacy Framework for Canadian Schools (K-8)

This framework was launched in 2015 by MediaSmarts, Canada's Centre for Digital and Media Literacy. The framework is based on six fundamental aspects of digital literacy, Finding and Verifying, Ethics and Empathy, Privacy and Security, Digital Health, Consumer Awareness and Community Engagement. Under Finding and Verifying, pupils will be taught how to locate information online and evaluate its reliability. Within the Ontario curriculum skills associated with online comprehension and the internet are framed within a literacy framework (Johnson, 2015).

In 2008, the Australian Curriculum, Assessment and Reporting Authority (ACARA) was established and charged with the responsibility of creating a national curriculum. One of the key aims of the new curriculum developed by ACARA (2014) was to ensure that Australia's youth develop the necessary ICT skills to partake in Australia's skilled economy. The roll out of the new curriculum is gradual and begun in 2012, with some subjects such as English and Maths being taught at different year levels. Full implementation of *Australian Curriculum K-10* will be completed in 2017. The Australian curriculum is a continuum based on three main elements, learning areas, general capabilities and cross-curriculum priorities (ACARA, 2014). The Australian Curriculum has recognised the importance of ICT skill development including it as one of the seven general capabilities and as a learning area in partnership with Design and Technology. The design and technology curriculum details how pupils should be taught to 'use computational thinking and information systems to define, design and implement digital solutions' (ACARA, 2014).

The Australian Curriculum has included the development of key internet reading skills within the English learning area. The English curriculum devised by ACARA includes several references to internet, digital, multimodal and multimedia texts. Whereas previous states based curricula stipulated that pupils must be exposed to a range of paper based texts such as 'Australian literature and other Australian texts', the national curriculum states that pupils must be exposed to 'newspapers, magazines and on television, film, radio, computer software

and the internet' (ACARA, 2014:41). As part of the English curriculum pupils are taught concepts of print and screen and how to identify elements of online texts including 'text, navigation, links, graphics and layout' (ACARA, 2014: 41) English Curriculum content also dictates that pupils should be taught complete research using print and internet sources. The curriculum also outlines how digital composition and e-literature should feature as part of English writing lessons including 'hypertext fiction, computer art installations, kinetic poetry and collaborative writing projects' (ACARA, 2014: 41). The Australian curriculum frames internet skills within a literacy framework.

In 2005 the British government launched the Harnessing Technology Strategy. This strategy aimed to use education as a means to develop 21st century skills needed to maintain global competitiveness. In 2009, the Independent Review of the Primary Curriculum suggested that the then National curriculum of England (1988) was too prescriptive and outdated and should be replaced with a new curriculum. The review also argued that the new curriculum should highlight 'literacy, numeracy and ICT capability as Essentials for Learning and Life' (Hague and Payton, 2010: 15). In 2014, the new primary and secondary national curriculum was rolled out in England, Wales and Northern Ireland. The curriculum is structured in four key stages, with twelve 'core' subjects and 'other foundation' subjects. Some of the core subjects include English, Maths and Science, Computing and Design and technology (Hague and Payton, 2010: 15).

Computing is a new subject that has been included in the revised 2014 curriculum. The Computing Curriculum is centred around three related aspects Computer Science (CS), Information Technology (IT) and Digital Literacy (DL) (Berry, 2013: 5). DL is the aspect of computing that focusses on developing key internet skills. DL aims to cultivate pupils who are competent and confident in using different ICTs including the internet (Berry, 2013: 5). Learning targets include the ability to use 'search technologies effectively, appreciate how results are selected and ranked, and be discerning in evaluating ... (internet) content' (Department for Education, 2013: 179). Evidently, within the new national curriculum framework, the subject of computing is the area of the curriculum that focusses on online skills. The English Curriculum does not include any reference to internet, digital, multimedia or multimodal text (Berry, 2013: 15). Within the National Curriculum, the internet and its associated skills are framed as a technology issue taught through the subjects of computing and design and technology.

The Irish primary school curriculum (1999: 29) acknowledges the important role of ‘technological skills’ in today’s society and knowledge based economies. The curriculum (1999:29) proposes that ICT including the internet should be used as a resource to ‘enhance learning’ within the curriculum. To this end, the curriculum (1999:29) suggests that ICT should be integrated into all curricular areas to enrich teaching and learning. The Department of Education and Skills recognised that while the curriculum offered a general approach on how to integrate ICT into different subject areas, it did not offer teachers sufficient detail to implement this approach. As a result, the NCCA were commissioned to devise a set of specific guidelines to outline how teachers could effectively integrate ICT across all curricular areas (NCCA, 2004: 1). In 2004 the NCCA published ‘Information and Communications Technology (ICT) in the Primary School Curriculum- Guidelines for Teachers.’ The guidelines outline a three pronged approach for effectively integrating ICT into the curriculum; Learning through ICT, Learning with ICT and Learning about ICT (NCCA, 2004: 1). The NCCA (2004: 37) guidelines also suggest three primary uses of the internet within the curriculum framework including using the internet as an information resource that can provide pupils with information on curricular content. A further use outlined includes communication, both national and global to support aims in different curricular areas. The final use outlined is using the internet as a publishing medium for pupil curricular work and portfolios (NCCA, 2004: 109). As part of the Learning about ICT approach, the guidelines suggest that pupils should be taught specific internet research skills such as how to effectively ‘manage, evaluate, and integrate the information that they find from a range of internet sources’ (NCCA, 2004: 109). The guidelines also state that pupils should learn about how to use search engines effectively and efficiently (NCCA, 2004: 110). In 2007, revisions simplified the guidelines but the foundations of the approach outlined in the original guidelines remained largely intact (NCCA, 2007).

More recent curricular publications that have highlighted the role of the internet within the Irish curriculum include ‘Literacy and Numeracy for Learning and Life: The National Strategy to Improve Literacy and Numeracy among Children and Young People 2011-2020’ and the ‘NCCA Primary Language Curriculum’ (2016). These two publications represent a departure from the integration of ICT across all curricular areas, to the inclusion of ICT in literacy strategy and curricula. The Literacy and Numeracy for Learning and Life (2011: 8) strategy outlined a new definition of literacy as the ‘capacity to read, understand and critically appreciate various forms of communication including spoken language, printed text,

broadcast media, and digital media.’ Throughout the strategy this revised definition and view of literacy is reiterated. The strategy claims that the Primary school (1999) curriculum does not offer sufficient pedagogical guidance on how to teach the skills associated with electronic communications and digital media such as the internet (2011: 51). It also suggests that primary school pupils should be assessed in their ability to read digital material (2011: 18). The NCCA Primary Language Curriculum (2016) follows a similar vein. The revised literacy curriculum is based on a definition of text that includes digital, electronic and multimodal texts and includes the study of the conventions of print and digital texts (2016: 107). The digital conventions outlined in the new Primary Language Curriculum include ‘scrolling, swiping left to right and top to bottom orientation of print’ all skills associated with the navigation of online texts (2016: 107). With the release of this Primary Language Curriculum, Irish educational policy suggests that the internet is a literacy issue.

A review of public policy initiatives reveals that many nations are putting provisions in place to ensure that their young populations are prepared for ‘workplaces in a globalized, information economy’ (Leu and Zawilinski, 2007: 4). On examination of the policy, it also becomes evident that nations are employing divergent approaches to the development of key internet skills. Countries such as Ireland, America, Canada and Australia have framed internet skills as a literacy issue. However, nations such as the United Kingdom have framed internet skills as a technology issue (Leu et al, 2013c:1154). This divergence in policy has lead researchers to question what is the most effective context through which to teach key internet skills?

Is the Internet a Literacy Issue? 2.3

With the emergence of a knowledge based economy educationalists began to question the most effective way of equipping students with the skills considered essential for their future roles in a ‘knowledge economy’ (Hague and Payton, 2010: 16). Some researchers suggested that the acquisition of internet based skills was strictly a technology issue. Theorists including Kuhlthau (1987), Rader (1991), Behrens (1994) and Doyle (1994) suggested that to use the internet and its associated technologies successfully, students must be taught a set of discrete technical skills (Glister, 1997). More recently, the Web 1.0 and Web 2.0 models proposed by Greenhow, Robelia, and Hughes (2009: 246) outline how skills associated with internet use

can be taught to pupils in Web 2.0 classrooms. In Web2.0 classrooms internet based skills are taught in discrete technology lessons (Leu et al, 2009: 265).

Many education theorists have criticised the framing of the internet as a technology issue. Leu et al (2009:266) suggest that teaching just the technological aspects of the internet overlooks the underlying social practices at play. The forms and functions of literacy have always and will continue to be ‘determined by the continuously changing social forces at work within any society and the technologies these forces often produce’ (Leu et al, 2013c: 1151). Today this cycle continues, social forces continue to shape the forms and functions of literacy. The social forces at work this present day include

global economic competition within economies based increasingly on the effective use of information and communication, the rapid appearance of the Internet in both our professional and personal lives and public policy initiatives by nations that integrate literacy and the Internet into instruction (Leu et al, 2013c: 1151)

These social forces and their associated internet technologies are defining what it means to be literate in society today.

Due to the social forces at work and the associated technologies they produce, the concept of literacy and what it means to be literate meant many different things, over the years and decades (Bawden, 2001: 3). Initial definitions of literacy described literacy as ‘the ability to use language in its written form’ (Bawden, 2001: 3). As time progressed definitions of literacy included not only the ability to decode print but also the ability to ‘read with meaning, and to understand’ (Gilster, 1997: 33). Definitions of the literacy construct were then extended to include the ability to interpret the social and cultural elements associated with text. McGarry (1993: 83) described this aspect of literacy as ‘a critical awareness of the cultural assumptions, the ethical norms and the aesthetic value of the printed word’. More recently, literacy definitions have been revised to include the skills associated with online reading. Leu et al, (2004: 1572) define literacy as

the skills, strategies, and dispositions necessary to successfully use and adapt to the rapidly changing information and communication technologies and contexts that continuously emerge in our world and influence all areas of our personal and professional lives.

This revised definition of literacy reflects the research community’s view of the internet as a context in which to read, write and communicate.

Many well revered international organisations within the literacy community have recognised that the advent of the internet has led to a re-envisioning of literacy and what it means to be literate in today's society. Organisations such as the International Literacy Association (ILA) (2001:2) have positioned the internet as a literacy issue. The ILA (2001:2) state that 'to become fully literate in today's world, students must become proficient in the new literacies of ICT' including the internet. The ILA (2001:2) contend that international policy makers 'have a responsibility to effectively integrate these technologies (the internet) into the literacy curriculum in order to prepare students for the literacy future they deserve.' Other organisations which have firmly placed the internet within the realm of literacy and literacy instruction include the National Council of Teachers of English (NCTE). The NCTE (2013: 1) issued a position statement on 21st century literacies outlining that today a literate person must be able to

build intentional cross-cultural connections and relationships with others so to pose and solve problems collaboratively and strengthen independent thought; design and share information for global communities to meet a variety of purposes; manage, analyse, and synthesize multiple streams of simultaneous information and create, critique, analyse, and evaluate multimedia texts.

These position statements published by leading associations within the literacy community clearly indicate that the internet is a literacy, not a technology issue.

The claim that the internet is a 'context in which to read' is supported by much statistical evidence (Leu, et al, 2009:266). In 2005 the 'one-billionth individual started reading online' (Leu et al, 2007: 2). In figures reported by the Kaiser Family Foundation (2010), it was reported that the majority of reading that children in America engage in is online reading. Similar findings were reported amongst European pupils, 85% of whom use the internet to engage in online reading and inquiry (Hasebrink et al, 2011). In fact, Leu et al (2007:2) claim that 'in the history of literacy, no other technology for reading, writing, and communication has been adopted by so many people, in so many places, in so short a time.' The rate of online reading strongly suggests that the acquisition of online skills should be taught through a literacy lens.

Theory and relevant research presented by the Literacy community strongly suggests that literacy is the context through which we should teach key internet skills. Leu et al (2009:266) claim that 'framing the Internet as a literacy issue, instead of a technology issue, is not a

trivial matter for education.’ Theorists claim that in order to ‘advance our understanding of the teaching and learning potentials of the Internet’ we must frame the internet as a literacy issue. Viewing the internet as a literacy issue will ‘permit researchers to integrate analyses of the online reading of information with online writing, media construction, and communication (Leu et al, 2009:266). Teaching key internet skills and strategies through a literacy lens allows for the integration of reading and writing in ‘meaningful ways.’ Spiro DeSchryver and Hagerman (2015: 121) claim that the integration of online reading and writing through collaborative inquiry based tasks ‘promotes the development of reading skills necessary to comprehend online content.’ Kuiper and Volman (2008: 245) contend that when pupils are involved in inquiry based reading and writing projects they are stimulated ‘into constructing meaningful knowledge and into developing an inquisitive attitude’ which allows them to consume online information in a more critical way. Results of studies including Barson, Frommer, and Schwartz, (1993), Meskill and Krassimira (2000) and Warschauer (1999) have all reported the beneficial effects of integrating the online writing and reading processes. Teaching internet associated skills through a literacy lens facilitates the effective integration of the online reading and writing processes.

Another significant implication of framing the internet as a literacy issue relates to the effective integration of technology within school settings. The integration of internet based skill targets in literacy curricula will ensure that teachers teach internet based skills as part of daily literacy instruction (Hamilton, 2007:19). It will also mean that students will not attend a separate technology class. This effectively results in the classroom teacher taking responsibility for teaching ‘online information use and effective communication’ (Leu et al, 2009:266). Furthermore, assessment of online skills will be assessed as part of the literacy curricula and not as a separate subject area (Leu et al, 2009:266). Studies including Demetriadis et al (2003) and Hodas (1993) have suggested that teachers are typically averse to integrating technological advancements into their classroom practice. The inclusion of internet based skills in literacy curricula will aid the integration of technology into the school settings as it will ease the resistance amongst teachers to technological innovations (Cuban, 2001). All these factors will facilitate the assimilation of technology into the everyday practice of primary school teachers. Hamilton (2007:19) claims that the integration of technology in literacy instruction ‘improves student achievement.’ In addition Hamilton (2007:19) reports that teaching literacy through a literacy lens leads students to develop to ‘complex thinking, creative problem solving and collaboration.’

Framing the internet as a technology issue is a flawed approach because it does not fully capture the social forces at play. These social forces and their associated internet technologies are defining what it means to be literate in society today. This view is shared by a number of international literacy bodies and associations including the International Literacy Association (ILA) and the National Council of Teachers of English (NCTE). This view is also reinforced by online reading figures with statistics provided by the Kaiser Family Foundation (2010) and Hasebrink et al (2011) suggesting that the majority of adolescents engage in online reading on a daily basis. The framing of the internet as a literacy issue has many important implications for the realm of education. From an educational perspective, it is essential that the internet is framed as a literacy issue because doing so ensures that pedagogical practice can integrate online reading and writing. Framing the internet as a literacy question allows researchers to investigate the application of a range of paper based reading approaches to the online environment such as the application of comprehension strategy instruction in an online environment.

New Literacies Theory 2.4

The conceptualisation of the internet as a literacy issue has ‘prompted individuals from many disciplines to begin a collaborative approach to theory building’ (Leu et al, 2009:266). The New Literacies theory emerged as a result of this collaborative approach. New literacies encompass ‘the new skills, strategies, dispositions, and social practices that are required by new technologies for information and communication’ (Leu et al, 2009: 266). New Literacies theory is based on the premise that the internet ‘is this generation’s defining technology for literacy and learning’ (Leu et al, 2013c: 1158). The New Literacies perspective proposes that literacy is multiple and multifaceted (Leu et al, 2004: 1156). The concept that modern day literacy is a multiple and not a singular construct was proposed by the New London group (Cope and Kalantzis, 2000). The scholars in attendance affirmed that the complex myriad of literacies introduced by the technology revolution could only be aptly described as multiple in nature. The New London group (Cope and Kalantzis, 2000: 32) defined ‘multiliteracies as a set of open-ended and flexible multiple literacies required to function in diverse contexts and communities.’ The New Literacies perspective shares this belief in the multiplicity of literacy. New Literacies theorists argue that New Literacies are multiple because new technologies can represent meaning through a variety of media. Theorists also argue that New

Literacies are multiple in nature because they require the manipulation of multiple tools and skills (Leu et al, 2004).

The new technologies featured as part of the New Literacy perspective include technologies such as ‘gaming software, video technologies, technologies that establish communities on the internet, search engines and webpages’ (Leu et al, 2004:1570). However, this is not an exhaustive list as new technologies continually appear. According to the New Literacies approach, with each technological change that occurs a new literacy emerges requiring new skills and new strategies for their effective use (Leu et al, 2008). These changes are called ‘Envisionments.’ Envisionments, associated with the emergence of new technologies lead to the constant creation of New Literacies. This effectively means, that New Literacies are deictic, a defining feature of the New Literacies perspective (Leu et al, 2004).

The deictic nature of New Literacies has raised issues for theory development. Theorists were concerned that the theory’s ability to evolve could not keep pace with continual technological changes. As a result, a dual New Literacies theory emerged. This dual theory describes New Literacies in terms of two levels; uppercase and lowercase (Leu et al, 2015: 2). Uppercase theories represent the ‘the broader, more inclusive concepts’ underpinning New Literacies theory’ (Leu et al, 2009:26). While lowercase theories ‘explore a specific area of new literacies and/or a new technology’ (Leu et al, 2015: 2). Lowercase theories also include a more ‘focused disciplinary base, such as the semiotics of multimodality in online media (e.g., Kress, 2003)’ (Leu, 2015: 2). Lowercase theories intend to capture the ‘specific types of changes’ that occur within a ‘deictic world.’ When ‘integrated into a broader New Literacies theory,’ lowercase theories provide a set of ‘guiding principles that are more stable over time’ (Leu et al, 2015: 2).

Another key aspect of the New Literacies approach is that of critical literacies. Leu et al (2004) claim that New Literacies demand critical thinking. The internet offers a forum for ‘people who have strong political, economic, religious, or ideological stances’ (Leu et al, 2013c: 1161). As a result, information presented online is often strongly biased towards a particular point of view. Online readers must therefore, ‘become more critical consumers of the information they encounter’ (Leu et al, 2013c: 1161). In addition, pupils who engage with New Literacies must use critical thinking to evaluate the authenticity of information published on the internet (Leu et al, 2004).

The uppercase New Literacies perspective suggests that ‘speed counts in important ways within the New Literacies’ (Leu et al, 2004: 1589). Speed becomes a more important feature of effective reading, when reading on the internet. Highly efficient readers will ‘skim webpages, link to other webpages, and generally sift through large amounts of information’ within a short time frame (Leu et al, 2004: 1597). This ability will allow them to consume the information presented in New Literacies in a much shorter time than slow rate readers. Due to the huge volume of information available online speed becomes an important feature of effective online reading (Coiro et al, 2008).

The New Literacies theory claims that New Literacies can be socially constructed. New social practices have emerged with the advent of New Literacies. This is because new technologies provide ‘new ways of constructing, sharing, and accessing meaningful content’ (Leu et al, 2013: 1162). The development of these new social practices is facilitated by the ‘collaborative, distributed, and participatory nature of ...digital spaces’ (Leu et al, 2013: 1162). The New Literacies perspective suggests that the construction of knowledge will become more and more collaborative through the sharing of knowledge in forums presented on new technologies (Leu et al, 2004).

According to Leu et al (2004: 1599) teachers of New Literacies should be ‘aware of emerging technologies for information and communication, capable of identifying the most important new literacies that each requires, and proficient in knowing how to support their development in the classroom.’ Their role in the development of New Literacies is considered more important than in a print learning environment, as they have to direct students in the correct use of complex, multimodal hypertexts. However, the uppercase New Literacies approach also suggests that the role of the teacher is significantly altered by the emergence of new technologies. Kellner (200: 251) supports this view suggesting that nowadays ‘students and youth are often more media savvy, knowledgeable, and immersed in media culture than their teachers, and thus can contribute to the educational process through sharing their ideas, perceptions, and insights.’ Teachers are no longer considered as the ‘source of all literacy knowledge.’ They are viewed as ‘orchestrators’ who facilitate the development of new literacies (Leu et al, 2004: 1599).

The uppercase New Literacies theory proposes that additional strategies and skills are necessary to guarantee the effective use of new technologies (Leu et al, 2013b). This outlook caused researchers within the New Literacies community to investigate and begin to establish the lowercase theories associated with new technologies such as the internet. New Literacies theorists argue that pupils are not adequately equipped to cope with the new challenges of comprehension inquiry and information seeking presented online (Sutherland-Smith, 2002). As a result the navigation of complex nuances embedded in online hypertexts requires online comprehension strategy instruction (Eagleton, 2001). Leu et al (2004) argue that without explicit comprehension strategy instruction on how to correctly navigate new technologies, pupils will not use new technologies to their full potential. When seeking to develop the lowercase theory of online comprehension researchers started by investigating the ‘cognitive processes involved in comprehending printed text’ (Coiro, 2007: 218).

New literacies encompass ‘the new skills, strategies, dispositions, and social practices that are required by new technologies for information and communication’ (Leu et al, 2009: 266). New Literacies theory suggests that envisionments or technological advancements are constantly occurring in modern day society. According to New Literacies theory readers must develop new skills and strategies in order to cope with the envisionments that occur. New Literacies theory also proposes that reading online demands critical thinking. Critical thinking will allow readers to discern the quality and authenticity of information presented online. New Literacies theory also proclaims that when reading online rate of reading is an important factor, as speedy readers are better enabled to skim and scan large amounts of information in an efficient way (Leu et al, 2004: 1597). A further key feature of the New Literacies perspective is the importance of communication and collaboration. New Literacies theorists argue that knowledge construction will become a collaborative process through the sharing and communication of information online (Leu et al, 2004). These features of New Literacies have changed the role of the teacher within the literacy classroom. Under New Literacies theory, the teacher becomes less of an information dispenser and more of a facilitator (Leu et al, 2013b). Finally, New Literacies is a dual theory including uppercase and lowercase theories. New Literacies uppercase theory captures the overarching features of the New Literacies approach while lowercase theories outline the skills and strategies associated with particular technological advancements. A key lowercase theory is that of online comprehension.

Comprehension 2.5

Comprehension is ‘arguably the most important’ element of effective reading instruction (Pearson, 2008: 3). There are ‘many definitions’ of reading comprehension (Paris and Hamilton, 2008: 32). Over time the ‘trajectory’ of comprehension definitions has altered and progressed. Initial definitions centred on thinking and reasoning processes with later definitions focussing on constructive and interactive processes (Paul and Yang, 2011: 34). Early definitions included Thorndike (1917: 329) who suggested that comprehension involves ‘selecting the right elements in the situation and putting them together in the right relations.’ Later definitions, moved on to include the constructive processes underpinning reading comprehension (Paris and Hamilton, 2008: 32). Constructivist theorists included Anderson and Pearson (1984) and Durkin (1993) described reading comprehension as the construction of meaning that occurs during the reading process. More recent definitions, define comprehension as an interaction, as the reader integrates knowledge acquired from the text with their prior knowledge of the topic at hand (Blachowicz and Ogle, 2001: 25). With the ever-evolving nature of reading comprehension definitions many have started to question if a definitive definition of reading comprehension exists (Paul and Yang, 2011: 34).

Paris and Hamilton (2008: 32) contend that there is ‘little consensus’ on a definitive definition of reading comprehension. Paris and Hamilton (2008: 32) argue that it is difficult to select one definitive definition because the boundaries of the concept of reading comprehension are ‘so poorly marked.’ Paris and Hamilton (2008: 32) claim that within literacy literature reading comprehension represents one aspect of a larger ‘communicative interaction’ and as such it becomes difficult to identify what constitutes reading comprehension and what does not. Paul and Yang (2011: 34) support this claim suggesting that reading comprehension is an ‘ill-defined, ill-structured, complex phenomenon.’ There is lack of consensus on a definitive definition of what constitutes reading comprehension. However, it is widely accepted that ‘reading comprehension is a cognitive process that integrates complex skills’ (Willis, 2008: 277). This view of comprehension is captured in the National Assessment of Educational Progress (NAEP) committee’s definition of reading comprehension. The NAEP Reading Framework Committee defines reading comprehension as ‘an active and complex process that involves understanding written text, developing and interpreting meaning, and using meaning as appropriate to type of text, purpose and situation’ (Driscoll et al, 2009: 52). Baker and Beall (2009: 378) claim that reading comprehension is such a complex cognitive process because it involves metacognition.

According to Flavell (1976) and Brown (1978) metacognition is ‘knowledge about cognition and regulation of cognition’ (cited in Baker and Beall, 2009: 375). In reading, metacognition refers to ‘knowledge of comprehension strategies, as well as the knowledge that good readers use the strategies consciously when they read’ (Collins-Block and Pressley, 2002: 292). In reading terms, metacognitive strategies are typically ‘conceptualized as comprehension monitoring’ (Dole, Nokes and Driets, 2009: 349). Wagoner (1983: 344) defined comprehension monitoring as ‘an executive function, essential for competent reading, which directs the reader’s cognitive processes as he/she strives to make sense of incoming information.’

There is a huge body of research to suggest that metacognition is an integral part of successful reading comprehension. A number of studies investigated if improving pupils’ metacognitive skills would improve their comprehension. Seminal studies in this regard include Paris, Cross and Lipson’s (1984) Informed Strategies for Learning intervention study and Palincsar and Brown’s (1984) reciprocal teaching study. Paris, Cross and Lipson’s (1984) study involved teaching third grade pupils how to use different strategies for improving comprehension monitoring. The results of the study indicated that the teaching of key strategies improved pupil comprehension monitoring skills and overall reading comprehension levels. In Palincsar and Brown’s (1984) reciprocal teaching study pupils were taught to use the strategies of predicting, clarifying, summarizing and questioning. The findings of this study revealed that the intervention was successful in developing comprehension monitoring and general reading comprehension performance. Other studies reported similar findings, for example Baker and Zimlin (1989) found that when a sample of seventh grade pupils were taught how to use ‘fix-up’ strategies their reading comprehension improved. Further evidence supporting the claim that metacognition is an essential element of effective comprehension, was presented by Haller, Child and Walberg (1988). Haller et al (1998) conducted a meta-analysis to establish the ‘effects of metacognitive instruction on reading comprehension.’ The meta-analysis revealed a mean effect size of 0.71 suggesting that empirical research in the area is largely supporting the claim that metacognitive instruction improves reading comprehension (Baker and Beall, 2009: 378). The ‘consistent finding.... over time’ is that ‘students who are more successful readers exhibit higher levels of metacognition knowledge about reading and are more skilled at evaluating and regulating their cognitive processes during reading’ (Baker and Beall, 2009: 373). The role of metacognition in reading comprehension was officially recognised when the National Reading Panel (2000) reported that metacognition and comprehension monitoring are

strategies shown through ‘reliable and replicable research to affect comprehension.’ The National Reading Panel (2000) advised that metacognition and comprehension monitoring should be fostered through comprehension strategy instruction (Baker and Beall, 2009: 373).

Duke et al (2011: 52) claim that a well-balanced comprehension instruction programme should ‘provide exposure to a volume and range of texts, provide motivating texts and contexts for reading, teach text structures, engage students in discussion, build vocabulary and language knowledge and teach strategies for comprehending.’ Pearson and Duke, (2002: 205) concur suggesting that a balanced comprehension instruction programme includes ‘both explicit instruction in specific comprehension strategies’ and a ‘supportive classroom context.’ Elements of the ‘supportive classroom context’ include ‘reading real texts for real reasons, reading the range of text genres, vocabulary development, accurate and automatic decoding of words and high-quality talk about text’ (Pearson and Duke, 2002: 207). This literature review will focus on Comprehension Strategy instruction.

Comprehension Strategy Instruction 2.6

Comprehension is a ‘complicated’ process that involves the assimilation of ‘letter-, word-, and above-the-word-level’ information (Block and Pressley, 2002: 292). Pearson and Duke (2002: 205) argue that because comprehension is such a complex process it requires a ‘balanced instructional approach.’ Duke et al (2011:52) claim that a well-balanced comprehension instruction programme should ‘provide exposure to a volume and range of texts, provide motivating texts and contexts for reading, teach text structures, engage students in discussion, build vocabulary and language knowledge and teach strategies for comprehending.’ Pearson and Duke (2002: 205) concur suggesting that a balanced comprehension instruction programme includes ‘both explicit instruction in specific comprehension strategies’ and a ‘supportive classroom context.’

According to Blachowicz and Ogle (2001: 31) comprehension is a process ‘demanding strategic approaches.’ Strategies differ from skills because skills are applied ‘without conscious thought,’ where as strategies are ‘reasoned plans’ applied consciously and adapted to different situations (Collins-Block and Duffy 2008: 20). Comprehension strategies are ‘specific, learned procedures that foster active, competent, self-regulated, and intentional reading (Trabasso and Bouchard, 2002: 177) Readers who use comprehension strategies are good at monitoring their comprehension and at addressing problems within their reading as they arise (Armbruster et al, 2001: 42). The overall aim of comprehension strategy instruction

is that readers will be able to apply the strategies independently (Collins-Block and Duffy, 2008: 20).

Before the 1970's explicit comprehension instruction did not feature as part of reading instruction. In 1979 Durkin reported that classrooms typically omitted or spent very little time (20mins out of 5000 mins observed) comprehension instruction from their reading instruction (Trabasso and Bouchard, 2002). Studies conducted by Markman (1977 cited in Trabasso and Bouchard, 2002) revealed that many of the readers observed failed to effectively self-monitor and identify text inconsistencies. This discovery ignited great research interest in the area of comprehension instruction. Initial comprehension strategy instruction was based on teaching pupils to use an individual strategy and targeted pupils who were considered poor readers. As more research became available, it later evolved into multiple strategy instruction directed at readers of all abilities (Trabasso and Bouchard, 2002). During the 1980's and 1990's research from controlled short term studies suggested that comprehension strategy instruction was effective. Since then research reviews and meta-analyses have revealed that empirical evidence largely supports the effectiveness of comprehension strategy instruction (Sinatra, Brown and Reynolds, 2002: 62). A large scale study conducted by Duffy et al (1987 cited in Block and Pressley, 2002) and Paris et al (1984, cited in Block and Pressley, 2002) demonstrated that when compared with a control group, pupils who had received comprehension strategy instruction exhibited greater metacognition.

In 1992 Pearson et al (1992 cited in Schmar-Dobler, 2003) compiled a 'comprehensive synopsis' of comprehension strategy research. The synopsis revealed that seven effective comprehension strategies consistently emerged from the research. These seven strategies dubbed the 'comprehension curriculum' include 'activate prior knowledge, monitor and repair comprehension, determine important ideas, draw inferences, ask questions and navigate' (Schmar-Dobler, 2003). Pearson et al (1992 cited in Schmar-Dobler, 2003) found that these strategies are consistently used by readers who demonstrate effective text comprehension. Collins-Block and Duffy (2008: 22) concur stating that with the addition of 'creating images' these strategies have been shown to be 'highly successful' in teaching readers to become effective at text comprehension. In a recent study conducted by Klinger and Vaughan (1999) strategy instruction based on the Collaborative Strategic Reading model, lead to improvements in participants demonstrating comprehension measured using standardized test scores. Hence, there is a comprehensive evidence base to support the use of comprehension strategy instruction using print texts.

A number of well-known comprehension theorists including Block and Pressley (2002: 292) and Pearson and Duke (2002: 205) have claimed that effective comprehension instruction must feature comprehension strategy instruction. The claim that comprehension strategy instruction is an effective way to promote reading comprehension is a robust claim supported by a large pool of empirical evidence including a range of controlled studies and meta-analyses. Today it is widely accepted that comprehension strategy instruction is an effective way to promote reading comprehension in the print environment (Armbruster et al, 2001: 42). However, what remains unknown is the effect of comprehension strategy instruction when applied to online texts. This study intends to investigate the impact of comprehension strategy instruction applied to online texts.

Comprehension Strategy Instruction Online 2.7

The success of comprehension strategy instruction using print texts caused researchers to investigate the application of comprehension strategy instruction in an online environment. Coiro and Dobler (2007) suggest that the most effective way to teach pupils the skills associated with online comprehension is through explicit strategy instruction. Byeong-Young (2013: 329) concur claiming that the explicit teaching of online comprehension strategies is the most effective way to ‘support students in the internet age’. There is much empirical evidence to support the use of online comprehension strategy instruction. Coiro et al (2014b: 47) reported that participants in their study who used online comprehension strategies demonstrated ‘more focused searches and relevant academic discussions while navigating multiple web sites; their inquiry products were of higher quality; and they demonstrated greater amounts of evidence-based reasoning.’ Coiro and Dobler (2007: 220) reported similar findings, stating that online readers who did not employ a specific set of online reading strategies exhibited ‘processing challenges associated with cognitive overload, disorientation, distraction, and frustration.’ Other issues that arise in the absence of online strategy use include the inability to effectively use information once located online and the tendency of users to drift aimlessly from one search question to another (Lyons et al, 1997 cited in Coiro and Dobler 2007). While research evidence clearly suggests that comprehension strategy instruction facilitates online comprehension it remains unclear which comprehension strategies best facilitate online comprehension.

Online Comprehension 2.8

According to Leu et al (2011: 6) ‘online reading comprehension is not isomorphic with offline reading comprehension.’ Leu et al’s (2008:354) claim that ‘online and offline reading comprehension are not the same’ is supported by a number of key research findings. Leu et al (2008:57) reported that results from their study revealed that ‘low performing offline readers are not necessarily low performing online readers.’ In the study, a 7th grade pupil with a specific reading disorder who recorded the lowest score on offline comprehension assessments, scored the highest score on online comprehension assessments. This finding indicates that offline and online comprehension are different. Similar findings were presented by Leu et al (2005) who found no significant correlation evident between online comprehension and the Connecticut Mastery Tests in Reading. Furthermore, Coiro (2007 cited in Leu et al, 2009: 267) found that prior knowledge, a key indicator of successful comprehension in print based reading, ‘may contribute less to online reading comprehension ... because readers often gather required prior knowledge online as part of the reading paths they follow.’ Research evidence clearly indicates that there are differences between print and online comprehension but what are these key differences?

Perhaps the most important difference between online and offline comprehension is purpose for reading. People read offline for many different reasons. However, reading online is ‘typically much more focused on reading to solve a problem or to answer a question’ (Leu et al, 2015: 3). Essentially ‘online reading comprehension is online research’ (Leu et al, 2008: 250). In a recent revision to New Literacies theory, the term online comprehension has been replaced with online comprehension and research reflecting the pivotal role of research in online comprehension (Leu et al, 2013).

Online reading to research is a ‘complex’ process that ‘begins with a question and takes place within a nearly limitless informational space where anyone may publish anything. ... (and) where readers regularly communicate with others about the problem they’re trying to understand’ (Leu et al, 2008:354). When online reading involves ‘inquiry and problem solving’ readers need to employ ‘additional strategies’. Online reading comprehension ‘requires research with additional technologies (e.g., search engines, text messaging, note-taking tools) and also requires additional social practices (e.g., using a search engine to locate information about the creator of a website to help determine the reliability of the information) (Leu et al, 2015: 3).

Online research and comprehension requires the successful navigation of ‘additional technologies’ (Leu et al, 2015: 3). This includes the navigation of hypertexts. The term hypertext refers to an ‘informational environment in which textual materials and ideas are linked to one another.... within hypertext systems’ (Burbules and Callister, 2000: 43). The presence of hypertexts online requires readers to partake in a type forward reasoning to predict the path of hyperlinks and to locate information. This is a skill unique to online research and comprehension. Another skill unique to online research and comprehension is known as ‘self-directed text construction’ (Coiro and Dobler, 2007:241). Readers can select the online text, the links they pursue and the information they assimilate creating a ‘unique informational trace’ (Leu et al, 2011: 8). Malloy and Gambrell (2006: 483) suggest that unique reader pathways form online because the Internet has a greater number of pages and variety of text than hard copy could provide.’ As a result ‘a reader’s pathway can be multi-linear and multi-directional’ this complicates the traditional comprehension process and requires readers to employ additional comprehension and research skills (Walsh, 2006: 30).

Successful online research and comprehension also ‘requires additional social practices.’ Leu (2011: 8) claims that ‘online reading comprehension is not simply an individual process but rather a collaborative and social practice’. Studies such as Kiili, Laurinen, and Marttunen, (2009) and Laurinen, Marttunen, and Leu, (2011), have reported that online comprehension performance improves when it is collaborative in nature. These studies reported that collaborative based online research and comprehension led to ‘deeper exploration of ideas and different perspectives’ (Leu, 2011: 8). Other studies which have produced results in support of the positive effects of collaborative online comprehension include Everett-Cacopardo (2011), Zawilinski (2011), and O’Byrne (2011). This collaborative aspect of online research and comprehension means that online comprehension ‘becomes tightly integrated with writing as we communicate with others to learn more about the questions we explore and as we communicate our own interpretations’ (Leu et al, 2013a: 222). Many of the contexts for online comprehension involve communication including ‘E-mail, text messages, blogs and wikis’ (Leu et al, 2013a: 222).

According to New Literacies theory, in order to successfully comprehend online readers must adopt the ‘additional social practices, skills, strategies, and dispositions’ associated with online research (Leu et al, 2013c:1159). However, there are instances online when readers are not engaged in research for example when reading a single web-page. A single webpage ‘represents reading a fixed and limited text, with little or no social interaction, no connection

to other texts, no searching for information, and little if any control by the reader about what to read'(Leu, 2011:6). This means that when reading a single webpage 'reading skills and strategies ... for off line reading comprehension are required' (Leu, 2011: 6). Hence, print based strategies are necessary for online comprehension when online reading 'occurs as isolated reading acts' (Leu et al, 2015: 2). Dwyer (2016: 384) concurs stating that 'successful online and offline reading share a number of key skills.' Those skills include 'rapid decoding and word recognition to aid reading fluency, and specific strategies like monitoring understanding' (Dwyer, 2016: 384). An effective online comprehension strategy instruction programme must feature both New Literacies online research and comprehension strategies and print comprehension strategies.

Investigation of online comprehension such as Leu et al 2008 (in Wepner et al, 2014:57), Leu et al (2015) and Coiro (2007, as cited in Leu et al, 2009: 267) have revealed that online and offline comprehension are different. New Literacies theorists suggest that the key difference between online and offline comprehension is based on purpose for reading. When online readers typically engage in a research process in which they seek information to answer a question or solve a problem (Leu et al, 2013c). This online research process requires readers to develop a number of unique skills and strategies such as the ability to engage in forward reasoning in the selection of hyperlinks and the ability to effectively engage in 'self-directed text construction' (Coiro and Dobler, 2007:241). Furthermore, online comprehension and research requires 'additional social practices' related to the emergence of new communication forums such as social networking sites, chat rooms and blogs (Leu et al, 2013c:1159). It is clear that online readers require additional skills and strategies to successfully comprehend when conducting online research. However, when reading online there are times when readers are not engaged in research for example when reading a single web-page. During these instances readers need to apply skills and strategies typically associated with print comprehension (Leu, 2011: 6). A review of the literature indicates that in order to successfully comprehend online readers must be enabled to apply both additional New Literacies strategies and print strategies. Hence, an effective online comprehension strategy instruction programme must feature both New Literacies online research and comprehension strategies and print comprehension strategies.

New Literacies Online Research and Comprehension Strategies 2.9

The New Literacies perspective on online comprehension is based on a ‘problem based inquiry involving the skills, strategies, dispositions, and social practices that take place as we use the Internet to conduct research, solve problems, and answer questions’ (Leu et al, 2014: 346). There is much empirical evidence to suggest that the application of the reading to identify important questions (RIQ), reading to locate information(RLI), reading to evaluate information critically(RCE), reading to synthesize information(RSI), and reading and writing to communicate information (RCI) strategies improve online comprehension (Leu, et al, 2011: 7).

The online information inquiry process always starts with a ‘question or an information problem to solve’ (Leu and Zawilinski, 2007). Leu, (2011 et al: 7) propose that ‘how a question is understood is a central aspect of online reading comprehension.’ This is because ‘reading initiated by a question differs in important ways from reading that does not’ Leu, (2011 et al: 7). Online readers who begin their search with a research question are less likely to veer off topic (Leu et al, 2011: 7). Readers who identify a search question tend to stay on topic because they are constantly checking if newfound information matches the purpose of their original online search question (Dobler, 2012: 21). A number of studies such as Kuiper, Volman, and Terwel, (2007), Kuiper and Volman, (2008), and Dwyer (2010) have suggested that effective online readers always start online comprehension tasks with a question. Kingsley and Tancock, (2013: 392) reported that ‘students who selfgenerate research questions in online environments have increased motivation and increased success in the searching process’ (Kingsley and Tancock, 2013: 392).

When reading online, pupils are often ‘overwhelmed by an abundance of information.’ Due to features such as links, readers can access ‘virtually unlimited’ information relating to their search topic instantly (Schmar-Dobler, 2003: 81). It is therefore essential that online readers develop the ability to useonline reading comprehension skills and strategies to locate relevant information (Leu et al, 2007:47). According to the International ICT Literacy Panel, (2002) the ability to locate information on the Internet is essential to online reading. Leu et al (2007: 47) suggest that the ability to efficiently locate information online requires four key skills; ‘knowing how to use a search engine to locate information; reading search engine results; reading a Web page to locate information that might be present there; and making an inference about where information is located by selecting a link at one site to find

information at another site.’ Essentially, online readers must be skilled in the ability to evaluate search results for the information most relevant to their search (Drew, 2012: 326). They then need to competently assess ‘all the features of a webpage’ to determine which feature will allow them to access the desired information most efficiently (Schmar-Dobler, 2003: 81). This effectively means that online readers should be competent at locating relevant information speedily (Kingsley and Tancock, 2013: 390).

Leu et al (2014: 205) suggest that locating information online is a key strategy underpinning successful online comprehension, stating ‘if you cannot locate information related to your problem, you cannot read online.’ There are a number of studies which support the claim that reading to locate information is an essential online comprehension strategy. Those studies include the ‘Teaching Internet Comprehension to Adolescents (TICA) Project’ (Reinking and Bradley, 2004). This study centred on using the Internet Reciprocal Teaching (IRT) model to teach pupils how to apply a number of new literacies online comprehension strategies including reading to locate information (Leu et al, 2008). Leu et al (2014: 205) suggest that locating information online is a key strategy underpinning successful online comprehension, stating ‘if you cannot locate information related to your problem, you cannot read online.’ Other studies which have reported results indicating the effectiveness of the locating information online comprehension strategy include Leu and Reinking (2010) and Kingsley (2011).

According to Leu et al (2011) a key strategy for ‘successful’ internet comprehension is the ability to ‘critically evaluate online information.’ This sentiment is reflected in the CCSS, which state that pupils should demonstrate the ability to ‘assess the credibility and accuracy’ of digital sources (CCSS, 2010:18). Kingsley and Tancock (2014: 394) argue that pupils need to critically evaluate online information because they ‘typically believe’ that material published online is credible and valid. However, online content is often biased to achieve ‘aesthetic, political, ideological and/or economic’ gain (Livingstone, 2004: 4). Leu et al (2011) suggest that critical evaluation of online material involves the ability to ‘read and evaluate the information’s level of accuracy, reliability, and bias.’ To determine the authenticity of online information readers must be taught strategies to evaluate the author’s credentials such as searching the author’s name in a search engine to establish their qualifications and background (Kingsley and Tancock, 2014: 394). Readers should also be

primed to recognize the ‘clues’ for determining legitimacy. Those clues can be taught by using bogus websites. Bogus websites appear to be true but are actually full of misinformation. When pupils are exposed to bogus websites they become aware of the hallmarks of illegitimate information (Dobler, 2012: 21). Livingstone (2004: 4) claims that pupils should be taught how to ‘critique’ online information to determine not only its accuracy but also its ‘objectivity.’ Kingsley and Tancock (2014: 394) concurs stating that online readers must be taught how to screen information for content bias. For example, readers can be shown how to use the web address as a ‘screening tool’ and how to look for ‘references linked to academic or legitimate organizations’ (Kingsley and Tancock, 2014: 394). Studies such as Judd, Farrow, and Tims (2006) and Coiro, Coscarelli, Maykel, and Forzani (2015) have indicated that the reading to critically evaluate information strategy enhances online research and comprehension.

Leu et al (2011: 7) suggest that to successfully research and comprehend online, readers must develop the ability to ‘synthesize information from multiple online sources.’ This is because, the internet presents ‘additional challenges to coordinate and synthesize vast amounts of information presented in multiple media formats, from a nearly unlimited and disparate set of sources’ (Leu et al, 2011: 7). Research such as Jenkins (2006) and Castek (2008) has clearly indicated that reading to synthesize information online is a ‘central component of online reading comprehension’ (Leu et al, 2011: 7). New Literacy theorists suggest that online readers require comprehension strategy instruction in the application of online synthesis. This is because online synthesis requires additional skills when compared to paper based synthesis. According to New Literacies theory, online readers engage in two types of synthesis. The first type of synthesis involves integrating ‘the meaning of the texts, as they do with offline texts, putting together an understanding of what they have read.’ The second, additional type of synthesis requires online readers to ‘actively construct the texts that they read through the choices they make about which sites to visit, which links to follow, whom to communicate with, and whose messages to read’ (Leu and Zawilinski, 2007: 48). This type of synthesis based on the self-construction of text, is particularly challenging as it requires readers to ‘navigate individual paths through a multitude of text constantly evaluating and summarizing along the way’. In order for online readers to comprehend effectively online they must be taught the additional skills associated with online synthesis.

The New Literacies model of online research and comprehension ‘integrates reading with writing.... in an online context that is typically socially constructed.’ This process is

described as communication (Leu et al, 2011: 7). According to Leu et al (2011: 7) ‘online reading, writing, and discussion are so closely connected that it is not possible to separate them.’ Leu et al (2011: 7) state that ‘online reading comprehension, by necessity, includes communication.’ This is because to fully communicate in online environments, readers must engage in an interactive process of posing and answering questions (Coiro, 2011). Therefore, online reading comprehension includes the ‘online reading and communication skills required in discussion, texting, blogs, wikis, video, shared writing spaces (such as Google Docs), and social networks such as Ning’ (Leu et al, 2011: 7). Studies such as Leu et al (2004), Lankshear and Knobel (2003) and Beach and Lundell (cited in Reinking et al, 1998) support the claim that communication is a vital aspect of online reading comprehension. The lowercase New Literacies theory of online comprehension and the many research studies conducted in this area clearly suggest that online comprehension strategy instruction requires the online research comprehension strategies of reading to define important questions, reading to locate online information, reading to critically evaluate online information, reading to synthesize online information and reading and writing to communicate online information.

Print strategies applied to the Online Environment 2.10

When considering how best to facilitate online comprehension of static, single web page texts theorists such as Coiro (2007) started by investigating the application of print strategies to online texts. It is important to note that studies in this area are currently still quite limited and as a result the transfer of all print comprehension strategies has not yet been investigated (Zhang and Duke, 2008: 131). Strategies investigated to date include; monitoring comprehension, synthesis, determining importance, questioning, inferring, and prediction.

Monitoring comprehension is a key strategy in successful print based comprehension. Studies such as Baker (2002) and Hartman (1995) have reported that ‘skilled readers of printed text regularly make connections and monitor their understanding of what they read within one text and across multiple texts’ (Coiro and Dobler, 2007: 241). A number of studies have investigated the role of monitoring comprehension in an online environment. In a study conducted by Coiro and Dobler (2007: 240) it was reported that online readers engage in comprehension monitoring behaviours typically used in a print environment such as ‘goal setting, predicting, monitoring, and evaluating.’ However, it was also reported that online readers engage in other monitoring behaviours specific to the online environment. These behaviours include the integration of ‘physical process of clicking the mouse, dragging scroll

bars, rolling over dynamic images, and navigating pop-up menus that intertwines with a cognitive process of planning, predicting, monitoring, and evaluating one's pathway through open Internet text spaces' (Coiro and Dobler, 2007: 242). Online comprehension monitoring also requires readers to regulate comprehension 'across much shorter and disparate units of Internet text than the continuous text passages typically included in printed text comprehension tasks' (Coiro and Dobler, 2007: 241). According to Coiro et al (2014b: 47) self-monitoring is necessary for online reading to ensure that readers 'stay focused on their purpose while exploring relevant online texts.' A number of studies suggest that the monitoring strategy is integral to successful online comprehension. Afflerbach and Cho (2008) conducted an examination of 46 think-aloud protocol studies. This examination suggested that monitoring comprehension emerged as a key strategy in successful online comprehension. Byeong-Young's (2013: 329) study revealed that 'monitoring and managing reading' is one of four key strategies essential for successful online comprehension. These findings are supported by Coiro et al (2014b: 48) who reported that readers who monitored their online comprehension through collaborative discussion demonstrated 'more focused searches and relevant academic discussions while navigating multiple web sites; their inquiry products were of higher quality; and they demonstrated greater amounts of evidence-based reasoning drawn from text.'

Research including Castek (2008) and Kingsley (2011) have found that synthesis is a pivotal strategy in online comprehension. Synthesis online involves assimilating information from a variety of sources including 'text, graphics, audio, tags, bookmarks, and hyperlinks' and establishing the relationships between the different pieces of information sourced (Kingsley and Tancock, 2014: 396). Synthesis online differs to print based synthesis because readers are required to connect ideas across 'multiple Internet texts' (Leu et al 2011: 7). Synthesis online also involves the assimilation of large volumes of information presented in different media formats from an almost infinite range of sources (Leu et al 2011: 7). Drew, (2012: 327) claims that synthesis online is more complex because it can also involve synthesising information from competing points of view.

A number of studies have analysed the application of the determining importance strategy to online texts. Schmar-Dobler (2003) qualitative study of strategies applied by five skilled fifth grade readers revealed that the determining importance is a strategy employed by successful online readers. In a similar qualitative study, conducted by Zhang and Duke (2008) it was reported that 12 skilled online readers used the determining importance strategy when reading

online. Zhang and Duke (2008: 146) described how readers typically applied the determining importance strategy by ‘scanning through the Google results page, evaluating the information provided, and then choosing the most relevant and appropriate link’ from the information presented online. Fidel et al, (1999) suggest that the determining importance is an important online comprehension strategy because it can help prevent cognitive overload. Cognitive load refers to the ‘level of mental energy required to process a given amount of information.’ Cognitive overload occurs in an online environment when ‘too much effort is involved in navigating and responding to the interactive elements of the online component’ (Lim, 2004: 17). When cognitive overload occurs the ‘mental resources available for comprehension ... may be reduced (Lim, 2004:17). Lim (2004: 17) suggests that using online comprehension strategies such as determining importance will prevent cognitive overload.

Studies such as Yopp (1988) have reported that teaching readers to self-question facilitates print text comprehension. Investigations such as Coiro and Dobler (2007) have suggested that the questioning strategy also promotes online comprehension. The type of questions typically used by effective online readers is self-monitoring questions. Schmar-Dobler (2003) suggest that online readers must use a ‘guiding question’ to avoid ‘getting lost or side-tracked.’ For example, Coiro (2005, cited in Coiro and Dobler, 2007: 34) reported that successful online readers self-monitored by generating questions such as ‘Does this information make sense? Where else can I look? Who created the Web site and why? Who *Is* the author? Who is linking to the site?’ Coiro and Dobler (2007: 235) reported that in their study effective online readers also used the questioning strategy to monitor their comprehension examples of some of the questions readers used include ‘What pertinent information stands out on this page? Should I skim or read more carefully? Does this make sense?’

Print based research has highlighted the inference strategy as a ‘central component of skilled reading .’ Inferring refers to the ‘ability to read between the lines while making connections not explicitly stated in the text’(Coiro and Dobler,2007: 219). Coiro and Dobler, (2007: 219) claim that comprehending online requires ‘similar and more complex dimensions of inferential reasoning than the comprehension of printed informational texts.’ Coiro (2005 cited in Coiro and Dobler, 2007: 30) concurs stating that online comprehension ‘demands higher levels of inferential reasoning.’ In a study conducted by Coiro and Dobler, (2007: 219) how pupils infer online was documented. The results indicated that some of the typical inferring skills associated with print texts were also applied to online texts. Those skills

included using literal matching skills, structural and contextual cues to make inferences. The study also revealed that when applied to online texts the inferring strategy also involves ‘high incidence of forward inferential reasoning’ and ‘multilayered reading processes across three-dimensional Internet spaces’ (Coiro and Dobler, 2007: 219). Leu and Zawlinski, (2007) suggested that a key feature of forward inferential reasoning online is the ability to make inferences about the potential paths of hyperlinks. Studies including Coiro and Dobler (2004), Henry (2006) Leu and Zawlinski, (2007) and Castek, (2008), have reported that readers employ the inferring strategy when reading online.

Readers who are effective at comprehension relate their prior knowledge to ‘ideas in text in order to understand what they are reading’ (Collins-Block and Paris, 2008: 159). Predicting is an effective way to activate a reader’s prior knowledge (Armbruster, et al, 2001: 42).

Predicting can involve asking children what they know about the text topic or this helps to activate the reader’s relevant schemata. In a review of fourteen studies investigating the relationship between prior knowledge and print comprehension all but one study suggested that activating prior knowledge improves comprehension (Collins-Block and Paris, 2008: 180). Other studies Chiesi Spilich and Voss (1979), Post, Greene and Voss (1988) have shown that if readers are familiar with the text topic they demonstrate improved print comprehension. Similar findings have been reported for the application of the prediction strategy in the online environment. Calisir and Gurel (2003 cited in Coiro, 2011: 359) found that text structure knowledge ‘played a significant role in comprehension of linear and hierarchical hypertext in an online environment.’ Bilal (2001 cited in Coiro, 2011: 359) also reported that knowledge of how to navigate hypertext structures facilitated online reading tasks. Kendeou and Broek, (2007: 1575) also reported findings which suggested that text structure instruction aids online comprehension. Coiro and Dobler’s (2007) study also revealed that prior topic knowledge plays a role in online comprehension.

Research into the application of print comprehension strategies to online texts indicates that print based comprehension strategies can enhance online comprehension. These findings suggest that print based comprehension strategies should feature as part of a successful online comprehension strategy instruction programme. Print based strategies reported to support online comprehension include; monitoring comprehension, synthesis, determining importance, questioning, inferring, and prediction.

Evidence for a Combined New Literacies and Print Online Comprehension Instruction Model 2.11

A number of qualitative findings such as Schmar-Dobler, (2003), Coiro and (2007), Afflerbach and Cho (2008), Zhang and Duke (2008) and Byeong-Young (2013), have suggested that the ‘skills and strategies required to comprehend printed text are intertwined with a set of new and more complex skills and strategies to read successfully for understanding on the Internet’ (Coiro, 2011: 353). Schmar-Dobler, (2003) reported that the skilled online readers investigated, applied a combination of traditional print strategies and new more sophisticated online strategies. Schmar-Dobler, (2003) found that readers demonstrated the use of determining important ideas, monitoring and repairing comprehension, activating prior knowledge, and making inferences, as well as skimming, scanning, searching, and navigating. Coiro and Dobler (2007: 215) also conducted a qualitative study of what strategies and skills were employed by successful online readers. The results of the study indicated that skilled online readers again used a combination of print and new literacies online strategies. Coiro and Dobler (2007: 215) discovered that when reading online readers used ‘prior knowledge sources, inferential reasoning strategies, and self-regulated reading processes.’ The results of another qualitative study conducted by Zhang and Duke (2008) revealed that when reading online for different purposes skilled readers utilised a combination of print strategies such as activating prior knowledge and online research strategies such as identifying research questions. Furthermore, Afflerbach and Cho (2008: 212) carried out an extensive analysis of 46 online think-aloud protocol studies which suggested that successful online readers use a combination of traditional print based strategies and novel online strategies. The strategies that emerged from the analysis were ‘identifying and learning text content, evaluating, monitoring... realizing and constructing potential texts to read... determining the most appropriate reading path, and managing a shifting problem space’ (Afflerbach and Cho, 2008: 212) In a more recent qualitative study, Byeong-Young (2013: 329) examined the strategies utilised by seven ‘accomplished’ online readers. The findings revealed that online comprehension is most successful when readers employed a combination of the print and online strategies ‘realizing and constructing potential texts, identifying and learning information, evaluating and sourcing texts, and monitoring and managing their reading’ (Byeong-Young, 2013: 329).

While there is substantial body of qualitative research to suggest that the application of both print and online comprehension strategies facilitates online comprehension, there are very few quantitative studies that have investigated this claim (Leu et al, 2015). Kuiper, Volman and Terwel (2008: 667) claim that quantitative research in this area is ‘scarce’ as most previous studies have been descriptive and small-scale and focussed on ‘students’ search processes.’ Of the quantitative studies that exist in this area, most have examined the impact of the application of just New Literacies strategies such as Leu et al (2008), Castek, (2008), Leu and Reinking (2010). Studies such as Zawilinski et al’s (2007) Teaching internet comprehension to adolescents (TICA) project, Henry’s (2006) SEARCH framework, Reinking and Bradley’s (2004) internet reciprocal teaching approach and Kingsley and Tancock’s (2014) Online Research and Comprehension Instruction model have investigated the effect of New Literacies online research and comprehension strategy instruction. Other quantitative studies in the area including Coiro and Dobler, (2007), Kymes (2005) and Coiro (2011) have investigated the potential of print strategy comprehension instruction in an online environment. However, there are very few quantitative studies that have investigated the potential of a combined New Literacies and print comprehension strategy instruction programme. Leu et al (2015: 2) claim that qualitative research including Coiro (2011) and Coiro and Dobler (2007) ‘show that there is a complex mixture of both offline and new online elements that take place during online reading.’ However, much will remain ‘unknown about how strategic readers negotiate meaning with a variety of texts on the Internet’ until further quantitative research investigates whether a combination of New Literacies and print comprehension strategies can promote online comprehension (Byeong-Young, 2013: 329).

Rationale for Research 2.12

According to Dalton and Proctor (2008: 297) the education community is ‘urgent need’ of ‘models of research and development’ that integrate our ‘knowledge of reading comprehension based on print technology...with our emerging knowledge of comprehension in New literacies spaces such as hypertexts and websites.’ Dalton and Proctor (2008: 297) argue that the research community needs to provide education practitioners with models of online comprehension ‘with a rapid research to practice timeline.’ Leu and Zawilinski (2007: 2) argue that if the education community is not provided with a viable and practical pedagogical framework for teaching online comprehension many students will be

‘unsupported in developing the new literacies of online reading comprehension in school.’ Leu et al (2004: 1170) claim that New Literacies research in the area of online comprehension should ‘focus’ on developing models that work in ‘real learning contexts.’ This mixed methods field study aims to highlight an effective model of online comprehension strategy instruction that can be applied to ‘real learning contexts’ especially the primary school setting (Leu et al, 2004: 1170).

According to Forzani and Leu (2012: 422) the majority of online comprehension research has focussed on ‘older populations and out-of-school settings.’ Studies such as Barron et al, (2011) and Marsh (2011) have investigated the effect of online comprehension strategy instruction with older subjects in non-school settings. As a result there is currently ‘little empirical data with which to inform new literacies learning in the primary grades’ (Forzani and Leu, 2012: 422). Leu and Zawlinski (2007: 14) concur claiming that further research must be conducted with ‘younger students to determine the contexts in which the learning of online reading comprehension strategies is optimized.’ Forzani and Leu, (2012: 422) state that it is ‘imperative’ to conduct further research into how young pupils comprehend online, ‘since the ability to read, write, and communicate online will profoundly impact all children’s futures’ (International Reading Association 2001 cited in Forzani and Leu, 2012: 421).

This research is of particular relevance within the Irish context given the dearth of empirical research in the area of online comprehension strategy instruction. There are few studies that have investigated online comprehension strategy instruction within an Irish context (Dwyer, 2010). The most notable studies conducted at Irish primary level was completed by Dwyer (2010) and Dwyer and Larson (2014). Dwyer (2010: 1) conducted a formative study which explored what teaching methodologies best support the online comprehension development of struggling readers. The study revealed that ‘new literacies were acquired through explicit instruction, adaptive scaffolding and peer to-peer collaboration’ Dwyer (2010: 1). The study did not examine specific print and new literacy comprehension strategy instruction, but rather examined the best pedagogical practice to support online comprehension. Dwyer and Larson (2014) also conducted a study with primary aged children. This study examined the supports within e readers for developing vocabulary knowledge. This study will extend the currently limited pool of research on online comprehension and research strategy instruction within the Irish context.

The relevance of this study is particularly pertinent given the recent launch of the ‘The Digital Strategy for Schools (2015-2020).’ This strategy ‘provides a rationale and a Government action plan for integrating ICT into teaching, learning and assessment practices in (Irish) schools over the next five years’ (2015: 5). The strategy aims to use the learning potential of ICT to ensure that ‘Ireland’s young people become engaged thinkers, active learners, knowledge constructors and global citizens to participate fully in society and the economy’ (2015: 5). The strategy recommends that in order for students to become ‘global citizens’ they must develop key digital literacy skills ‘such as computational thinking, logic, critical thinking and strategic thinking to solve problems’ (2015: 22). Many of these digital literacy skills fall under the umbrella of online comprehension and research. In line with the recommendations of ‘The Digital Strategy for Schools (2015-2020), this study aims to offer teacher guidance on effective pedagogical practice in the area of online comprehension strategy instruction.

In 2016 the ‘Primary Language Curriculum’ for junior infants to second class (2016) was released. This new curriculum included important revisions to the 1999 literacy curriculum such as acknowledging the role of digital texts and technology in literacy education. However, the curriculum failed to specifically include reference to internet or online texts and made no explicit mention of online comprehension. This is despite recommendations from a specially commissioned curriculum advice paper which stated ‘given the prevalence of digital media, including the internet, in our daily lives it is important to consider a new literacies framework’ in the new curriculum (Kennedy et al, 2012:40). This recommendation particularly pertained to the definition of text to be included in the new curriculum (Kennedy et al, 2012:40). With the imminent release of the Primary Language Curriculum for middle and senior classes this study intends to highlight a viable framework for teaching online comprehension and research strategies applicable within the Irish Primary school context.

This study hopes to address a number of key limitations associated with current research in the area of online comprehension. These limitations include a lack of practical pedagogical frameworks for teaching online comprehension skills that can be applied in real classroom settings. Furthermore, this study aims to add to the currently limited pool of research on online comprehension instruction with primary age pupils and with pupils within the Irish education system. The content of this study is very relevant given the current Irish education

climate. With the recent release of ‘The Digital Strategy for Schools (2015-2020)’ and the ‘Primary Language Curriculum’ (2016) the importance of pedagogy to develop key digital literacy skills has been brought to the fore. This study intends to highlight combined online comprehension strategy instruction as a viable way to improve the key digital literacy skill of online comprehension.

Conclusion 2.13

An analysis of the research to date proposes that an effective online comprehension strategy instruction program should feature New Literacies online comprehension strategy instruction and print comprehension strategy instruction. The research suggests that pupils should be taught New Literacies online comprehension strategies to facilitate online comprehension during research tasks. An evaluation of the research also indicates that ‘static’ reading on the internet such as reading a single web-page requires the application of print comprehension strategies.

A review of the research also revealed that a very limited pool of studies have investigated the potential of implementing a combined New Literacies and Print comprehension strategy instruction. Of the few that have examined the potential of a combined comprehension strategy instruction program, most have been qualitative in nature. Quantitative research is needed to establish if a combined New Literacies and print comprehension strategy instruction programme is an effective pedagogical approach for improving online comprehension. Examination of the research suggests that there is an ‘urgent need’ for the development of practical online comprehension strategy instruction programs in particular at primary school level Dalton and Proctor (2008: 297). This study intends to address this need by highlighting an effective online comprehension strategy instruction model suitable for primary aged pupils. An evaluation of the research suggests that within the Irish context there is an acute lack of studies investigating effective online comprehension instruction. This coupled with the recent release of the ‘The Digital Strategy for Schools (2015-2020)’ and the imminent release of the senior Primary Languages curriculum makes the content and results of this study both relevant and timely.

Evidence Based Framework Underpinning Online Comprehension Strategy

Intervention 2.14

In recent years, studies investigating the factors that best facilitate online comprehension strategy instruction have started to emerge. Castek (2008) conducted a study which revealed a

number of contributing factors to successful online comprehension development. Those factors include initial teacher modelling and scaffolding followed by extensive independent and collaborative practice of new strategies, authentic learning situations and explicit comprehension strategy instruction (Castek, 2008).

‘The Gradual Release of Responsibility Model,’ (Pearson and Gallagher, 1983) outlines the process by which students gradually assume a greater degree of responsibility for a particular aspect of learning. The model is based on the gradual transfer of responsibility from teacher to student over five stages. Those stages include explicit teacher instruction outlining how and when the strategy should be used. This stage is followed by teacher and possibly student modelling of the strategy being used. The next stage involves collaborative use of the strategy, followed by guided or scaffolded use of the strategy. At the final stage the student assumes all responsibility for strategy use and engages in independent strategy practice (Pearson and Gallagher, 1983). Allington and McGill-Franzen (in Israel and Duffy, 2014: 504) suggest that after the final stage of the model students ‘develop an internalized self-regulation of comprehension processes’.

Recent studies have investigated the use of ‘The Gradual Release of Responsibility Model,’ in online comprehension strategy instruction. Northrop and Kileen (2013) reported that ‘The Gradual Release of Responsibility Model,’ was an effective framework to teach early literacy and comprehension skills using iPads. In a study conducted by Kingsley and Tancock (2014) an online comprehension inquiry programme with fifth grade pupils was implemented. The programme was based on the Internet Reciprocal Teaching model (Leu, 2008) which includes stages from ‘The Gradual Release of Responsibility Model.’ The results indicated that the programme augmented pupil online comprehension skills. In a more recent study Coiro et al (2014a) reported that structured tasks that scaffold the ability to question, navigate, and negotiate the meaning of online text improve online comprehension.

A think-aloud is when the ‘teacher pauses while reading to verbally model the thought processes of a skilled reader as he or she interacts with a text’ (Coiro, 2011: 108). The think-aloud technique facilitates reading comprehension development because it shows pupils that ‘reading is a meaning-making process, involves the use of strategy, and is a skill that can be developed.’ During a think-aloud the teacher demonstrates and explains not only ‘what she or he is doing but also why, for what purpose, and how understanding of the information is

gained and assimilated.’ In this way pupils are exposed to the thinking strategies or the “secrets” of good searchers and good online readers (Kymes, 2005: 496). Think-alouds can also be used by teachers to draw pupil attention to often ‘overlooked or hidden comprehension strategies that are useful in particular reading situations’ (Coiro, 2011: 108). In a review of print-based think-aloud studies conducted by Pressley and Afflerbach (2005, as cited in Kymes, 2005: 493) reported that think-alouds foster the development of ‘reader’s goals; text processing; affective response; and controllable, conscious comprehension.’

Studies investigating the effect of think-alouds on online comprehension are not as numerous as print-based studies. However, studies to date have reported positive effects. Studies conducted by Brandt (2000, as cited in Kymes, 2005), Nielsen (1997, as cited in Kymes, 2005) and Shapiro (1994, as cited in Kymes, 2005) suggest that think-aloud is an effective way to explain online comprehension strategy use. More recently (Coiro, 2011: 107) reported that the use of teacher think-alouds to model and demonstrate online comprehension strategy use improved pupil ability to ‘actively consider additional strategies for effectively comprehending and using the range of informational texts they encounter on the Internet.’

In print-based comprehension research, the use of collaboration has been widely used in comprehension strategy instruction. Models such as Reciprocal Teaching (Brown and Palinscar, 1989), Transactional Strategies Instruction (Pressley et al, 1992) and Collaborative Strategic Reading (Klinger and Vaughan, 1999), have all used collaboration as a means to develop print comprehension strategies. The use of collaboration in print strategy instruction is widely supported by research in this area. For example, in a review of ten print-based comprehension studies Trabasso and Bouchard (2002:185) reported that collaborative learning enhanced comprehension strategy use among pupils in grades three to six. There is a growing pool of research which suggests that collaboration is a central to developing online and multimodal comprehension. Leu et al (2013c:1164) suggest that online comprehension ‘appears to be enhanced when it takes place collaboratively.’ Leu et al (2011: 14) argue that collaboration should feature as part of ‘instructional models developed for teaching the new literacies of online reading comprehension.’ A number of studies have reported that collaboration fosters online comprehension development. In a comparative study of individual and online reading Kiili et al (2011) reported that collaborative reading context offered additional opportunities for deeper exploration of ideas and different perspectives. Numerous other studies have reported the positive effect of collaboration on online comprehension including Everett-Cacopardo (2011), Zawilinski (2011), and O’Byrne (2011).

Coiro (2002: 462) suggests that authentic practice situations can facilitate the development of online comprehension. Coiro et al (2014: 45) support this view suggesting that authentic practice situations ‘provides for linking to sources and images, increases students’ interest, and meets their desire to make a difference.’ Boling et al (2008: 505) claim that authentic practice situations increase motivation, engagement and performance in online comprehension tasks. Coiro (2011: 109) claims that the use of authentic practice situations teaches pupils how to ‘flexibly apply’ online comprehension strategies in new settings. Studies such as Castek (2008) and Leu et al (2008) have reported that the use of authentic practice situations enhances online comprehension. Castek (2008: 109) found that when reading online participants were more likely to transfer ‘what they learn from strategy instruction to new informational texts when it is embedded within inquiry activities with content-specific goals.’ Coiro, (2011: 109) claims that the most successful authentic practice situations are ‘content-related information problems, or online information challenges, designed both to develop conceptual knowledge and elicit important online reading comprehension skills.’

The framework outlined above will be used to teach pupils how to apply a combination of Print and New Literacies comprehension strategies to online texts. ‘The Gradual Release of Responsibility model,’ (Pearson and Gallagher, 1983) will be used by the teachers to scaffold pupils in their use of new comprehension strategies. While, the ‘Think-Aloud’ approach will be used to model correct strategy use. Also as part of the comprehension strategy intervention, pupils will work collaboratively and engage in authentic practice situations to develop their strategy use.

Chapter Three

Methodology

Introduction 3.0

In this chapter the researcher will present the rationale for chosen research method. The researcher will outline the embedded mixed methods design of the study and will explain how this design offered the greatest insight into the research questions. The sampling procedure utilized to recruit participants will then be detailed. The researcher will describe the setting of the study including an outline of key demographics. Then the demographics relating to the study participants will be presented. The researcher will then proceed to outline the instructional programme used to deliver Comprehension Strategy Instruction in the treatment conditions. This will be followed by a description of data collection tools and an analysis of the reliability and validity of these tools. The researcher will then outline quantitative and qualitative data analysis techniques. Finally, the researcher will describe measures put in place to ensure this study adhered to MIREC ethical guidelines.

Overview of Research Methodology 3.1

- This study was based on an embedded mixed methods design. In this study, qualitative data was embedded within a quasi-field experimental design. The researcher adopted quantitative methods to test the hypothesis that a combined New Literacies and Print Comprehension Strategy Instruction intervention positively influences online comprehension levels. The researcher used qualitative data produced by Focus Group sessions and Reflective Logs to explore the participants' application of individual comprehension strategies in an online environment.
- In this study for the purposes of quantitative research, the researcher applied a random stratified sampling technique. For the purposes of qualitative research, the researcher applied a purposeful sampling technique. Participants were recruited from the selected school after the researcher had received permission from the principal to carry out the study. This recruitment process began with the distribution of parent information sheets detailing the research process and the aims of the research (*See Appendix B*). Following this, interested parties received parental consent forms (*See Appendix C*) to allow their child or children to participate in the study.

- This study was conducted in a large, mixed, urban primary school. The primary school is located in North county Dublin approximately 36 kilometres outside of Dublin city. One hundred and sixty Irish primary school pupils participated in the quasi-field experiment ($n = 160$). 84 female participants ($n = 84$) and 76 male participants ($n = 76$) partook in this study. Participants were ranging in age from seven to ten. 15 participants participated in focus group sessions with 9 females and 9 males aged between seven and eleven. 30 participants aged from 9 to 10 completed reflective logs. Six focus groups were conducted. Two focus groups were drawn from each experimental condition. The focus groups had three participants in each group representing one participant from each class level (first, second, third class).
- The researcher designed and developed the instructional programmes that were taught in the experimental conditions of this study. The between group independent variable was form of comprehension strategy instruction and consisted of four conditions: Condition 1 was a control condition, participants in this condition did not engage in Comprehension Strategy Instruction. In Condition 2 participants received Print based Comprehension strategy instruction. In Condition 3 participants received New Literacies Comprehension strategy instruction. Finally, in Condition 4 participants received Combined Print and New Literacies Comprehension strategy instruction. The dependent variable was Online Comprehension levels which were measured using the Online Research and Comprehension Assessment (ORCA) Primary.
- Quantitative data was collected using the ORCA Primary and ‘Internet Usage and Ability Questionnaire’. An adapted version of the Online Research and Comprehension Assessment (ORCA) Elementary (Castek, 2008), the ORCA Primary was used to measure the participants’ online research and comprehension levels in both the experimental and control conditions. An internet usage and ability questionnaire was administered to all participants prior to and post intervention. The internet usage questionnaire has been adapted from Castek’s (2008) Internet use survey and Kingsley’s (2011) ‘Internet Usage and Ability Questionnaire’. The ‘Internet Usage and Ability Questionnaire’ was used to collect data relating to participants’ internet usage and their self-reported internet skills ability.

- Qualitative data was collected using focus group sessions and reflective log entries. In this study the researcher collected Focus Group data after the intervention phase and collected Reflective Log data throughout the intervention phase. Three focus groups were conducted post intervention with one focus group representing each treatment condition. Participants were recruited for focus groups using purposive sampling methods. Each focus group comprised of five participants of varying age. Participants aged between 9 and 10 completed reflective logs at the end of each instructional session. The reflective log invited participants to share their thoughts, feelings and opinions on their learning experiences across the three treatment conditions.
- Preliminary quantitative data analysis started with the researcher running a priori power analysis in order to assess the required sample size to reliably detect the expected effect size. A standard multiple regression was then conducted to ascertain what contribution the extraneous variables of Prior Topic knowledge and Internet ability made to pre-test ORCA primary revised scores. Primary quantitative analysis involved an initial examination of mean ORCA Primary scores. This was followed by statistical analysis related to the research questions. A Wilcoxon Signed rank test was conducted to determine if there was a significant difference in online comprehension levels from Time 1 to Time 2 in the Combined Comprehension Strategy Instruction Condition. To further investigate the research questions Kruskal-Wallis test comparing the Post intervention ORCA Primary scores between the four conditions were conducted. The researcher then analysed ORCA primary and internet skill scores across age and gender.
- Qualitative results stemmed from Thematic Analysis of focus group and reflective log data. This thematic analysis identified one main theme; The application and uses of individual comprehension strategies in online comprehension and research. Within this theme three subthemes were identified; strategies used for online comprehension research purposes; strategies used for online comprehension of static texts and strategies that were ineffective for either online research comprehension or online comprehension of static texts.

Rationale for Chosen Research Method 3.2

The mixed methods research paradigm has ‘grown out of the work of others as well as the historical and philosophical discussions of the last several decades’ (Creswell and Clark, 2011: 22). Its early conception emerged from novel research methods employed in studies such as Cambell and Fiske (1959), Sieber (1973), Denzin (1978), Jick (1979), Cook and Reichardt (1979). Following on from this ‘formative period’ the mixed methods research paradigm debate ensued. This debate centred on the legitimacy of combining philosophical assumptions underlying quantitative and qualitative research methods (Creswell and Clark, 2011: 25). While the paradigm debate continues amongst some scholars, pragmatism has been put forward as the ‘best philosophical foundation for mixed methods research’ (Creswell and Clark, 2011: 26). During and indeed after the paradigm debate period, researchers such as Bryman (1988), Tashakkori and Teddlie (1998, 2003) and Bamberger (2000) started to outline set procedures for ‘data collection, data analysis, research designs, and the purposes for conducting a mixed methods study’ (Creswell and Clark, 2011: 26). The establishment of set procedures paved the way for researchers from ‘many disciplines and many countries’ to adopt a mixed methods research approach (Creswell and Clark, 2011: 27). Mixed Methods research has ‘experienced a tremendous increase in popularity in the social, behavioural and associated sciences in recent years’ (Bergman, 2008:1). Between 1995 and 2005 more than sixty mixed methods articles were published (Clark, 2005). This figure continues to rise with Ivankova and Kawamura (2010) reporting 325 mixed methods research studies in health and medicine and 146 mixed methods studies in education. The popularity of mixed methods research it not only evident within journals articles but also in ‘a mushrooming of conferences and workshops’ based on mixed methods (Bergman, 2008:1). As a result of author advocacy for mixed methods and prolific research completed in the area, mixed methods research has been recognised as the ‘third research paradigm’ (Johnson and Onwuegbuzie, 2004: 14).

Since its inception definitions of mixed methods research and what it entails have evolved and diversified. Original definitions such as Greene, Caracelli and Graham (1989) captured the mixing of two research methods at data collection level. Later definitions including Johnson et al (1997:123, as cited in Greene, 2007) extended definitions of mixed methods to include a combined interpretation of quantitative and qualitative data. More recent definitions, have acknowledged that mixed methods research reflects ‘multiple ways of making sense of the social world’ (Greene, 2007: 20).

For the purposes of this research, mixed methods research will be defined according to ‘a definition of core characteristics of mixed methods research’ outlined by Creswell and Clark (2011: 5). These core characteristics reflect the diverse viewpoints and key assumptions informing the mixed methods research model.

(Mixed Methods) Collects and analyses qualitative and quantitative data, mixes the two forms of qualitative and quantitative data concurrently by combining them, gives priority to one or to both forms of data, uses these procedures in a single study or in multiple phases of a program of study, frames these procedures within philosophical world views or theoretical lens; and combines the procedures into specific research designs that direct the plan for conducting the study (Creswell and Clark, 2011: 5)

After careful consideration of the research questions, the researcher selected a mixed methods embedded design. Efron and Ravid (2013) describes the embedded mixed methods design as an approach in which qualitative and quantitative data are collected but one type of data is embedded within the dominant data type. In this study, qualitative data was embedded within a quasi-field experimental design. Creswell and Clark (2011: 92) suggest that the embedding of qualitative data within an quasi-experimental design is the ‘most common type of embedded design found in the literature.’ In this type of embedded design ‘the qualitative data can support statistical results by addressing questions that are unanswerable using experimental or correlational research’ (Ary et al, 2013: 595). The researcher felt that this design offered the greatest insight into the research questions. The researcher adopted quantitative methods to test the hypothesis that a combined New Literacies and Print Comprehension Strategy Instruction intervention positively influences online comprehension levels. The researcher used qualitative data produced by Focus Group sessions and Reflective Logs to explore the participants’ application of individual comprehension strategies in an online environment.

A mixed methods approach was applied to address some of the key limitations inherent in both quantitative and qualitative design. According to Cohen et al (2013) mixed methods research can address many of the limitations inherent in qualitative and quantitative research. Creswell and Clark, (2011: 12) suggest that the fundamental limitation of quantitative research is its failure to attend to the ‘context or setting in which people talk.’ Quantitative research does not offer any insight into participant views and experiences (Rumsey and Harcourt, 2014). This limitation is addressed in this mixed methods study with the inclusion of qualitative focus group data. Some of the significant limitations associated with qualitative methods are also addressed in this study by employing quantitative research methods. Houser (2014: 79) asserts that the flaws associated with qualitative data include ‘limitations in

generalizing the results to the larger population, potential for bias in interpreting data and lack of consistency in methods of data collect.’ The researcher addressed these key limitations by applying quantitative data collection and analysis techniques.

Aliaga and Gunderson (2000, as cited in Muijs, 2004: 1) state that the purpose of quantitative research is ‘explaining phenomena by collecting numerical data that are analysed using mathematically based methods (in particular statistics)’ Quantitative research methods are ‘taken largely from the natural sciences (e.g. biology, physics, etc.), which are then transposed to social research settings like education’ (Muijs: 2004 4). The scientific method utilised in quantitative research allows the researcher to ‘maximize objectivity, replicability, and generalisability of findings’ (Muijs 2004: 1). Quantitative studies typically feature the ‘use of instruments such as tests or surveys to collect data, and reliance on probability theory to test statistical hypotheses that correspond to research questions of interest’(Conrad and Serlin, 2011: 149). A key assumption underpinning quantitative research is the ‘use of hypothesis testing to make deductive inferences about characteristics of a population’ (Conrad and Serlin, 2011: 150). In this study the researcher wished to apply quantitative methods to test hypotheses. Muijs (2004: 8) suggests that quantitative methods are ‘especially suited to the testing of hypotheses.’ This is because quantitative methods allow the researcher to ‘use statistical techniques to decide whether or not to reject or provisionally accept the hypothesis’ (Muijs 2004: 8).

In this study the researcher conducted a quasi-field experiment to test the hypothesis that a combined New Literacies and Print Comprehension Strategy Instruction intervention positively influences online comprehension levels and to investigate if a combined Comprehension Strategy Instruction programme is more effective at improving online comprehension levels than a Print or New Literacies Comprehension Strategy Instruction programme. According to Cohen, Manion and Morrison (2013:322) in educational research ‘it is simply not possible for investigators to undertake true experiments.’ This is because educational research typically takes place ‘outside the laboratory’ in an education setting (Cohen et al, 2013:322). Muijs (2004: 26) claims that within educational research field experiments offer an insight into the application of an intervention within a classroom not offered from true experiments that take place in an ‘an artificial laboratory environment.’

According to Burke-Johnson and Christensen (2013:321) a field experiment is ‘an experimental research study that is conducted in a real-life setting.’ In a field experiment variables are ‘isolated, controlled and manipulated’ in a natural setting (Cohen et al, 2013:316). This manipulation of variables means that the researcher ‘can create high internal validity and possibly even make a causal conclusion at the end of the study’ (Langston, 2010: 158). The external validity of field experiments is also generally high as the researcher can ‘draw causal inferences under naturalistic conditions’ (Salkind, 2008:401). In the ‘complex’ education setting, the advantages of field experimentation over laboratory experimentation are ‘clear’ (Salkind, 2008:402). Field experiments are particularly suited to the education setting because the classroom context ‘resembles the setting within which the intervention is likely to be deployed in the future (Salkind, 2008:400). This researcher adopted a quasi-experimental design as it was not possible to employ random sampling techniques to recruit schools for this study. Quasi-experiments are popular in educational research because of difficulties recruiting school and participants randomly (Cohen et al, 2013).

This study utilised a quasi-field field experiment to test the hypothesis that a combined New Literacies and Print Comprehension Strategy Instruction intervention positively influences online comprehension levels.

This quasi-field experiment was based on a 4 x 2 mixed factorial design. The between group independent variable is online comprehension intervention type and consists of four levels: No intervention, Print Comprehension Strategy Instruction Intervention, New Literacies Comprehension Strategy Instruction Intervention and a Combined Print and New Literacies Comprehension Strategy Instruction Intervention. The within groups independent variable is time which was measured pre-intervention (Time 1) and post-intervention (Time 2) for each condition group. The dependent variable is online comprehension levels which was measured using an adapted version of Castek’s (2008) Online Research and Comprehension Assessment Elementary.

Table 3.1
Table outlining Quasi-field Experiment Design

Condition	Treatment level			
Condition 1	R	O		O
Condition 2	R	O	x	O
Condition 3	R	O	x	O
Condition 4	R	O	x	O

Qualitative research is ‘largely an investigative process where the researcher gradually makes sense of a social phenomenon by contrasting, comparing, replicating, cataloguing and classifying the object of the study’ (Cress, 2003, as cited in Aloe-Chase, 2008: 194). The goal of ‘qualitative research is to understand a particular social situation, event, role, group, or interaction’ (Locke, Spirduso and Silverman, 1987: 194). Some of the key features of qualitative research include flexible inquiry ‘guided by participants’ comments,’ and research that typically occurs in natural settings. A further key feature of qualitative research is an exploration of the ‘experiences, perspectives and thoughts of participants through various strategies of enquiry’ (Harwell, 2011:149). This kind of exploration inherent in qualitative research allows the researcher to ‘focus on learning the meaning that the participants hold about the problem or issue.’ In this study, the researcher collected and analysed focus group and reflective log data to explore the participants’ application of individual comprehension strategies in an online environment.

Sampling 3.3

For the purposes of quantitative research the researcher employed purposive sampling techniques to recruit a school that was suitable for research purposes. The researcher then applied a random stratified sampling technique to assign participants to the four condition groupings. The random stratified sampling technique was selected as it provides a probability sample. The random stratified sampling technique was selected as the researcher wished to divide the target sample into homogenous groups. Cohen et al, (2013:154) suggests that random stratified sampling ‘involves dividing the population into homogenous groups, each containing subjects with similar characteristics.’ Tayie (2005: 38) claims random stratified sampling is the ‘approach used when adequate representation from a sub sample is desired.’

For the purposes of this study, the sub groups or strata were gender (male and female) and age (7-8 years old and 9-10 years old).

For the purposes of qualitative research, the researcher applied a purposeful sampling technique (Patton, 2002). According to Merriam (2009:77) purposeful sampling is ‘based on the assumption that the investigator wants to discover, understand and gain insight and therefore must select a sample from which the most can be learned’ (Merriam, 2009: 77). The researcher applied purposeful sampling to select participants for focus group discussions with the relevant age and gender demographic and also to select participants from the different treatment conditions. The researcher also selected pupils in the 9-10 years age bracket to complete the reflective logs. Participants in this age range were selected because the researcher felt they would be able to effectively reflect and record their experience of the research process. This is based on Oakhill, Barnes and Bryant’s (2004: 38) claim that children aged between nine and ten are typically ‘independent’ readers and writers. Applying purposeful sampling in this way, allowed the researcher to effectively explore the participants’ application of individual comprehension strategies in an online environment.

The researcher met with the principal of the school to discuss the research process and the aims of the study. The researcher then gave the principal the relevant information sheet to further inform their decision regarding partaking in the study (*See Appendix A*). When written consent from both the school manager and the principal was received, the researcher proceeded to present the study to the first, second and third class teachers. The researcher then started to recruit participants from the classes of teachers who had agreed to be part of the research. This recruitment process began with the distribution of parent information sheets detailing the research process and the aims of the research (*See Appendix B*).

Following this, interested parties received parental consent forms (*See Appendix C*) to allow their child or children to participate in the study.

Setting 3.4

The study was conducted in a large, mixed, urban primary school. The primary school is located in North county Dublin approximately 36 kilometres outside of Dublin city. The school is situated in an economically disadvantaged area with an employment rate of 18%, 4% above the national average (CSO, 2015). The school is a developing school with pupils from Junior Infants to fourth class currently in attendance. Current enrolment stands at 429 pupils with an average class size of 30 pupils. The school is multi-denominational and has an

ethnically diverse pupil population with over 30% of pupils originally from countries outside of Ireland. This is reflected in the high percentage of English as an Additional Language (EAL) learners currently standing at 40%.

Participants 3.5

One hundred and sixty Irish primary school pupils participated in this quasi-field experiment ($n = 160$). 84 female participants ($n = 84$) and 76 male participants ($n = 76$) partook in this study. Participants were ranging in age from seven to eleven. Amongst the sample, 45 Participants were aged 7 ($n = 45$), 45 participants were aged 8, ($n = 45$), 35 participants were aged 9 ($n = 35$) and 35 participants were aged 10 ($n = 35$). The percentage of participants classed as EAL learners stood at 36%. While the percentage of participants receiving learning support stood at 18%.

Table 3.2

Table outlining, the number of participants, the number of males and females, the mean age and standard deviation of each condition.

	Condition 1	Condition 2	Condition 3	Condition 4
<i>n</i>	40	40	40	40
Male	16	18	21	21
Female	24	22	19	19
Mean Age (<i>in years</i>)	8 years 2 months	8 years 3 months	8 years 8 months	8 years 9 months
<i>SD (in years)</i>	.56	.84	.73	1.11

Instructional Programme 3.6

The researcher designed and developed the instructional programmes that were taught in the experimental conditions of this study. The researcher based the design of the instructional programmes on an extensive review of the literature and on suggestions outlined in programmes including ‘The Building Bridges of Understanding’ comprehension strategy instruction programme (Courtney and Gleeson, 2010). The New Literacies instructional programme delivered instruction on the effective application of the New Literacies Online Comprehension and Research strategies as outlined by Leu et al (2015). Those strategies

include 1) Reading to Identify Important Questions, 2) Reading to Locate Online Information, 3) Reading to Critically Evaluate Online Information, 4) Reading to Synthesise Online Information and 5) Reading and Writing to Communicate Online Information (Leu et al, 2015: 3). The Print instructional programme delivered instruction on the effective application of the print comprehension strategies outlined in ‘The Building Bridges of Understanding’ comprehension strategy instruction programme (Courtney and Gleeson, 2010). The strategies outlined in the programme include 1) prediction, 2) making connections, 3) questioning, 4) monitoring, 5) determining importance, 6) inferring and 7) synthesising (Courtney and Gleeson, 2010). The New Literacies and Print comprehension strategy instruction programme were based on instruction in the New Literacies online comprehension and research strategies and in the print comprehension strategies outlined above.

Table 3.3
Table outlining, comprehension strategies featured in instructional programmes for each condition.

Condition	Comprehension strategies featured in instructional programme
Condition 1 Control No Comprehension Strategy Instruction	None
Condition 2 Print Comprehension Strategy Instruction	<ul style="list-style-type: none"> • Prediction • Making connections • Questioning • Monitoring • Determining importance • Inferring • Synthesising
Condition 3 New Literacies Comprehension Strategy Instruction	<ul style="list-style-type: none"> • Reading to Identify Important Questions (RIQ) • Reading to Locate Online Information (RLI) • Reading to Critically Evaluate Online Information (RCE) • Reading to Synthesize Online Information (RSI) • Reading and Writing to Communicate Online Information (RCI)

<p>Condition 4</p> <p>Combined-New Literacies and Print Comprehension Strategy Instruction</p>	<ul style="list-style-type: none"> • Reading to Identify Important Questions (RIQ) • Reading to Locate Online Information (RLI) • Reading to Critically Evaluate Online Information (RCE) • Reading to Synthesize Online Information (RSI) • Reading and Writing to Communicate Online Information (RCI) • Prediction • Making connections • Questioning • Monitoring • Determining importance • Inferring • Synthesising
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Each of the instructional programmes was based on a research-based instructional framework. The framework was used in each instructional programme to teach pupils how to apply comprehension strategies to online texts. ‘The Gradual Release of Responsibility model,’ (Pearson and Gallagher, 1983) was used by the teachers to scaffold pupils in their use of new comprehension strategies. While, the ‘Think-Aloud’ approach was used to model correct strategy use (Coiro, 2011). Also as part of each comprehension strategy instructional programme, pupils worked collaboratively and engaged in authentic practice situations to develop their strategy use (Castek, 2008).

Participants in experimental conditions partook in the instructional programme sessions in a classroom allocated by the school principal for the purpose of this research. The classroom provided a comfortable and quiet location in which to carry out the instructional sessions. The classroom was equipped with an interactive whiteboard which was used to model and demonstrate online reading, research and comprehension activities. During each instructional session participants had access to Wi-Fi networked Apple iPad tablets.

Instructional Programme Condition 1 and Condition 2 3.6.1

Under Condition 1, the control condition participants did not partake in any instructional programme. During the allocated instruction time they completed non-English reading or writing tasks with the relevant teacher.

Under Condition 2 participants engaged in eight one hour print comprehension strategy instruction sessions. In session one and two the teacher used the think-aloud approach to model how to apply the prediction strategy to an online environment. The teacher did so by modelling how to activate prior topic knowledge and how to use cues to preview online texts. During modelling the teacher used think aloud to highlight the key teaching points. These key teaching points making predictions before, during and after reading an online text and using information from the online such as headings and pictures text to make predictions. The teacher then scaffolded the pupils in completing a collaborative task based on using the prediction strategy in an online environment. Participants recorded their prior knowledge of Ernest Shackleton, before making predictions about what information the webpage <http://easyscienceforkids.com/all-about-ernest-shackleton/> might contain. Finally, the participants applied the prediction strategy in an authentic task based on making and recording predictions for a list of target websites.

Session three offered instruction on the making connections strategy. The session provided instruction on how to make text to self, text to text and text to wider world connections on a webpage or website. The teacher used think-aloud to model how to activate our schema to make different kinds of connections when reading an online text . The teacher supported participants in their use of the strategy as they worked in collaborative groups to make connections with the online texts available at <http://www.shortstories.net/for-children/school-stories/>. The teacher then gave participants the opportunity to apply the making connections strategy in an authentic practice situation.

Session four involved instruction on the questioning strategy. Think-aloud by the teacher demonstrated how to self-generate questions based on an online text. During modelling the teacher highlighted the key teaching points (eg. generating questions before, during and after reading, understanding that there are different types of questions). The teacher explained that as we read we read we think of different types of questions, ‘On the Surface’ and ‘Under the Surface’ questions. The teacher then used a tree based graphic organiser to explain that ‘On the Surface’ questions refer to literal questions (who, what, where, when) the answers of which are normally found in the text, while Under the Surface’ questions refer to inferential questions (why, how) the answer of which requires thought and inference beyond the text. The teacher then scaffolded the pupils in completing a collaborative task based on using the questioning strategy in an online environment. This task involved participants recording their self-generated questions in Notability as they read. The teacher then gave the participants a

task based on applying the questioning strategy in an authentic practice situation. This involved the participants recording questions based on the online text <http://www.britannica.com/animal/gray-wolf>.

In session five participants received instruction on how to monitor comprehension when reading an online text. As part of this instructional session participants learned how to clarify a word or phrase that did not make sense and how to decode a word that they are stuck on. The teacher used think aloud to model key teaching points. These points included reading ahead to gather more information, rereading a part of the text that is ambiguous, considering if this part of the text is necessary for my overall understanding and asking others for help. The teacher then supported the participants in completing a collaborative task. Participants then used the monitoring comprehension strategy to clarify a paragraph of online text.

In session six participants were taught how to apply the determining importance strategy. The teacher utilised the think-aloud approach to model how apply different strategies to determine the important information presented in an online text. Those strategies include categorizing pieces of information in a text into important and non-important, grouping facts according to topics, editing and selecting the main points from a piece of text, scanning and skimming the text for important information and using headings, figures and graphs to locate important information. The teacher then scaffolded the participants' completion of a collaborative task based on using the determining importance strategy. This task involved participants determining the most important pieces of information from an online text <http://mbgnet.net/sets/tundra/index.htm>. The participants also applied the determining importance strategy in independent authentic tasks.

Session seven centred on the inferring strategy. The teacher employed the think-aloud approach to demonstrate how to infer when reading an online text. The teacher modelled how to use background knowledge to make decisions about online text and how to make decisions about online texts that are not explicitly stated. The teacher then supported participants in the completion of a collaborative task where they had to make inferences about an online text. The teacher gave participants the opportunity to apply the inferring

strategy in an authentic practice situation. This involved the participants recording inferences based on the online text <http://www.poemhunter.com/poem/if-I-were-in-charge-of-the-world>

In session eight, the teacher used the think-aloud approach to model how to apply the synthesising strategy. During modelling the teacher utilised think aloud to highlight the key teaching points. These points included rereading to clarify, rereading to deepen understanding, combining new ideas with earlier interpretations and organising the different pieces of information to create a meaning greater than the sum of each piece. The teacher then scaffolded the pupils in completing a collaborative task based on using the synthesising strategy to find out about the life cycle of the lady bird. Finally, the participants applied the synthesising strategy in an authentic task based on using different online texts to retrieve information about the importance of recycling.

Instructional Programme Condition 3 and Condition 4 3.6.2

Under Condition 3 participants engaged in eight one hour New Literacies online comprehension and research strategy instruction sessions. In session one the teacher began by modelling the Reading to Identifying Important Questions (RIQ) strategy. The teacher used the think-aloud approach to model how to devise effective online research questions for searching for information using search engines. The teacher did so by modelling how to devise an effective research question about Earnest Shackleton. During modelling the teacher used think aloud to highlight the key teaching points; how to identify, revise and delete poor research questions. The teacher demonstrated how to compose an effective research question. This involved the teacher using think-aloud to evaluate the effectiveness of different research questions, before deleting those that were too broad. The teacher demonstrated how to use the following questions to guide effective research question composition ‘What do I need to find out? Where should I begin? Where do I want to go? What do I need to do first?’ The teacher then scaffolded the pupils in completing a collaborative task based on using the RIQ to research Charles Dickens. Finally, the participants applied the RIQ strategy in an authentic task based on seeking information about President Michael d. Higgins.

In session two the teacher commenced by modelling the Reading to Locate Online Information strategy. The teacher applied the think-aloud approach to model how to effectively locate information online. The teacher modelled how to pick the most suitable website from a search engine results list based on the topic of Vikings in Ireland. During modelling the teacher used think aloud to highlight the key teaching points. In this session the

key teaching points included how to select an appropriate search term, how to use a search engine, how to effectively and efficiently read search results, how to read and identify key elements of a Web page and how to make inferences about the path of hyperlinks. The teacher then supported the pupils in completing a collaborative task based on using the Reading to Locate Online Information strategy to select the most suitable website from a paper results list. Finally, the participants applied the Reading to Locate Online Information strategy in an authentic task based on selecting the most relevant website to answer the research question ‘What is the President of Ireland’s role?’

Session three also offered instruction on the Reading to Locate Online Information strategy. This session offered instruction on how to locate information efficiently and effectively on a website. The teacher utilised the think aloud to model how to apply the Skimming/Scanning, Looking for headers, Looking at pictures and using Control F with target word or term strategies to locate online information efficiently. The teacher used ‘Using the Web: Learning from Web Sites from www.educationplace.com-see and Using the Web: Find the Right Site from www.educationplace.com-see to allow participants to practice key skills from the session. The teacher supported participants in their use of these strategies as they worked in collaborative groups to locate information on volcanoes using different websites. The teacher then gave participants the opportunity to apply the Reading to Locate Online Information strategy in an authentic practice situation.

In Session four the teacher used the think-aloud approach to model how to Critically Evaluate Online Information. The teacher modelled using www.thedogisland.com how to use cross-checking and the 5 W’s of Cyberspace questions- Who, What, Where, When and Why techniques adapted from the Media Awareness Network: Deconstructing Web Pages to critically evaluate online content. The teacher also used the think-aloud approach to demonstrate how to determine the authenticity of a website by checking the website for a frequently asked questions section, for directions, for website rates and statistics and for a copyright date. During modelling the teacher used think aloud to demonstrate the cross-check technique which involves checking the validity of the site by looking for three other sources that corroborate information found on the original website. The teacher then scaffolded the participants in completing a collaborative task. The participants used the cross-check technique to evaluate the hoax Tree-Octopus website available at www.

<http://zapatopi.net/treeoctopus/>. Finally, the participants applied the Reading to Critically Evaluate Online Information strategy to compare and evaluate three websites. A sample of this session can be seen in *Appendix D*.

In session five the participants again received instruction on the application of the Reading to Critically Evaluate Online Information strategy. As part of this instructional session participants learned how to check the credentials of website authors/creators and how to screen for content bias on websites. The teacher used think aloud to model key teaching points (eg. Click the “Contact” button or an “About Us” link, Put the author’s name into a search engine). The teacher used think-aloud to demonstrate how to screen for content bias by reading the website’s mission statement, by considering the objective or purpose of the site and by examining the website’s URL. The teacher then supported the participants in completing a collaborative task. Participants then used the Reading to Critically Evaluate Online Information strategy to assess the authenticity of three websites.

In session six, the teacher utilised the think-aloud approach to model how to apply the Reading to Synthesize Online Information strategy. During modelling the teacher used think aloud to highlight the key teaching points including finding relevant information from different sources and websites, organising information from multiple websites, picking out the important information that is relevant to the research question, deleting any information that does not appear to support the research question and combining the information to answer the research question. The teacher then scaffolded the pupils in completing a collaborative task based on using Reading to Synthesize Online Information strategy to answer the following research question: ‘What are the stages of the lady-bird life cycle?’ Finally, the participants applied the Reading to Synthesize Online Information strategy in an authentic task based on using the following websites <http://www.benefits-of-recycling.com/recyclingforkids/> and <http://www.theworldcounts.com/stories/Recycle-Facts-for-Kids> to answer the following research question: ‘Why is recycling important?’

In sessions seven and eight the participants received instruction on the Reading and Writing to Communicate Online Information strategy. The teacher used the think-aloud approach to model how to communicate online using email, wikis, blogs, social networks and video. During modelling the teacher highlighted the key teaching points and skills associated with the different modes of online communication (eg. writing strategies for using a blog). The teacher then scaffolded the participants’ completion of a collaborative task based on using the

Reading and Writing to Communicate Online Information strategy. These tasks included creating a video depicting a persuasive argument for banning homework and using the Edmodo social network to share ideas. The participants also applied the Reading and Writing to Communicate Online Information strategy in independent authentic tasks centred on the writing for the school blog over the two sessions.

Under Condition 4 participants partook in eight one hour New Literacies online comprehension and research strategy instruction sessions and eight one hour print comprehension strategy instruction sessions. The format and content of the print comprehension strategy instruction sessions was the same as those outlined under Condition 2. Likewise, the format and content of the New Literacies online comprehension strategy instruction sessions were the same as those outlined under Condition 3.

Data collection 3.7

An adapted version of the Online Research and Comprehension Assessment (ORCA) Elementary (Castek, 2008), the ORCA Primary was used to measure the participants' online research and comprehension levels in both the experimental and control conditions (*See Appendix E.1*). Castek (2008) designed the ORCA elementary based on the Online Research and Comprehension Assessments (ORCAs) developed by the ORCA Project (Leu et al, 2008). The ORCAs are 'performance based' assessments designed to assess online comprehension and research by 'asking students to conduct actual research in an online environment' (Leu et al, 2013a: 227). The ORCAs have been rigorously validated including testing in cognitive labs, pilot testing among 1,200 students and an extensive validation trial (Leu et al, 2012). Leu et al (2013a: 226) suggest that the ORCAs are both 'valid and reliable' measures of online comprehension and research. Given the solid psychometric base provided by the ORCAs, Castek's (2008) ORCA elementary follows a similar format and uses a scoring rubric based on that produced by the ORCA project.

Castek (2008) designed the ORCA Elementary to assess the online comprehension and research skills of pupils aged between nine and ten. The structure of the ORCA elementary is based on the completion of five information tasks. Each task is designed to measure one of the five key New Literacies online comprehension and research skills. Those skills include 1) Reading to Identify Important Questions, 2) Reading to Locate Online Information, 3)

Reading to Critically Evaluate Online Information, 4) Reading to Synthesise Online Information and 5) Reading and Writing to Communicate Online Information (Leu et al, 2015: 3). According to the ORCA elementary administration guidelines, each participant should be given up to thirty minutes to complete each task.

To achieve reliability, Castek (2008) designed the ORCA Elementary scoring rubric based on the ORCA's rubric. A Cronbach's Alpha based on the ORCA Elementary indicated an 'inter-rater reliability coefficient of .790 suggesting a moderate level of internal consistency' (Kingsley, 2011: 64). Castek (2008) put a number of measures in place to establish the validity of the ORCA Elementary scale. The ORCA Elementary was reviewed by an expert panel, it was then piloted on two pupils within the appropriate age bracket. Finally, Castek, (2008) engaged in a rigorous review process liaising with members of the expert panel and teachers involved in the research process. This review process included the analysis of 'field notes, screen capture data and student responses' (as cited in Kingsley, 2011: 64). These measures established the ORCA Elementary as a valid measure of online comprehension and research among the target sample age.

For the purposes of this study the researcher wished to adapt the ORCA Elementary compiled by Castek (2008). The researcher wished to revise the ORCA Elementary for a number of reasons. Firstly, the researcher wished to work with a sample ranging in age from 7 to 10. This meant that the ORCA elementary designed for 9 to 10 year olds would have to be revised. Furthermore, the researcher discovered that a number of the websites included as part of the information tasks were no longer available. Finally, the researcher, wished to adjust the ORCA Elementary to suit the participants' Irish context and so avoid any content validity issues.

The researcher liaised with Castek regarding the potential revision of the ORCA Elementary. Castek suggested that the issue regarding discontinued websites could be addressed by using the ORCA Elementary- Revised adapted by Kingsley (2011). The researcher reviewed Kingsley's (2011) version of the ORCA Elementary and deemed it appropriate for this study. Kingsley (2011) had adapted the ORCA elementary scale to include three information tasks instead of five due to website discontinuation and time constraints. The researcher then slightly adapted the wording of Kingsley's (2011) scale to avoid any content validity issues. For example, the researcher amended the following task introduction:

We are fifth graders at Edward's School in Vancouver, Canada. We are looking for a sight we lost called Endangered Animals around the World made by the BBC (Kingsley, 2011: 160).

We are in third class in Co. Cork. We are looking for a sight we lost called Endangered Animals around the World made by the BBC.

For the purposes of this study the adapted ORCA Elementary-Revised will be referred to as the ORCA Primary.

Task 1 'Animal Endangerment,' assessed the skills of locating, searching and synthesising information. As part of this task, participants were required to locate the website and find information explaining why animals are endangered and how children can help endangered animals. According to the rubric, to gain full marks in this task participants had to 'successfully locate the website, provide at least two reasons for animal endangerment and two ways kids could help' (Kingsley, 2011: 65).

Task 2 'How Many Otters are There?' assessed the skills of locating and critically evaluating information. As part of this task, participants were required to explain whether the websites they found were reliable. According to the rubric, to gain full marks in this task participants had to 'confirm results with more than one Website, and explore the author's credentials and related experience with sea otters' (Kingsley, 2011: 65).

Task 3 'All About Sea Otters' assessed the skills of locating and critically evaluating information. As part of this task, participants were required to find the appropriate website before explaining how they knew the makers of the websites were experts. According to the rubric, to gain full marks in this task participants had to 'correctly list uniform resource locator (URL), explain who made the site and provide a logical explanation of site reliability' (Kingsley, 2011: 65).

For post-test purposes the adapted ORCA Primary was used. The skills assessed by each task and rubric criteria remained the same but the task topics and corresponding questions differed (*See Appendix E.2*).

Craighead and Nemeroff (2001: 1362) describe questionnaires as 'inventories used by researchers to gather various kinds of information from responding individuals.' Scott and Morrison (2006:189) suggest that questionnaires typically exhibit a 'self-completion format' and produce quantitative data. According to Goddard and Villanova (as cited in Leong and Austin, 2006: 114) 'questionnaires are among the most frequently used research methods of

the social sciences.’ Questionnaires are popular amongst researchers as they represent a ‘general freedom from bias on the part of the interviewer’ and ‘large number of individuals can respond’ (Craighead and Nemeroff, 2001: 1362). Scott and Morrison (2006:189) state that questionnaires are ‘an appropriate tool’ to use when conducting educational research especially when used to examine typical behaviours rather than to measure a construct or concept. Questionnaires are also effective at gaining ‘insights about personal functioning.’ (Craighead and Nemeroff 2001: 1362). This is why the researcher selected a questionnaire as the most effective instrument to gain quantitative information regarding participant internet usage and skill level prior to intervention.

An internet usage and ability questionnaire was administered to all participants prior to and post intervention. The internet usage questionnaire has been adapted from Castek’s (2008) Internet use survey and Kingsley’s (2011) ‘Internet Usage and Ability Questionnaire’. The researcher wished to adapt the questionnaire to account for the range of ages of participants completing the questionnaire in this study. To cater for the wide age bracket the researcher shortened the questionnaire. The researcher also adjusted the questionnaire to account for technological advancements (ie. the inclusion of tablets).

The Internet Usage and Ability Questionnaire contains seventeen items and assesses self-reported internet usage and internet skill ability (*See Appendix F*). The first section of the questionnaire contains nine items. The first two items seek demographic information including age and gender. The remaining five items seek information regarding participants’ perception of their print and online reading abilities and information regarding internet access. The final two items in the first section require participants to provide information on the frequency of the internet usage at home and in school by using a 6 point response scale; Never, Less than once a week, once a week, a few times each week, once a day and lots of times a day.

The second section of the ‘Internet Usage and Ability Questionnaire’ focusses on acquiring information regarding participants’ self-reported internet skills ability. Each item features a seven point sliding scale ranging from beginner to expert. These items were designed to assess participants’ perceived ability to apply New Literacies skills and strategies. Those skills include identifying important questions, locating online information, critically evaluating online information, synthesising online information and reading and writing to communicate online information.

It is widely established in print comprehension literature that when comprehending readers ‘rely’ on prior topic knowledge (Coiro and Dobler, 2007: 230). Readers use ‘domain-specific information and key vocabulary’ as they comprehend printed texts (Coiro and Dobler, 2007: 230). A number of studies including Hill and Hannafin (1997) and Coiro and Dobler (2007) have also revealed the role of prior topic knowledge in online comprehension. Therefore, the researcher felt it necessary to control for the effects of prior topic knowledge in order to gain accurate online comprehension and research scores from the pre and post ORCA primary scales. The researcher assessed the prior topic knowledge of participants before administering the pre ORCA primary scales. The researcher designed a prior topic knowledge survey to determine participants’ level of prior knowledge. The survey features questions developed to test participant knowledge on the research topics included as part of the pre ORCA primary scales. The pre-test prior knowledge survey features questions to assess prior knowledge of snow leopards and questions to assess prior knowledge of otters (*See Appendix H*).

A focus group is a ‘type of group interview in which a moderator leads a discussion with a small group of individuals to examine, in detail, how the group members feel about a topic’ (Burke-Johnson and Christensen 2014: 234). Focus groups typically feature between six and twelve ‘homogenous’ individuals ‘who are purposively selected because they can provide the kind of information of interest to the author’ (Burke-Johnson and Christensen 2014: 235). Focus groups produce qualitative data that are ‘in the words of group participants’ (Burke-Johnson and Christensen 2014: 235). Brodigan (1992: 1) claims that focus groups are distinct from other types of qualitative data because they feature ‘group discussion.’ This group format featuring the ‘interactions between the moderator and respondents and the interactions between the respondents themselves’ adds ‘depth and dimension to the knowledge gained’ through focus group discussion (Vaughn, Shay Schumm and Sinagub, 1996: 16). Vaughn et al, 1996: 15) argues that ‘focus groups are effective for a wide range of approaches and research purposes.’ Some of those purposes include the ‘use of focus group data to ‘follow up on quantitative investigations’ (Vaughn et al, 1996: 15). Education features amongst the key approaches suited to focus group research. This is largely because focus groups is a research tool that is highly consistent with current trends in education ... that aim to understand more about what key stake holders think and feel’ (Vaughn et al, 1996: 16). In addition, when used ‘with other methods’ focus groups ‘bring an improved depth of understanding to research in education’ (Vaughn et al, 1996: 15). Finally, focus groups are ‘widespread’ in educational

research because focus groups have been deemed as an ‘appropriate method for conducting research with children’ (Scott and Morrison, 2006:114). According to O’ Kane (2000: 136, as cited in Scott and Morrison, 2006:114) focus groups ‘break down the power imbalance between adults and children , and create space that enables children to speak and be heard.’ The researcher selected focus groups as a means to collect qualitative data because it is a research method that can explore the reasoning behind quantitative results and it is well suited to the realm of educational research especially working with participants of a young age.

The collection of focus group data took place after intervention and the subsequent post-testing phase. The focus groups had three participants in each group representing one participant from each class level (first, second, third class). Bryman (2015: 506) suggests that smaller focus groups are advantageous because there is typically ‘greater opportunity for disagreement and diversity of opinion’ amongst participants. In addition Millward (2012: 426) suggests that smaller focus groups prevent ‘subgroups’ forming. These advantages were seen in a study conducted by Peek and Fothergill (2009: 37) when focus groups with between three and five participants ‘ran more smoothly than the larger group interviews ... conducted.’ Trakas (2008) also advises the use of smaller focus groups when interviewing children. This is because small focus groups counteract two of the key challenges children experience when participating in focus groups ‘to participate and interact in a group.... and to develop communicative exchanges with others about a topic’ (Trakas, 2008:37).

Six focus groups were conducted. Two focus groups were drawn from each experimental condition. In this way the, focus group were based on a multiple category design. This design involves conducting focus groups with different types of participants in stages or simultaneously. The multiple category design allows the researcher to make comparisons in two ways: from one group to another within a category and from one category to another (Kruger and Casey, 2015). This design allowed the researcher to draw comparisons between the focus group transcripts produced by participants from the different experimental groups.

According to Kruger and Casey (2015) effective moderators must understand the purpose of the study. An effective moderator must have experience at drawing the most useful information from participants (Kruger and Casey, 2015). The researcher is therefore well placed to act as moderator. The researcher has an extensive knowledge of the study and its purpose and the researcher has previous experience acting as a moderator where she

developed the necessary skill set to moderate effectively. The moderator adopted an approach based on the 'less control moderating style.' Flexible moderation allows the participants to do most of the talking, thus providing rich descriptions...and in depth explanations of social processes' (Hesse-Biber and Leavy, 2010: 184).

The questioning style of the moderator is 'key to determining the nature of the discussion' (Millward, 2012: 430). When planning focus group questions the moderator must consider 'the sequence of the questions as well as how they are worded' (Millward, 2012: 430). In terms of the sequence of the questions the moderator began with some general questions before moving onto more research-related topics. This approach is advocated by Bryman (2015: 510) who suggests that beginning with general questions 'stimulates discussion.' This is especially true of child participants. Trakas (2008:23) suggests that in a focus group setting 'children can feel intimidated and vulnerable.' However, the moderator can put child participants at ease by beginning the focus group session with general questions that allow children to use 'their own words rather than...technical or adult terms' Trakas (2008:23). The topic related questions were posed by the moderator after the initial general question phase has ended. The topic questions focussed on gaining participants view on the application of different strategies in the online environment and were open-ended questions. Millward (2012: 429) states that 'consistent use of open-ended questions helps create a climate of attentiveness and listening where people feel able to respond any way they like.

For the purposes of his study, the moderator applied the moderately structured group approach. This approach was selected because it is effective at exploring both the research focus and the participants' views. This approach involved the moderator using a funnel approach to questioning. The 'funnel approach' is based on a discussion that 'moves from broader to narrower topics' (Morgan, 1997:52). The moderator commenced by asking broad open ended questions. This approach is also advocated by Bryman (2015: 510) who suggests that beginning with general questions 'stimulates discussion.' This is especially true of child participants. Trakas (2008:23) suggests that in a focus group setting 'children can feel intimidated and vulnerable.' However, the moderator can put child participants at ease by beginning the focus group session with general questions that allow children to use 'their own words rather than...technical or adult terms' Trakas (2008:23)

Progressing through the funnel design the moderator then adopted a more directive approach. This allowed the moderator to cover topics and ask questions for the middle funnel stage.

These questions were preselected by the researcher and centred on gaining the participants view on the application of different comprehension strategies in an online environment. Finally, the moderator asked more specific questions in the final funnel stage. This stage typically involves ‘sharply focussed discussions of narrowly defined issues’ (Morgan, 1997:52). The specific questions posed by the moderator at this stage focussed on the effectiveness of individual comprehension strategies in an online environment. Johnson and Christensen (2013:235) support this approach stating that ‘more specific’ topic related questions are better posed ‘later’ in the focus group discussion when the moderator can probe for additional information or clarification.

Maree and Van Der Westhuizen (2009: 26) suggest that reflective logs detail participants’ ‘personal experience during actual research settings.’ Reflective logs are considered a ‘valid’ source of qualitative data (Bold, 2011:197) and are ‘characterized by the immediacy of the accounts’ (Hamilton and Corbett-Whittier, 2013: 102). The nature and structure of the log is often ‘researcher driven’ (Hamilton and Corbett-Whittier, 2013: 102). Researchers use reflective logs to gain ‘an understanding of the lived experiences of the participants to explore how they respond to events and interactions’ (Hamilton and Corbett-Whittier, 2013: 103). In education intervention based research participants typically reflect on both ‘the research process and the learning journey’ in their reflective log. Bold (2011:197) claims that children are capable of keeping reflective logs through the recording of data in a child friendly way. In this study participants used reflective logs to record their thoughts and feelings about different comprehension strategies throughout the research process. Participants can record their reflections in written form (*See Appendix G*). The reflective log featured a ‘flexible structure; empowering the individual but still with a research focus (Hamilton and Corbett-Whittier, 2013: 102).

Reliability of Quantitative Data 3.8

According to Moser and Kalton (1989: 353, as cited in Kumar, 2010) ‘a scale or test is reliable to the extent that repeat measurements made by it under constant conditions will give the same result.’ The ‘consistency and stability in an instrument’ are key indicators of its reliability (Kumar, 2010: 181). A reliable instrument should produce ‘consistent measurements’ across the ‘same or similar conditions’ (Kumar, 2010: 181). The reliability of an instrument can be determined using internal and external consistency procedures. According to Bryman and Cramer (2004:77) internal consistency procedures relate to establishing the

consistency of measurement between items within a scale. External consistency procedures ‘compare findings from two independent processes of data collection with each other’ (Kumar, 2010:182). The ORCA elementary (Castek, 2008) has demonstrated internal consistency among the task items calculated at .790 using Cronbach’s alpha statistic (Kingsley, 2011: 64). The ORCA elementary also demonstrated external consistency with ‘an ‘inter-rater reliability coefficient of .790 suggesting a moderate level of internal consistency’ (Kingsley, 2011: 64). A factor analysis based on The Internet Usage and Skill Questionnaire indicated that the questionnaire was ‘reliably measuring two primary dimensions of student response regarding using Internet materials (Kingsley, 2011: 111). As the ORCA Primary was adapted from other instruments further internal and external consistency procedures are necessary to truly evaluate the reliability of this measure.

Validity of Quantitative Data 3.9

Validity is defined as the extent to which ‘the researcher has measured what he set out to measure’ (Smith, 1991: 106, as cited in Kumar, 2014). In quantitative research validity refers to the ability of ‘an empirical measure’ to reflect the ‘real meaning of the concept under consideration’ (Babbie, 1989: 133, as cited in Kumar, 2014). According to Hartas (2015:77) there are ‘many threats to validity’. These threats are generally termed as either internal or external validity threats. Internal validity threats are ‘experimental procedures, treatments or experiences of the participants that threaten the researcher’s ability to draw correct inferences from the data about the population in an experiment’ (Cresswell, 2013: 156). Some of the key threats to internal validity in educational quantitative research include ‘instrumentation, attrition, maturation, selection and the Hawthorne effect’ (Hartas, 2015: 80). The researcher controlled for practice effects in post-testing by using different items on the post ORCA primary. The researcher also endeavoured to control for the threat of inconsistency in testing by administering the test by following the protocol for administering the ORCA primary (*See Appendix I*). This ensured that participants receive consistency in test administration in pre and post testing. By using the same scale with different items the researcher also guaranteed that pre and post scores were comparable. To control for attritional effects resulting from participant drop out the researcher recruited a larger than necessary to sample, from which to draw upon in the case of drop outs. Maturation and the Hawthorne effects were limited by the inclusion of a control group in the experimental design. Selection threats to internal validity have been addressed with the application of a probability sample assigned to relevant conditions using random stratified sampling. By applying the random stratified sampling

techniques the researcher was also able to ensure that the condition groups were comparable in terms of age and gender. Finally, the investigator controlled for the extraneous variable of prior knowledge by assessing pupils prior topic knowledge before examining its contribution to the dependent variable through statistical analysis.

The researcher also put a number of provisions in place to control for external threats to validity. External validity refers to the ability to ‘generalize results beyond the context of a specific study’ (Hartas, 2015:76). Threats to external validity include selection and setting (Hartas, 2015). The researcher limited the threat of selection by using random stratified sampling. The research endeavoured to ensure that the condition groupings are representative of the population by include drawing on strata groupings for age, sex and social background. Hartas, (2015:80) claims that applying random sampling techniques ‘alleviates...the potential threat to generalization.’ In terms of setting, this investigation is a field experiment which ‘reduces the reactivity characteristics of laboratory based research’ (Reis and Judd, 2014:22). The external validity in terms of setting, in this study is higher than if it had taken place in a laboratory. This is because it was a field research study completed in a natural classroom setting not manipulated in any way by the researcher.

Validity and Reliability of Qualitative Data 3.10

Qualitative validity involves ‘determining whether the findings are accurate from the standpoint of the researcher, the participant, or the readers of an account (Cresswell, 2013:201). To achieve, validity in qualitative studies ‘the researcher checks for the accuracy of the findings by employing certain procedures’(Cresswell, 2013:201). In qualitative literature terms such as ‘trustworthiness and credibility’ are used to describe internal validity (Trochim and Donnelly, 2007:149). Credibility refers to ‘whether the participants’ perceptions of the setting or events match up with the researcher’s portrayal of them in the research report’ (Lodico, Spaulding and Voegtle, 2010; 273).In this study the researcher put a number of measures in place to enhance the credibility of qualitative data collected. The researcher took sufficient time to collect the data, the researcher used the focus group platform to take part in meaningful interactions with the participants and the researcher used the role of moderator to cultivate ‘strong and nurturing’ relationships with participants (Lodico et al, 2010: 273).

The researcher also put provisions in place to improve the confirmability of the study’s qualitative findings. Stoner (2010:28) describes confirmability as the researcher’s effort to

determine the ‘accuracy or credibility of the findings through specific strategies.’ To enhance the confirmability of the qualitative methods employed in this study, the researcher triangulated different data sources. According to (Cresswell, 2013:201) ‘if themes are established based on converging several sources of data or perspectives from participants, then this process can be claimed as adding validity to the study.’ The researcher used triangulation of focus group and reflective log data to improve the confirmability of this study.

Another important aspect of qualitative data relates to the reliability of the data and the ability of the data to generalize. In qualitative studies this ability to generalize is referred to as transferability (Kuckartz, 2014: 155). Flick (2009: 26) describes transferability as one of the primary aims of qualitative research. According to Kuckartz (2014: 155) is the degree to which the study’s results reflect the external context of the specific research question at hand. In the case of this study the external context to which the results apply is the primary school setting. Thus by conducting the study in a natural school setting, the researcher has enhanced the transferability of the qualitative data findings.

Quantitative Data Analysis 3.11

Preliminary quantitative data analysis started with the researcher running a priori power analysis in order to assess the required sample size to reliably detect the expected effect size. A standard multiple regression was then conducted to ascertain what contribution the extraneous variables of Prior Topic knowledge and Internet ability made to pre-test ORCA primary revised scores. The researcher then examined descriptive statistics relating to participants internet usage and internet skill levels. The researcher used descriptive statistics produced by the Internet Usage and Skills Questionnaire to explore any patterns or trends in participants’ pre and post intervention internet usage and skill levels.

Primary quantitative analysis involved an initial examination of mean ORCA Primary scores. This was followed by statistical analysis related to the research questions. A Wilcoxon Signed rank test was conducted to determine if there was a significant difference in online comprehension levels from Time 1 to Time 2 in the Combined Comprehension Strategy Instruction Condition. Wilcoxon Signed rank tests were also used to assess differences in online comprehension levels from Time 1 to Time 2 in the Control, Print and New Literacies conditions. To further investigate the research questions Kruskal-Wallis test comparing the Post intervention ORCA Primary scores between the four conditions were conducted. The

researcher then analysed ORCA primary and internet skill scores across age and gender. A Kruskal-Wallis test was conducted based on data in each condition to investigate if there was a significant difference in the post ORCA primary across age. The researcher also employed a series of Mann-Whitney *U* tests to compare the performance of the 7 to 8 and 9 to 10 age groups on items of the Internet Usage and Skills Questionnaire's skill subsection. Finally, the researcher used a Kruskal-Wallis test to investigate if there was a significant difference in the post ORCA primary scores of males and females. Analysis of the impact of gender also included a series of Mann-Whitney *U* tests to compare the performance of the males and females on items of the Internet Questionnaire skill subsection.

Qualitative Data Analysis 3.12

The researcher used thematic to analyse qualitative data in this study. Alhojailan (2012:40) states that thematic analysis is 'Thematic Analysis is a type of qualitative analysis... used to analyse classifications and present themes (patterns) that relate to the data.' In this study the researcher employed thematic analysis for the purpose of interpreting qualitative data.

Thematic analysis of data involves the researcher 'identifying, analysing, and reporting patterns (themes) within data' (Braun and Clarke, 2006: 82). Thematic analysis 'provides a systematic element to data analysis' using coding (Alhojailan, 2012:40). Namey et al (2008: 38) suggest that 'codes developed for ideas or themes are...applied or linked to raw data as summary markers for later analysis.' According to Braun and Clarke (2006: 84) a theme 'represents some level of patterned response or meaning within the data set.' For the purpose of this study, the researcher employed a 'theoretical' approach to thematic analysis. The researcher selected a 'theoretical' approach to thematic analysis as this approach lends itself to the coding of data for a 'specific research question' (Braun and Clarke, 2006: 87).

Theoretical is typically described as 'analyst-driven' and when compared to inductive analysis provides a more 'detailed analysis of some aspect of the data.' The researcher analysed data at a semantic level. The researcher was concerned with what surface data suggested and did not look 'for anything beyond what a participant has said or what has been written' (Braun and Clarke, 2006: 87).

In this study the researcher collected Focus Group data after the intervention phase and collected Reflective Log data throughout the intervention phase. The researcher then applied thematic analysis to analyse data from Focus Group transcripts and reflective logs. This involved the researcher transcribing focus group data that had been recorded using a

dictaphone. The transcribed the data using Microsoft word software. Following the transcription of focus group transcripts, the researcher then devised a coding framework. Manual coding according to this framework was then applied to the focus group transcripts and reflective log scripts. This involved the researcher reading and re-reading each script and transcript in its entirety before manually applying the coding system. Data was then collated according to the code it was assigned. The researcher then began to group codes according to common themes and sub themes. Codes categorized as outliers were discarded as they did not fall under any of the emerging themes. In this way the researcher was able to identify the main and subthemes from the acquired qualitative data.

Ethics 3.13

This study received ethical approval from the Mary Immaculate College Research Ethics Committee (MIREC). Before ethical approval could be granted the researcher had to agree to adhere to a number of measures. According to Hill (1995, as cited in Greene and Hogan, 2005:63) children are ‘seen as especially vulnerable to persuasion, adverse influence and indeed harm in research.’ Therefore, the researcher had to put a number of measures in place that pertained particularly to conducting research with child participants.

On the request of the ethics review board the researcher began by seeking permission to conduct the study from the school principal. The researcher met with the school principal. Here the study, its aims and the proposed research process were discussed. The researcher then gave the principal an information sheet outlining the key aspects of the study and research process. The principal was then invited to contact the researcher in due course if she was willing to offer consent for the study to take place in the school. The principal later contacted the researcher, at which point she read and completed the Principal Consent form.

Ethical codes outlined by bodies such as the British Psychological Association delineate that ‘parental consent should be sought in relation to children under sixteen’ (Hill, 1995, as cited, in Greene and Hogan, 2005:68). The researcher began this process by distributing ‘Parental Information Sheets’ to all pupils in first to third class. With the permission of the principal, the researcher also made a post on the school website outlining essential points of information about the study. The research then distributed written informed consent forms to parent(s) and guardian(s) who expressed interest.

Hill (1995, as cited Greene and Hogan, 2005:68) argues that consent ‘should be obtained in person from the child following presentation of written and verbal information about the research and its implications.’ Before commencing data collection, participants partaking in the control condition and those partaking in the field experiment were given information sheets outlining the structure and aims of the study (*See Appendix J*). During participant briefing the researcher made it clear that the participants were free to withdraw at any stage in the research process. Also during the briefing process, participants were informed that all data collected by the researcher will remain strictly confidential. According to Hill (1995, as cited in Greene and Hogan, 2005:68) it is especially important to assure child participants that data will remain confidential as many are ‘very concerned about actual or potential breaches of confidence.’ Following participant briefing, the participants were invited to complete the Participant Written Consent Form (*See Appendix K*).

According to Hill (1995, as cited in Greene and Hogan, 2005:68) researchers are ethically obliged to ensure that child participants do not experience any undue ‘stress and distress’ during the research process. Throughout the research process the researcher made every effort to ensure that participants in all conditions experienced the least stressful research process possible. The experiment was conducted in the participants’ school environment. This familiar environment helped the participants to feel more at ease during the research process. The researcher also put a number of provisions in place to ensure the emotional well-being of participants. These provisions pertain to the particular research methods in question and will be outlined below.

Following the research process participants in each condition and their parents were debriefed. Anderson and Arsenault (2005:20) argue that it is important to debrief child participants and their associate parent(s) or guardian(s) to ‘inform participants about the experiment, including any additional information that may have biased results if given in advance.’ The Parental Debriefing Form (*See Appendix L.1*) was distributed to Parent(s) and or guardian(s) after post-testing. It is also necessary to debrief participants to ‘clarify any questions that may arise’ and to give details of how to access subsequent research results (Anderson and Arsenault, 2005:20). Participants were debriefed immediately after post-testing using the Participant debriefing Form (*See Appendix L.2*).

The researcher also took into account ethical considerations associated with the particular research methods being used. In focus group research a ‘variety of unique ethical concerns’

arise because ‘focus group interviews take place in a group context’ concerns (Sprenkle and Percy, 2006:96). For example, the issue of confidentiality is complicated by the group dynamic. While the moderator can guarantee the ‘confidentiality of group members, there is no guarantee that other participants in the group will do likewise’ (Sprenkle and Percy, 2006:96). Hill (1995, as cited in Greene and Hogan,2005:76) suggests that group participant disclosures can be limited with the implementation of ‘ground rules.’ Sprenkle and Percy (2006:96) suggest that these ground rules should be set up prior to the focus group discussion. In this study there are several examples throughout the focus group transcripts in which the moderator explained the confidentiality ground rules for the focus group discussion. For example, in this study the moderator asked participants at the start of each focus group to ‘please do not talk about anything you hear today with other boys and girls who are not part of this group.’

Another ethical concern that is associated with conducting focus groups with children is the potential for the discussion to touch on sensitive issues. According to Smithson (in Alasuutari, Bickman, and Brannen, 2008: 360) the moderator can ‘try and move the discussion on or change the topic if group members appear uncomfortable with sensitive issues.’ The moderator applied this strategy in the case of sensitive topics arising in focus group discussions. For example, when conversation touched on the area of number of devices connected to the internet, the moderator became aware that one participant was uncomfortable and moved the conversation in another direction.

Participant 1: In our house we have wifi, so do we include phones and tablets connected to the internet or just computers?

Participant 2: But we don’t have and phones or computers connected to the internet

Moderator: Let’s talk about what things you like to do on the internet.

The researcher also put measures in place to deal with the specific ethical considerations associated with experimental research. In educational experimental research, one of the key ethical concerns is ‘whether the aims of the research are in any way subversive to the....subjects, teachers or institutions’ (Cohen et al, 2015:85). According to Stanley and Sieber (1992: 37) researchers should put provisions in place to ‘minimize the risk to participants however minor the risks may be.’ The researcher has evaluated the potential physical, psychological and emotional risk to participants. The researcher then deemed it necessary to put measures in place to prevent psychological and emotional risks to

participants. No physical risks were apparent. The researcher evaluated the psychological and emotional risks according to the criteria set out by Cardwell and Flanagan (2005:191). The criteria states that if ‘negative emotions’ are induced by a study there is a potential psychological and emotional risk to participants. The researcher wished to address the risk that participants might experience test anxiety when completing task in the ORCA primary. The research mitigated this risk by reassuring participants that the ORCA primary is a quiz and not a test and by explaining to participants that the researcher will not share the participants’ answers or quiz results with their teachers or peers.

The key ethical concern associated with the participants’ reflective logs relates to the researcher’s presentation of data. Due to the nature of qualitative data analysis ‘ensuring that participants are not identified is more difficult and requires particular attention’(Hill, 1995 as cited in Greene and Hogan,2005: 75). Participants may record ‘vivid examples, which may reveal too much about an individual, even though referred to anonymously.’ The researcher took particular care to ‘omit or disguise certain details of a situation so that persons involved are not identifiable’ (Hill, 1995 as cited in Greene and Hogan, 2005: 75). For example, the researcher removed any names that were referred to when participants’ reflected on the collaborative tasks they had completed with others and any specific references to their school name or location.

Conclusion 3.14

This chapter outlined the embedded mixed methods design of the study. The researcher selected this design model because it allowed the research to fully explore the research question. The researcher adopted quantitative methods to test the hypothesis that a combined New Literacies and Print Comprehension Strategy Instruction intervention positively influences online comprehension levels. The researcher used qualitative data produced by focus group sessions and reflective logs to explore what individual comprehension strategies pupils found most useful when comprehending online.

This chapter also outline how the researcher employed a random stratified sampling technique for recruiting quantitative participants. This sampling technique allowed the research to divide the target sample into homogenous groups. For the purposes of qualitative data collection the researcher employed purposive sampling. This allowed the researcher to

effectively explore what individual comprehension strategies pupils found most useful when comprehending online. This study was set in a large, mixed, urban primary school in North county Dublin. Participants who partook in the study ranged in age from 7 to 10 years. 84 female participants ($n = 84$) and 76 male participants ($n = 76$) partook in this study.

The instructional programme used in the treatment conditions of this study were based on a common framework used to teach pupils how to apply comprehension strategies to online texts. 'The Gradual Release of Responsibility model,' (Pearson and Gallagher, 1983, Coiro et al, 2014) was used by the teachers to scaffold pupils in their use of new comprehension strategies. While, the 'Think-Aloud' approach was used to model correct strategy use (Coiro, 2011). Also as part of each comprehension strategy instructional programme, pupils worked collaboratively and engaged in authentic practice situations to develop their strategy use (Castek, 2008).

Data collection tools used in this study include the ORCA primary and internet usage and ability questionnaire. The ORCA primary was administered to all conditions pre and post intervention. The ORCA primary was used to assess the online comprehension performance of participants. An internet usage and ability questionnaire was administered to all participants prior to intervention and post intervention. The internet usage and ability questionnaire was used to acquire descriptive statistics relating to participant internet usage and participant internet skill levels.

Preliminary quantitative data analysis involved the researcher running a priori power analysis in order to assess the required sample size for the study. This was followed by a standard multiple regression to ascertain what contribution the extraneous variables of *Prior Topic knowledge* and *Internet ability* made to pre-test ORCA primary revised scores. The researcher then examined descriptive statistics relating to the participants' internet usage and internet skill levels. Finally the researcher, used Kruskal-Wallis tests to ascertain whether there was a significant difference in post ORCA primary scores for different across age and gender in each condition. Primary analysis involved the use of Wilcoxon Signed rank tests to examine the difference in difference in online comprehension levels from Time 1 to Time 2 in all conditions, Primary analysis also involved the use of Kruskal-Wallis tests to determine if there was a significant difference between the control and each of the treatment conditions in post ORCA primary scores. Analysis of ORCA primary Subscale was then conducted using Wilcoxon Signed rank tests.

Finally, the researcher described measures put in place to address any ethical considerations. These measures included seeking permission to conduct the study from the school principal and seeking parental consent for participant participation. Other measures implemented to address ethical concerns included participant briefing and debriefing. The researcher also took into account ethical considerations associated with the focus groups and experimental research.

Chapter Four

Presentation of Findings

Introduction 4.0

This chapter will outline the preliminary and primary quantitative results of data analysis procedures. Initial preliminary analysis involved the researcher conducting a power analysis to ensure that the sample size produced sufficient power. Further preliminary analysis focused on using descriptive statistics to examine the demographic characteristics of the condition groups relating to internet access and usage. As part of the Preliminary stage of analysis the researcher also sought to investigate through regression analysis whether the extraneous variables of prior topic knowledge and internet skills ability level interfered with the dependent variable. Following the preliminary analysis stage, the researcher then started the main analysis process to test the hypothesis that a combined New Literacies and Print Comprehension Strategy Instruction intervention positively influences online comprehension levels. This involved conducting a Kruskal- Wallis test comparing the Post intervention ORCA Primary scores between the four conditions to ascertain if there was a significant difference between condition scores. As the Kruskal-Wallis test could not account for the main effect of time, a series of Wilcoxon Signed Rank Tests were run to compare the participants' pre and post ORCA scores for each condition. The researcher also conducted a series of Wilcoxon signed rank tests to examine if there was a significant difference in on Locating, Critically Evaluating and Synthesising ORCA primary sub scale scores pre and post intervention. The researcher then analysed ORCA primary and internet skill scores across age and gender. A Kruskal- Wallis test was conducted based on data in each condition to investigate if there was a significant difference in the post ORCA primary across age. The researcher also employed a series of Mann Whitney U tests to compare the performance of the 7 to 8 and 9 to 10 age groups on each item of the Internet Usage and Skills Questionnaire's skill subsection across the four conditions. The researcher used a Kruskal-Wallis test based on data in each condition to investigate if there was a significant difference in the post ORCA primary scores of males and females. Analysis of the impact of gender also included a series of Mann-Whitney *U* tests to compare the performance of the males and females on each item of the Internet Questionnaire skill subsection. Finally, qualitative findings will be presented based on the thematic Analysis of focus group and reflective log data.

Preliminary Analysis of Quantitative Findings 4.1

The researcher ran a priori power analysis in order to assess the required sample size to reliably detect the expected effect size. A power analysis for all three types of significance tests in a mixed ANOVA (between subjects; within subjects; and interaction) revealed that a total sample size of 75 would achieve power of 80% for detecting a medium sized effect ($d=0.4$) when employing the traditional .05 criterion of statistical significance. As a result of this analysis the researcher recruited an overall sample size well in excess of 75.

Descriptive analysis was conducted to explore the extent of participants' internet usage and internet skill levels prior to intervention. The researcher began by exploring internet usage patterns amongst the condition groupings. Frequencies analysis indicated that across the four conditions participants reported that they had on average 72 ($n=160, M=72, SD=2.5$) devices in their households connected to the internet. Please see the condition breakdowns for devices connected to the internet in participant households below (See Figure 1).

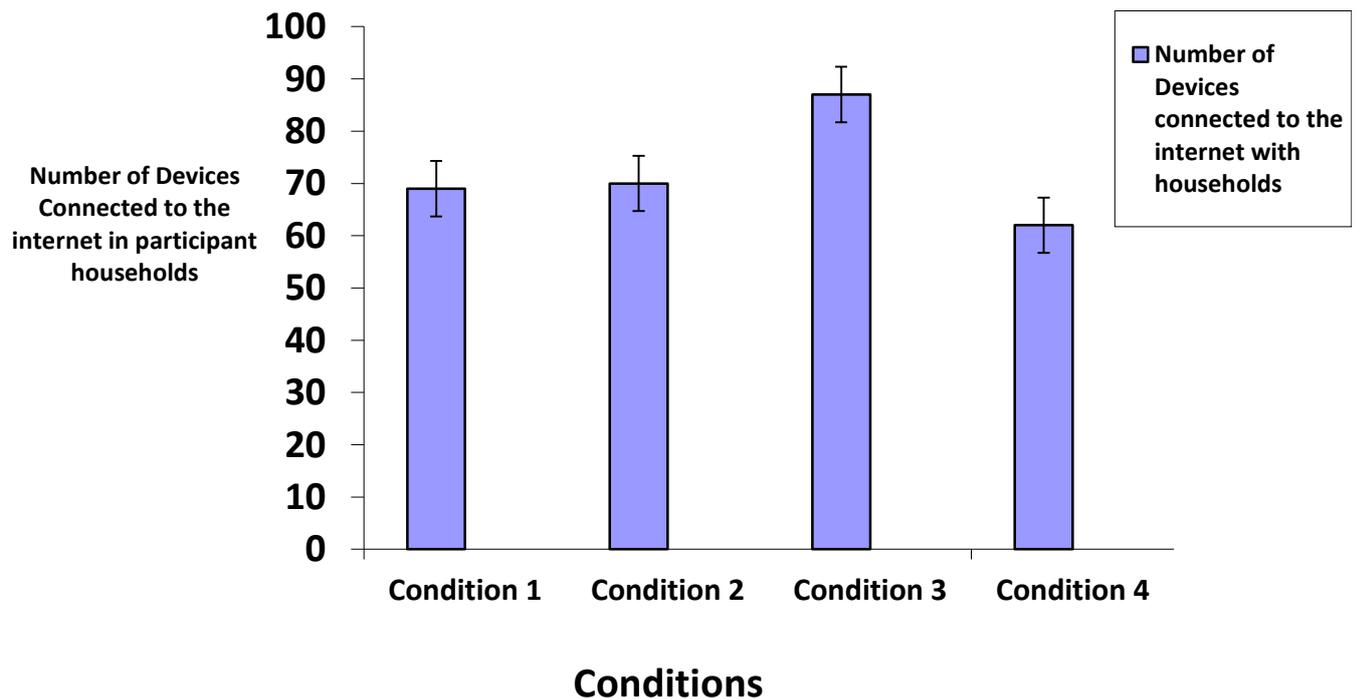


Figure 1
Figure displaying the number of total devices connected to the internet in participant households for each Condition.

These frequencies revealed that in Condition 1 20% of participants use the internet 'Lots of Times a Day' in school. Analysis of Condition 3 descriptives revealed similar results with

23% of participants reporting that they use the internet at school ‘Lots of Times a Day’. These figures were lower in Conditions 2 and 4 both standing at 11%. As a general trend more participants reported using the internet ‘Lots of Times a Day’ at home than in school with the exception of participants in Condition 4 and Condition 1. A further breakdown of these results can be seen in *Appendix M*. Examination of descriptive statistics also indicated that 34% of Condition 1 of participants and 20% of participants in Condition 2 never use the at home. Similar findings were ascertained for Condition 3 with 18% of respondents reporting that they never use the at home. These findings are interesting given the number of devices connected to the internet within participant households. Details of all participant responses from each condition can be seen in *Appendix N*.

The researcher also wished to use descriptive statistics to explore any patterns or trends in participants’ pre-intervention internet skill levels across condition groupings. The researcher used the internet skill subscale of the internet usage questionnaire to examine participant skill levels in a range of internet related areas. Those skills included searching for general information on the internet, searching for specific information on the internet, picking the best websites when given a list of search engine results, reading information on the internet, writing and sending emails and using the internet to ask a question. Interpretation of descriptive statistics revealed some notable differences between conditions (*See Appendix O-R*). This lead the researcher to conduct a standard multiple regression to investigate the contribution of internet skill ability to pre-test ORCA elementary revised scores.

Table 4.1
Table outlining the mean and standard deviation scores on prior topic knowledge assessments for each condition.

	Condition 1	Condition 2	Condition 3	Condition 4
<i>n</i>	40	40	40	40
Male	16	18	21	21
Female	24	22	19	19
Mean Score	0.22	0.45	0.36	0.50
<i>SD</i>	0.46	0.74	0.67	0.19

A standard multiple regression was conducted to ascertain what contribution the extraneous variables of *Prior Topic knowledge* and *Internet ability* made to pre-test ORCA primary scores. For the purposes of regression, Tabachnick and Fidell (2001: 123) provide a formula for calculating the sample size according to the number of independent variables been analysed ($N > 50 + 8m$ (where $m =$ Number of independent variables)). The researcher took this formula into account and selected 180 cases well in excess of the recommended threshold. Preliminary analyses were conducted to ensure no violation of the assumptions of normality, linearity, multicollinearity and homoscedasticity. The correlations between the extraneous variables were also examined. The correlation between the two variables was weak reported at $r = .18$, $p < .001$ which suggested that multicollinearity was most likely achieved.

A standard multiple regression was performed as the researcher had no theoretical grounds to determine the order of entry of the extraneous variables. The prediction model was not statistically significant $F(2,115) = .792$, $p = .455$, and accounted for approximately 1.4% of the variance of pre-test ORCA Elementary revised scores, $R^2 \text{ change} = .014$. In the final model both extraneous variables presented as not significant contributors to pre-test ORCA Elementary revised scores, with *Prior Topic knowledge* recording a higher Beta Value ($\beta = -.19$, $p = .21$) and *Internet ability* recording a lower Beta Value ($\beta = .04$, $p = .70$).

Primary Analysis of Quantitative Findings 4.2

Examination of the descriptive statistics suggested that the greatest increase in ORCA Primary scores from Time 1 to Time 2 occurred in the Combined Comprehension Strategy Instruction Condition (Condition 4). An inspection of the descriptive statistics also suggested that scores on the ORCA Primary increased from Time 1 to Time 2 in the control condition (Condition 1). However, this increase was modest in comparison to the increase in mean ORCA Primary scores seen in the treatment conditions. The greatest increases were seen in Condition 3 and 4. These trends can be seen in *Figure 2*.

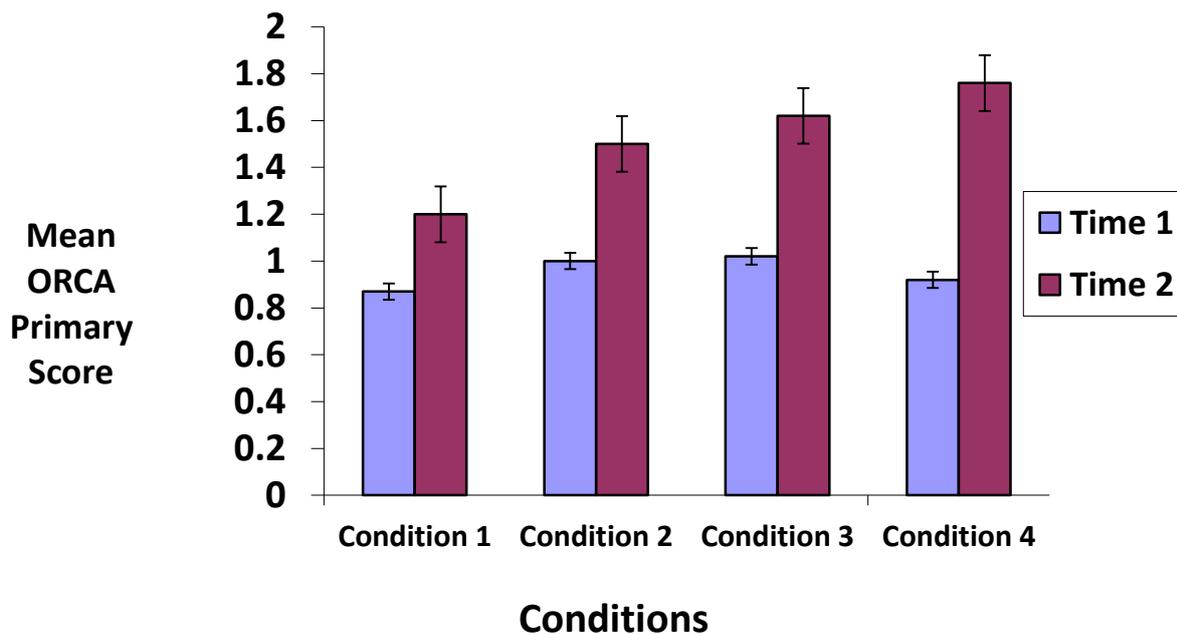


Figure 2
 Figure displaying the mean pre and post ORCA Primary Scores for each Condition.

The researcher also compared the differences in pre and post participant ratings on the Internet Usage and Skill Questionnaire skills’ scale for each condition. This involved an examination of percentage differences in participant self-ratings for each item on the internet skill scale. The results of which, are quite extensive and can be viewed in *Appendix O-R*.

The researcher wished to conduct a mixed between within subjects Anova to analyse if the independent variables have a main effect as well as reporting if the interaction between these variables is significant. However, normality tests revealed that the data was non-parametric. There is no direct non-parametric alternative to the mixed between within subjects Anova so a Kruskal-Wallis and series of Wilcoxon Signed rank tests were conducted. The Kruskal-Wallis test did not reveal a statistically significant difference in Post intervention ORCA Primary scores between the four conditions $X^2(3, n=160)=1.96, p=.58$.

The Wilcoxon Signed Rank Tests were run because the participants in each condition were measured on the dependent variable on two occasions, at Time 1 (Pre intervention) and at Time 2 (Post intervention). The Wilcoxon Signed Rank Test was chosen ahead of the paired samples t-test because the data collected in each condition was non-parametric. The researcher applied the Bonferroni correction to control for Type 1 errors. The Wilcoxon Signed Rank Tests were using Bonferroni adjusted alpha levels of .0125 per test (.05/4).

Wilcoxon Signed Rank Tests revealed no statistically significant difference in ORCA Primary revised scores from Time 1 to Time 2 in the control condition $z = -1.33$, $p = .18$, with a medium effect size ($r = .14$). Wilcoxon Signed Rank Tests also failed to indicate statistical significance in pre and post ORCA Primary revised scores in the Print Comprehension Strategy Instruction (Condition 2) and New Literacies Comprehension Strategy Instruction (Condition 3) conditions.

However, Wilcoxon Signed Rank Test did reveal a statistically significant increase in ORCA Primary scores from Time 1 to Time 2 in the Combined instructional condition, $z = 2.35$, $p = .01$, with a medium effect size ($r = .3$). The details of these results are outlined in *Table 4.2*.

Table 4.2
Table displaying the results of the Wilcoxon Signed Rank Tests and median ORCA Primary scores for each condition.

	Condition 1	Condition 2	Condition 3	Condition 4
<i>z</i>	-1.33	-1.44	-1.81	-2.35
<i>p</i>	.18	.15	.06	.01
<i>r</i>	.14	.16	.2	.3
<i>Md</i> (Time 1)	.5	0	0	1
<i>Md</i> (Time 2)	1	1	1	1

The researcher compared the individual strategy performance of participants using the post Internet Usage and Skills Questionnaire skills scale ratings and Locating, Critically Evaluating and Synthesising ORCA Primary sub scale scores. There were no sub-scales available for the Reading to Identify Important Questions or Reading and Writing to Communicate Online Information strategies.

The researcher examined the pre and post data for the subscales for normality. This examination indicated that the data sets were non-parametric. As a result, the researcher conducted a series of Wilcoxon signed rank tests to examine if there was a significant difference in on Locating, Critically Evaluating and Synthesising ORCA primary sub scale

scores pre and post intervention. As the researcher was conducting a series of Wilcoxon signed rank tests the Bonferroni correction was applied to control for type 1 error.

After the adjusted Bonferroni alpha value was applied ($p=.00$) a Wilcoxon Signed Rank Test indicated a statistically significant increase in the Locating ORCA primary sub scale from Time 1 to Time 2 in the Combined Comprehension Strategy Instruction condition $z = -3.00$, $p = .00$, with a medium effect size ($r = -0.33$). However, Wilcoxon Signed Rank Tests revealed no statistically significant difference in Critically Evaluating and Synthesising ORCA primary sub scale scores from Time 1 to Time 2 in the treatment conditions. The details of these results are outlined in *Table 4.3*.

Table 4.3
Table displaying the results of Wilcoxon Signed Rank Tests analysing differences in pre and post Locating ORCA Primary subscale scores for the treatment Conditions.

	Condition 2	Condition 3	Condition 4
z	-3.036	-2.681 ^b	-3.00
p	.002	.007	.00
r	-0.34	0.3	-0.33
Md (Time 1)	0	0	0
Md (Time 2)	2	1	2

Table 4.4
Table displaying the results of Wilcoxon Signed Rank Tests analysing differences in pre and post Critically Evaluating ORCA Primary subscale scores for the treatment Conditions.

	Condition 2	Condition 3	Condition 4
z	-.771	-1.594 ^b	-1.66
p	.440	.111	.09
-1.414 r	0.09	0.1	-0.1
Md (Time 1)	1	0	0
Md (Time 2)	2	2	2

Table 4.5

Table displaying the results of Wilcoxon Signed Rank Tests analysing differences in pre and post synthesising ORCA Primary subscale scores for the treatment Conditions.

	Condition 2	Condition 3	Condition 4
<i>z</i>	-1.414	-.378 ^b	-1.98
<i>p</i>	.157	.705	.04
<i>r</i>	-0.15	0.04	-0.22
<i>Md</i> (Time 1)	0	0	0
<i>Md</i> (Time 2)	2	1	2

Analysis of Age 4.3

The researcher wished to examine the effect of age on participant post ORCA primary scores across the four condition groupings. A Kruskal-Wallis test was conducted in each condition to investigate if there was a significant difference in the post ORCA Primary scores of 7, 8, 9 and 10 year olds. In Condition 1, a Kruskal- Wallis test revealed a significant difference across age in post ORCA primary scores $X^2(4, n=40) = 12.90, p = .01$. The Kruskal-Wallis test did not reveal a statistically significant difference in Post intervention ORCA primary scores across age in Condition 2, Condition 3 and Condition 4 (See Table 4.6).

Table 4.6

Table displaying the results of Kruskal Wallis Tests investigating the effect of age on post ORCA Primary scores for each condition

	<i>n</i>	<i>df</i>	X^2	<i>p</i>
Condition 1	40	4	12.90	.01
Condition 2	40	3	.941	.81
Condition 3	40	3	3.9	.26
Condition 4	40	3	6.08	.10

An examination of mean ranks scores across the four conditions revealed that participants aged from 9 to 10 years consistently outperformed participants aged 7-8 on post ORCA primary scoring (*See Appendix S-V*). This prompted the researcher to compare the results of the Internet Questionnaire skill subsection for the two age groupings, 7 to 8 years and 9 to 10 years. This involved the researcher conducting Mann-Whitney *U* tests comparing the performance of the two age groups on items of the Internet Questionnaire skill subsection. The researcher selected items where a notable difference was apparent between age groups in descriptive statistics. These figures suggested that 7 to 8 year olds scored consistently lower than 9 to 10 year olds on a range of comprehension related skills including the ability to critically evaluate, communicate and locate information online. The researcher conducted Mann-Whitney *U* tests investigating if there was a significant difference between the 7 to 8 years and 9 to 10 years in critically evaluating online, communicating online and locating information online. By selecting individual items for Mann-Whitney *U* test analysis the researcher reduced the risk of Type one error occurring.

Table 4.7
Table displaying the results of Mann-Whitney U Tests investigating the differences between 7to 8 and 9 to 10 year olds on Internet Usage Questionnaire-Skills subscale items.

	<i>n</i>	<i>Md</i>	<i>U</i>	<i>z</i>	<i>p</i>	<i>r</i>
<i>Critically Evaluating Online Information</i>	160	4	2037	-1.531	.126	0.1
<i>Communicating online</i>	160	4	2096	-1.284	.199	0.1
<i>Locating information online</i>	160	3	2133	-1.114	.265	0.08

Analysis of Gender 4.4

The researcher also wished to examine the effect of gender on participant post ORCA primary scores across the four condition groupings. A Kruskal-Wallis test was conducted in each condition to investigate if there was a significant difference in the post ORCA primary scores of males and females. In Condition 4, a Kruskal-Wallis test revealed a significant difference across age in post ORCA primary scores $X^2(1, n=40) = 3.92, p = .04$. The Kruskal-Wallis test did not reveal a statistically significant difference in Post intervention ORCA primary scores across age in Condition 1, Condition 2 and Condition 3 (*See Table 4.8*).

Table 4.8

Table displaying the results of Kruskal Wallis Tests investigating the effect of gender on post ORCA Primary scores for each condition.

	<i>n</i>	<i>df</i>	<i>X</i> ²	<i>p</i>
Condition 1	40	1	1.51	.21
Condition 2	40	1	1.75	.18
Condition 3	40	1	2.05	.15
Condition 4	40	1	3.92	.04

An examination of mean ranks scores across the four conditions indicated that females outperformed males on a range of skills measured using the Internet Questionnaire skill subsection (*See Appendix W-Z*). This prompted the researcher to compare the results of the Internet Questionnaire skill subsection across gender. This involved the researcher conducting Mann-Whitney *U* tests comparing the performance of males and females on items of the Internet Questionnaire skill subsection. The researcher selected items where a notable difference was apparent between age groups in descriptive statistics. These figures suggested that females outperformed males on a number of skill areas. While females outperformed males in a range of skill areas, the greatest difference in gender performance was in relation to communicating online, synthesising online and critically evaluating online. The researcher conducted Mann-Whitney *U* tests investigating if there was a significant difference between males and females in communicating online, synthesising online and critically evaluating online. By selecting individual items for Mann-Whitney *U* test analysis the researcher reduced the risk of Type one error occurring.

Table 4.9

Table displaying the results of Mann-Whitney U Tests investigating the differences between males and females on Internet Usage Questionnaire-Skills subscale items

	<i>n</i>	<i>Md</i>	<i>U</i>	<i>Z</i>	<i>p</i>	<i>r</i>
<i>Critically Evaluating Online Information</i>	160	4	517	-1.159	.246	0.09
<i>Communicating online</i>	160	5	486	-1.536	.124	0.1
<i>Synthesising information online</i>	160	4	572	-.510	.610	0.04

Presentation of Qualitative Findings 4.5

Thematic Analysis of Focus Group and reflective log data identified one theme, The Application of Individual Comprehension Strategies in Online Comprehension and Research. Within this theme three subthemes were identified; *Strategies used for Online Research*; *Strategies used for Online Comprehension* and *Ineffective Online Comprehension and Research Strategies*.

Subtheme One: Strategies used for Online Research 4.5.1

Thematic Analysis of qualitative data revealed that Condition 3 and 4 participants used the Reading to Identify Important Questions Strategy, the Reading to Locate Online Information Strategy, the Reading to Critically Evaluate Online Information Strategy, the Reading to Synthesise Online Information Strategy and the Reading and Writing to Communicate Online Information Strategy for online research purposes.

Evidence of the participants' application of The Reading to Identify Important Questions (RIQ) Strategy for research purposes can be clearly seen in qualitative data acquired through Focus group discussions and reflective log entries. In Focus groups Condition 3 and 4 participants consistently referred to the RIQ strategy as the 'most useful' strategy for research purposes. The participants cited many examples of how they used the RIQ strategy to conduct online research.

if you don't know anything you can go on the internet and ask a question but if you don't go on the internet you might not find it(the answer) for years or months

...like if you were curious about something you can ask a question on the internet

When you're not so sure about a thing and you can use a question to look it up the internet

...the internet makes you know more stuff when you come up with smart questions

An analysis of Reflective Logs also revealed how Condition 3 and 4 participants used the Reading to Identify Important Questions strategy to partake in online research.

I learned how to come up with good questions on the internet which helps me when I'm researching

When I want to find information on the internet, I need to come up with good questions

...pick a question then type in the question will give us an answer

...coming up with good questions means that you won't get too much information (on the internet)

Thematic analysis also revealed that participants typically used the Reading to Critically Evaluate Online Information (RCE) strategy when conducting online research. Participants highlighted the authentication of websites and website material as a key use of the RCE strategy. Participant discourse alluded to how the Reading to Critically Evaluate Online Information strategy allowed them to identify hoax websites and misinformation.

I learned some websites are fake and you can find out by the date

You can find out if the answer is wrong or not by checking your answer on other websites.

...if you think they (websites) are fake you need to go to another website to check if they are right

.ie you is like Ireland you can trust it and .org is like an organisation and you can trust it

The researcher's analysis of entries from Reflective Logs also suggested that the Reading to Critically Evaluate Online Information is useful when researching online. In Reflective Logs under the question 'What was important about what I learned?' the Condition 3 and 4 participants recorded

Some of the websites have different opinions some are right and some are wrong

The internet is sometimes wrong it can get you the wrong answer it is not always right

Try using another website if most of the websites are right then that website is right

On Wikipedia it's not always fact because someone has just written that

An analysis of qualitative data indicated that participants in Condition 3 and 4 applied the Reading to Locate Online Information (RLI) Strategy for online research. Focus Group data revealed that participants applied the RLI strategy for online research purposes.

When I used to use the computer I used to always click on the first thing that popped up I used to click without reading the descriptions I don't do that now

you don't have to go and read all of the information you just get the information to answer your question

First see a little bit about it but when you go on the website you can get more information and use that information

If you read underneath (the website description) its quicker and you find the information you want and when you go into the website you can get more of the right information

In Reflective Log entries participants reported that they learnt

It's best if you only read the most important information, you can look at the index and headings to help you get the answer to your question

You should only read the important parts and don't read the other parts otherwise it will take too long to find your answer

You read the information first because sometimes they have different things on the website and not the information you're looking for

I always used to click the first one that comes up but now I know you scroll down and click one that answers your question

When analysing the data, the researcher identified an overlap in participant responses coded as the 'Reading to Synthesise Online Information' and the print based Synthesising strategy. When the Synthesising strategy was applied to online texts its function became very similar to the Reading to Synthesise Online Information strategy. Responses from Focus Groups who

received Print Comprehension Strategy Instruction described how they applied the synthesis strategy to gather and integrate information during online research.

Just go somewhere else for the thing you wana know and join something up and you will get more knowledge

Similar responses were seen in the discourse of participants who experienced New Literacies Comprehension Strategy Instruction. Participants in Condition 3 and 4 outlined their use of the 'Reading to Synthesise Online Information' as gathering and culminating online information when conducting research

you gather all information up in one that will answer the big question that you want

...their colour. their food, where they live you gather all that up in one and that will answer the big question that you want

The application of the synthesising strategies for online research was also evident in reflective log entries including

All of them (websites) have different things and when you put them in one sentence together they can answer your question

Analysis of the datasets also suggested that Condition 3 and 4 participants used the Reading and Writing to Communicate Online Information Strategy when conducting online research. Several participant responses centred on the sharing of ideas to answer research questions online.

If some else knows the answer, they send it back to you

If you share with the other person they can give you the answer

Participants in Conditions 3 and 4 referred to many forums in which such an exchange of ideas could take place including social networks or through online messaging services.

If you put your (research) question on any messenger, write it to them, go on Skype, Viber or anything they might know and tell you

The researcher also identified responses in the Reflective Log entries of Condition 3 and 4 participants which suggested that the RCI Strategy was used for online research purposes. Some of those entries include:

It's good because you can talk to other people on the internet and if you don't know the answer they can tell you

Communicating it helps you because if you don't know the answer if you send them an email they send it back to you then it's in your head

Thematic Analysis of Qualitative data has clearly indicated that when conducting online research participants used the Reading to Identify Important Questions Strategy, the Reading to Locate Online Information Strategy, the Reading to Critically Evaluate Online Information Strategy, the Reading to Synthesise Online Information Strategy and the Reading and Writing to Communicate Online Information Strategy.

Subtheme Two: Strategies used for Online Comprehension 4.5.2

A further subtheme identified by the researcher was strategies used for online comprehension. Based on the datasets the researcher identified a number of strategies that participants in Conditions 2 and 4 used for online comprehension of single web pages or static online texts. Those strategies include Determining Importance, Monitoring, Making Connections and Questioning.

In the dataset a number of participants referred to the role of the Determining Importance strategy in their online comprehension of web pages. Numerous participants cited the large volume of information available on webpages as a significant challenge to successful online comprehension. Several participants described the cognitive overload they experienced when they did not employ the Determining Importance strategy.

if you read too much information (online) your eyes might hurt and you will forget it

When you read on the internet your brain gets too full of information

If you do read too much information (online) you will get confused

Participants in Condition 4 reported that when they employed the Determining Importance strategy their cognitive load was reduced and their online comprehension improved.

It's best if you pick out the important parts then you won't be as confused

Reflective log entries also echoed this theme,

If there is a really long paragraph on the internet and you're confused you should go back and pick out just the important bit

When reading on the internet you need to summarise so you can understand

This qualitative data indicates that participants employed the Determining Importance strategy to help them comprehend online texts.

Through further coding and thematic analysis of the data it became apparent that participants used the Monitoring strategy when comprehending static online texts. Condition 2 and 4 participants outlined how the Monitoring strategy helped him to decode unfamiliar words encountered on webpages.

Sometimes I get stuck on a word but now I just scroll down and read on then go back to it

You can declunk on the internet, like swimming pool you break it into swimming and pool

Reflective Log entries also captured the role of the Monitoring strategy in comprehending online text. A participant entry under the question ‘What was important about what you learned?’ read

When there are lots of words on the internet that you don't know you can sound them out

Participant responses from Condition 2 and 4 also highlighted how the Monitoring strategy was adapted and extended when applied to webpages.

There are long words which I didn't know I couldn't get them 'cause I didn't know it was really hard I was thinking what does this say until I clicked on an icon that I just clicked and I could listen to what the word is

If you have to read a sentence with a declunking word you can google the word you're stuck on

Yeah because there's an internet dictionary that you can type in and tells you what it means

A review of Qualitative data suggests that participants utilised the Monitoring strategy for online comprehension purposes.

Analysis of participant discourse and log entries suggested that the Making Connections strategy was used in the comprehension of static online texts. Condition 2 and 4 participant responses captured the similarities in Making Connections in the print and online environment.

When you're reading on the internet like about my pet dog and we have a pet dog as well then you can make a connection just like in a book

You make a connection like you're reading something on the internet and then you go down and see something you did before

Reflective Log entries also highlighted how the Making Connections strategy can be successfully applied to static online texts.

I can make connections on the internet like pictures on a website might show something that's happened to you

Finally, thematic analysis indicated that participants use the Questioning strategy for the comprehension of static online texts. In Focus Group discussions Condition 4 participants highlighted how they used the questioning strategy to facilitate their comprehension of static online texts

yes you can ask I wonder questions on the internet, it's the same as a book you just come up with questions about what you're reading

Reflective Log entries also suggested that participants in Condition 4 used the Questioning Strategy for online comprehension purposes.

You can ask I wonder questions on the internet like when we read on Britannica about the wolf like are there grey wolves in Ireland? How fast is the Grey Wolf?

Thematic Analysis of Focus Group and Reflective Log data suggests that participants used the Determining Importance, Monitoring, Making Connections and Questioning strategies for the online comprehension of single web pages or static online texts.

An analysis of qualitative findings suggest that the statistical significant increase in post ORCA Primary levels in the Combined Comprehension Instruction Condition may have been caused by the application of New Literacies online research and comprehension strategies for online research purposes and print comprehension strategies for the comprehension of static online text.

Subtheme Three: Ineffective Online Comprehension and Research Strategies 4.5.3

The researcher's analysis of the datasets revealed a third sub-theme; Ineffective Online Comprehension and Research Strategies. Analysis of Condition 2 and 4 participant transcripts and Reflective Log entries suggested that the Prediction and Inferring strategies did not transfer successfully to online texts.

Thematic Analysis revealed that participants found it challenging to apply the Prediction strategy in the absence of traditional prediction cues.

In a book there's pages with pictures where you can go to predict but there's no pages with pictures on the internet

In a book you can look at the picture and see what they are doing and make a prediction

There are no titles on the internet to predict

An examination of Focus Group transcripts revealed that participants felt that the Prediction strategy is redundant on the internet because reading online is self-directed with the reader selecting the content.

When you use the computer you know what you're going to do with it but with a book you have use your imagination to make a prediction about what's going to happen next

A lot of the time when you read on the computer you know what's going to happen next

Furthermore, participant entries in Reflective Logs suggested that the Prediction strategy was difficult to apply in an online environment.

On the internet it's kind of hard to predict

I don't think prediction is helpful on the internet

It's hard to predict on the internet, when you read a book you can use the pages in your book to predict

The researcher's analysis of the datasets also indicated that the 'Inferring Strategy' did not facilitate online comprehension or research. Reflective log entries captured participants' thoughts on the application of the inferring strategy online.

On the internet inferring is not that useful

I don't know how to infer on the internet

Condition 2 and 4 participants reported that they found it challenging to infer when reading online because of the informational text structure. Participants claimed that it was easier to use the inferring strategy with narrative texts found in storybooks.

You infer from what the author writes in a storybook not the internet

Inferring on the internet is harder than in a book

Conclusion 4.6

Results of a Wilcoxon Signed Rank Test revealed a statistically significant increase in online comprehension levels from Time 1 to Time 2 in the combined Print and New Literacies comprehension instruction condition. The hypothesis was supported by Wilcoxon Signed Rank Tests which revealed a statistically significant difference in online comprehension levels from Time 1 to Time 2 in the Combined Comprehension Instruction condition. In addition, the medium effect size ($r = -0.3$) reported for the Combined comprehension instructional approach (Condition 4) indicates that the practical or meaningful difference of this finding is noteworthy (McMillan and Schumacher, 2001). The hypothesis was further supported by Wilcoxon Signed Rank Tests revealed no statistically significant difference in online comprehension levels from Time 1 to Time 2 in the control, Print strategy instruction (Condition 2) and New Literacies strategy instruction (Condition 3) conditions. However, these findings should be interpreted with caution as a Kruskal-Wallis test revealed no significant difference in post ORCA scores between the control and combined instruction conditions. Further analysis included an examination of the age and gender variables. An analysis of age and post ORCA scores revealed no significant difference between age groups in conditions 2, 3 and 4. However, there was a significant difference between age groups in condition 1. In relation to gender, findings indicated that there was no significant difference in gender performance for post ORCA scores in conditions 1, 2 and 3. It is important to note that in Condition 4 gender analysis of post internet skills subscale ratings revealed that there was a notable and consistent difference between male and female scores. Thematic Analysis of focus group and reflective log data identified one main theme; The application and uses of individual comprehension strategies in online comprehension and research. Within this theme three subthemes were identified; strategies used for online comprehension research purposes; strategies used for online comprehension of static texts and strategies that were ineffective for either online research comprehension or online comprehension of static texts.

Chapter Five

Analysis of Findings

Introduction 5.0

This study investigated the effect of combined Print and New Literacies comprehension strategy instruction on, the online comprehension performance of Irish primary school pupils aged 7-10. The researcher analysed the pre and post ORCA Primary scores and Internet Usage and Ability Questionnaire (IUAQ) skills ratings of participants in each of the four conditions. Those four conditions included Condition 1; a control condition in which participants received no comprehension strategy instruction, Condition 2; in which participants received print comprehension strategy instruction, Condition 3 in which participants received New Literacies comprehension strategy instruction and Condition 4; in which participants received both New Literacies and print comprehension strategy instruction. This chapter will present a summary of findings and an analysis of the findings in relation to the research questions. As this is an embedded mixed methods study qualitative findings will be used to analyse and interpret quantitative results.

Firstly, a summary of quantitative findings will be presented and rejection of the null hypothesis will be considered in light of the findings presented. Then in order to interpret the overall differences between conditions reported by Wilcoxon-Signed Rank tests, the researcher will compare and contrast the individual strategy performance of participants across the four conditions. The researcher will compare the individual strategy performance of participants using ORCA Primary sub scale scores and post IUAQ skills ratings. The researcher will then analyse the findings of Kruskal-Wallis tests and interpret these results in light of the research questions. The researcher will then use Qualitative findings to analyse and interpret quantitative results. Next the researcher will present a theoretical explanation for findings relating to the research question. The researcher will then consider differences in online comprehension performance across age and gender. Finally, the researcher will consider the effect of limitations on the results of this study. Those limitations include the short intervention time, the suitability of the ORCA Primary as an accurate measure of online comprehension for 7 to 10 year olds, the possible interference of extraneous variables and the lack of depth and scope associated with qualitative data collected.

Summary of Quantitative Findings 5.1

The researcher hypothesised that a combined New Literacies and print comprehension instruction intervention would increase the online comprehension levels of a sample of Irish pupils aged between seven and ten years of age. The null hypothesis was rejected as the results of a Wilcoxon Signed Rank Test revealed a statistically significant increase in online comprehension levels from Time 1 to Time 2 in the combined New Literacies and print comprehension instruction condition. In addition, the medium effect size ($r = -0.3$) reported for the combined comprehension instructional approach (Condition 4) indicates that the practical or meaningful difference of this finding is noteworthy (McMillan and Schumacher, 2001). The hypothesis was further supported by Wilcoxon Signed Rank Tests which revealed no statistically significant difference in online comprehension levels from Time 1 to Time 2 in the control, Print strategy instruction (Condition 2) and New Literacies strategy instruction (Condition 3) conditions. However, these findings should be interpreted with caution as a Kruskal-Wallis test revealed no significant difference in post ORCA Primary scores between the control and combined instruction conditions. Further analysis included an examination of the age and gender variables. An analysis of age and post ORCA Primary scores revealed no significant difference for age groups in Conditions 2, 3 and 4. However, there was a significant difference between age groups in the control Condition. In relation to gender, findings indicated that there was no significant difference in gender performance for post ORCA primary scores in Conditions 1, 2 and 3. It is important to note that in Condition 4 gender analysis of post ORCA Primary scores revealed that there was a significant difference between male and female scores.

Interpretation of Primary findings 5.2

An examination of mean scores suggest that the greatest increase in post ORCA Primary scores was evident in Condition 4. A notable increase in post ORCA Primary scores was also evident in the New Literacies Condition. This increase was smaller than that recorded in Condition 4 (Combined Strategy Instruction) but larger than the mean post ORCA Primary scores for either Condition 2 (Print Comprehension Instruction) or Condition 1 (No Comprehension Instruction). The mean post ORCA Primary scores of participants in the Print Comprehension Strategy Instruction Condition revealed a modest increase from time 1 to time 2. This increase was greater than that evident in the control condition but smaller than the increases reported for the New Literacies and Combined Strategy Instruction Conditions.

In order to more fully understand the differences in overall condition results the researcher will compare and contrast the individual strategy performance of participants across the four conditions. The researcher will compare the individual strategy performance of participants using the post Internet Usage and Ability Questionnaire skills' ratings and Locating, Critically Evaluating and Synthesising ORCA Primary sub scale scores. There were no sub-scales available for the Reading to Identify Important Questions or Reading and Writing to Communicate Online strategies. It is important to note that the Internet Usage and Ability Questionnaire skills' ratings were completed by the participants and represent the participants' perception of their ability to apply specific strategies as opposed to an independent measure of their actual ability to use particular strategies.

An analysis of the results of this study clearly indicate that participants became more effective at applying 'The Reading to identify important questions strategy' (RIQ) after receiving comprehension strategy instruction in the New Literacies and Combined conditions. Evidence of this improved ability to apply RIQ can be clearly seen in post Internet Usage and Ability Questionnaire (IAUQ) skills ratings of participants in the relevant conditions. In Condition 3(New Literacies Strategy Instruction) and Condition 4 (Combined Strategy Instruction) participants demonstrated a marked improvement in their ability to use 'The Reading to identify important questions strategy.' Participants in Condition 3 recorded a notable decrease in the number of participants who rated themselves as a beginner at applying the RIQ strategy for research purposes, with Pre intervention levels of 42% falling dramatically to post intervention levels of 14%. Similar figures were reported for Condition 4 with the percentage of participants rating themselves as expert at 'using the internet to answer a question' rising from 17 % to 43%. These figures demonstrate that participants were better enabled to use the RIQ strategy post intervention in the New Literacies and Combined Comprehension Instruction Conditions. In contrast post Internet Usage and Ability Questionnaire skills ratings for the Control and Print conditions suggest that the participants' ability to apply the RIQ strategy for research purposes did not improve. In the control condition the participants' ability to apply the RIQ strategy at expert level fell from 33% to 21%. Similar findings were reported for the print condition with the participants' ability to apply the RIQ strategy at expert level falling by 20%. These figures demonstrate that participants were better enabled to use the RIQ strategy post intervention in the New Literacies and Combined Strategy Instruction Conditions.

The findings of this study clearly suggest that the participants' ability to apply the Reading to Identify Important Questions strategy for online comprehension research purposes improved post New Literacies intervention. This finding is in line with previous studies conducted in this area including Kuiper, Volman and Terwel (2007) and Kuiper and Volman (2008). However, while the findings of these studies offer useful insights into the application of the RIQ strategy neither studies' findings are transferable. According to Ary et al (2013: 600) transferability refers to 'the degree to which conclusions from a mixed methods study can be applied to other similar settings, people, time periods, contexts and the like.' In the study conducted by Kuiper et al, (2007: 666) participants were taught and assessed on their use of the RIQ through a 'content knowledge domain' of healthy food. This approach greatly limits the transferability of the findings as the results only apply to the use of the RIQ strategy within the specific 'content knowledge domain' of healthy food. Furthermore the results of this study are based on case studies which limits the population transferability of the study. This study offers transferable findings to support the claim that applying the RIQ strategy improves online comprehension when conducting research.

As outlined in the literature review theorists such as Leu and Zawilinski (2007: 47) and Drew, (2012: 326) have argued that picking the most suitable website from search engine lists is an essential skill associated with applying the Reading to Locate Online Information (RLI) strategy. The participants' ability to apply this skill was assessed using the Internet Usage and Ability Questionnaire-Skills subscale. Participants in Condition 3 (New Literacies Comprehension Strategy Instruction) and Condition 4 (Combined Comprehension Strategy Instruction) showed marked post intervention improvements in their ability to pick the best website from a list of results. In Condition 3 the percentage of participants who rated themselves as experts rose from 17% to 38%. Similarly in Condition 4 the percentage of participants who rated themselves as experts at 'picking the best website from a list of results' increased by 26% from pre to post intervention. These figures clearly indicate that post intervention participants in Conditions 3 and 4 felt more effective in applying the RLI strategy for online research purposes. Conversely, participants in the Control Condition recorded a drop of 25% in their Time 2 perceived ability to apply the RLI strategy post. However, participants in the Print condition did record an increase in the percentage of participants who rated themselves as expert at applying the RLI strategy. It is important to note that this increase was of 3% was modest when compared to the corresponding figures

for the New Literacies and Combined Comprehension Strategy Instruction conditions. These results should be interpreted with caution as the means of assessing the Reading to Locate Online Information strategy involved a measure of one aspect of the strategy ‘picking the most suitable website from search engine lists.’ Leu and Zawilinski, (2007: 47) suggest that the ability to efficiently locate information online requires four key skills;

knowing how to use a search engine to locate information; reading search engine results; reading a web page to locate information that might be present there; and making an inference about where information is located by selecting a link at one site to find information at another site

Had this measure encompassed all the skills associated with the RLI strategy participants in the print comprehension may not have recorded an increase. Overall, data sources indicate that participants in the New Literacies and Combined Comprehension Strategy Conditions became more proficient at applying the RLI strategy.

The researcher also analysed the participants’ performance in relation to the Reading to Locate Online Information strategy using the locating ORCA primary subscale adapted from similar subscales applied by Castek (2008) when using the ORCA Elementary and Kingsley (2011) when using the ORCA Elementary Revised. Results of a Wilcoxon Signed Rank Test indicated a statistically significant increase in locating scores from Time 1 to Time 2 in the Combined Comprehension Strategy Instruction condition $z = -3.00$, $p = .00$, with a medium effect size ($r = -0.33$). However, Wilcoxon Signed Rank Tests revealed no statistically significant difference in RLI scores from Time 1 to Time 2 in the Control, Print and New Literacies Conditions. It is important to note that had the Bonferroni correction not been applied a significant difference would also have been recorded for the New Literacies Condition. Given these findings and those acquired from the Internet Usage and Ability Questionnaire-Skills subscale it is fair to conclude that participants were more effective at applying the ‘The Reading to Locate information’ strategy after New Literacies and Combined Comprehension Strategy Instruction. These results are consistent with previous findings in the area.

A number of studies have reported that application of the Reading to Locate Online Information strategy improves online research comprehension. Those studies include Leu and Reinking (2005) and Kingsley (2011). Both Leu and Reinking (2005) and Kingsley (2011) used the Internet Reciprocal Teaching (IRT) Model. The IRT model shares many features with the instructional model used for this study such as initial teacher led instruction,

modelling of online reading comprehension strategies and a phase featuring independent inquiry. The findings of this study reinforce previous quantitative findings in this area and suggest that a model of instruction that features 'The Gradual Release of Responsibility model,' (Pearson and Gallagher, 1983) and structured opportunities to work collaboratively and engage in authentic practice situations can enhance pupils' ability to apply the RLI strategy.

A review of data acquired as part of this study suggests that participants in the New Literacies and Combined Conditions exhibited an increased ability to apply 'The Reading to critically evaluate' (RCE) strategy. Post Internet Usage and Ability Questionnaire-Skills subscale ratings support this claim. From pre to post intervention the percentage of participants who rated themselves as 'expert' at 'telling if information found on the internet is trustworthy' increased by 10% from time 1 to time 2 in the New Literacies condition. Likewise participants in the combined comprehension strategy instruction condition recorded an increase of 22% in the number of participants who rated their ability to critically evaluate online information as either very competent or expert. In contrast participants in the control and print conditions recorded a fall in the percentage of participants who rated themselves as expert at applying the RCE strategy. Participants in the control condition recorded a fall of 9% in the percentage of participants who rated themselves as expert at applying the RCE strategy. While participants in the print condition recorded a decrease of 27% for the corresponding figure. In contrast participants in the control and print conditions recorded a fall in the percentage of participants who rated themselves as expert at applying the RCE strategy. Participants in the control condition recorded a fall of 9% in the percentage of participants who rated themselves as expert at applying the RCE strategy. While participants in the print condition recorded a decrease of 27% for the corresponding figure. The fall in expert ratings may have been caused by the fatigue effect. The fatigue effect refers to the decline in participant performance that occurs with repetitive testing (Schweigert, 2011: 119). Brown (1999: 219) claims the fatigue effect arises when participants become 'tired, bored, or distracted' completing repeat assessments. The fatigue effect typically results in a deterioration in test scores which may explain the fall in expert ratings evident in Conditions 1 and 2 (Ray, 2011: 231).

The researcher also analysed the participants' performance in relation to the RCE strategy using the Critically Evaluating ORCA primary subscale adapted from similar subscales applied by Castek (2008) Kingsley (2011). Wilcoxon Signed Rank Tests indicated no

statistically significant increases in critically evaluating scores from Time 1 to Time 2 in any condition. However, an examination of median RCE scores shows the greatest increases occurred in the New Literacies and Combined Conditions. Review of the data clearly suggests that Condition 3 and 4 participants exhibited an increased ability to apply ‘The Reading to critically evaluate’ strategy.

The increases in the participants’ ability to apply the RCE are indeed notable given the findings of previous studies which suggest that online readers typically struggle with critically evaluating online information. Brand-Gruwel, Wopereis and Vermetten, (2005); Duijkers, Gulikers-Dinjens, Boshuizen, (2001) and Fuentes and Busqués (2000) have all reported that online readers find critically evaluating online information challenging. Walraven, Brand-Gruwel and Boshuizen (2008: 638) suggest that the main problems encountered by online readers trying to apply the RCE strategy is ‘evaluating search results, and evaluating and selecting sources and information.’ In fact Walraven et al (2008: 638) report that critically evaluating is particularly challenging for children because they tend to ‘believe that everything on the Web is true.’ In light of these findings the results of this study are all the more notable.

Quantitative data acquired through this study indicates that participants who received New Literacies and Combined Comprehension Strategy Instruction exhibited an increased ability to effectively apply the ‘Reading to Synthesise Online Information’ (RSI) strategy. Post Internet Usage and Ability Questionnaire-Skills subscale ratings in Condition 3 (New Literacies Comprehension Strategy Instruction) and Condition 4 (Combined Comprehension Strategy Instruction) demonstrated an improved ability to apply the RSI strategy. The Internet Ability Skills Scale assessed the participants’ self-rated ability to ‘bring together information from different websites on the internet.’ In Condition 3 participants recorded a 12% increase in ‘expert’ ratings. Similarly, Condition 4 participants reported a 29% to 40% increase in expert ratings at bringing together information from different websites on the internet.’ On the same item, participants in the control condition recorded a drop of 5% in their Time 2 scores. Surprisingly, participants in the print condition did record an increase in the percentage of participants who rated themselves as expert at applying the RSI strategy. It is important to note that this increase was of 1% was very modest in comparison to the corresponding figures for the New Literacies and Combined Conditions.

The researcher also analysed the participants' performance in relation to the RSI strategy using the Synthesis ORCA Primary subscale adapted from similar subscales applied by Castek (2008) and Kingsley (2011). When the Bonferroni correction was applied Wilcoxon Signed Rank Tests indicated no statistically significant increases in synthesising scores from Time 1 to Time 2 in any condition. However, had the researcher not applied the Bonferroni correction a significant difference in RSI scores would have been reported for the Combined Comprehension Strategy Instruction Condition. An examination of descriptive statistics also suggests that a considerable increase in RSI scores was evident in both the New Literacies and Print Comprehension Strategy Instruction conditions. The rise in RSI scores in the Print Condition can be explained by the overlap in the RSI and print based synthesis strategy. This overlap in the function of the synthesis and RSI strategies may also account for the modest rise in participants in the print condition who rated themselves as expert at applying the RSI strategy in the Internet Usage and Ability Questionnaire-Skills subscale. An overview of the quantitative data from this study clearly indicates that participants who received New Literacies and Combined Comprehension Strategy Instruction exhibited an increased ability to apply the 'Reading to Synthesise Online Information' strategy.

The findings of this study reflect previous findings in the area including Leu and Zawlinski (2007) and Ladbrook and Probert (2011: 105). Leu and Zawlinski's (2007) TICA project used qualitative methods to examine the effect of applying the Reading to Synthesise Online Information strategy amongst adolescents. While, the findings of the TICA project offer empirical evidence in support of applying the RSI strategy the findings are qualitative in nature and so offer no quantifiable conclusions. In addition, the TICA project was based on a sample of adolescents while this study has examined the application of the RSI strategy using a sampling ranging in age from 7 to 10 years. Ladbrook and Probert (2011: 105) employed qualitative methods and analysed the effect of applying the RSI strategy from the teacher's perspective. This study differs offering qualitative data that reflects the participants' perspective on the application of the RSI and other strategies. Leu et al (2013a: 228) claim that it is important to unearth participants' attitudes and feelings towards strategy use to discover 'possibilities for individual variation ... (that) could inform an upper-case theory of New Literacies in important ways' Leu et al (2013a: 228)

Analysis of the data revealed that participants felt that their application of the 'Reading and Writing to Communicate Online Information' (RCI) strategy improved after comprehension strategy instruction in Condition 3 (New Literacies Comprehension Strategy Instruction) and Condition 4 (Combined Comprehension Strategy Instruction). Internet Usage and Ability Questionnaire-Skills subscale assessed the participants' ability to apply the RCI strategy. Data suggested that participants were better enabled to 'write and send' emails post intervention in Condition 3 and Condition 4 with an increase in the number of participants who rated themselves as expert evident in both conditions. However, the corresponding figures for Conditions 1 and 2 recorded a decrease in the number of participants who rated themselves as expert at 'writing and sending emails.' Further data relating to the participants' perceived ability to 'Tell a friend how to read, write and share ideas on the internet' also indicated that participants in Conditions 3 and 4 were better at apply the RCI strategy post intervention. On this measure, Condition 3 participants recorded an increase of 31% participants who self-rated as 'expert' from pre to post intervention while in Condition 4 the percentage of participants rated as 'beginner' fell from 29% to 17%. In line with theoretical explanations put forward in the literature review participants in the Print and Control Conditions did not record an increase in their ability to 'Tell a friend how to read, write and share ideas on the internet'.

While the data presented thus far strongly suggests that participants exhibited an increased ability to use the 'Reading and Writing to Communicate online' strategy post intervention, the ORCA Primary adapted from the ORCA elementary revised did not contain items which assessed the participants ability to apply the 'Reading and Writing to Communicate online' strategy. This is a major flaw associated with the ORCA Primary which limits the researcher's ability to claim that participants improved in their ability apply the 'Reading and Writing to Communicate online' strategy. Future studies will need to use an online research comprehension tool that includes an element to assess the RCI strategy such as the ORCA - Blog (Leu et al, 2005). Kingsley (2011: 129) concurs stating 'making the online reading assessment authentic and incorporating online communication tools students might utilize outside of the classroom and in their future workplace should be a consideration.'

The primary findings of this study were based on the findings of a series of Wilcoxon Signed Rank Tests. A Wilcoxon Signed Rank Test revealed a statistically significant difference in

online comprehension levels from Time 1 to Time 2 in the Combined Comprehension Strategy Instruction Condition. However, Wilcoxon Signed Rank Test revealed no significant difference between pre and post intervention online comprehension levels for Condition 1, Condition 2 and Condition 3. In order to interpret these findings, the researcher conducted an analysis of individual strategy performance of participants using post Internet Usage and Ability Questionnaire skills' ratings and Locating, Critically Evaluating and Synthesising ORCA Primary sub scale scores. This analysis indicated that participants in the New Literacies and Combined Comprehension Strategy Instruction Conditions were better enabled to apply the Reading to Identify Important Questions, Reading to Locate Online Information, Reading to Critically Evaluate Online Information, Reading to Synthesise Online Information and Reading to Communicate Online Information strategies than those in the control and print conditions. An interpretation of primary findings must also include an analysis of Kruskal Wallis results which revealed no significant difference in post ORCA scores between the Control and Combined Comprehension Instruction conditions.

A Kruskal Wallis test revealed no significant difference in post ORCA scores between conditions. The findings of the Kruskal Wallis test may have been caused by the lack of power associated with non-parametric tests. Paulson (2003:520) suggests that 'because non-parametric statistics do not require set parameters they generally lack the power of parametric statistics.' Whitely and Ball (2002: 513) concur stating that nonparametric methods 'may lack power as compared with more traditional approaches.' Cohen (2008:750) argues that in comparison with the parametric ANOVA, there is 'somewhat reduced power available to the Kruskal Wallis.' In fact Cohen (2008:750) suggests that 'the power of the Kruskal Wallis compared with an Anova conducted on the same data is usually estimated at about 90%.' This reduced lack of power may have resulted in the Kruskal Wallis producing a non-significant difference between condition post ORCA scores. This view is supported by Paulson (2003:520) who suggests that the null hypothesis is more likely to be 'rejected by a parametric procedure' as non-parametric procedures lack 'power.' It is also possible that the small sample ($N=160$) was responsible for the insignificant results produced by the Kruskal Wallis test. McMillan and Schumacher (2001: 141) claim that statistical significance is 'directly related' to sample size. The larger a sample is the smaller the difference needed to produce statistical significance (McMillan and Schumacher, 2001: 141). Therefore, had a

larger sample been used in this study the Kruskal Wallis test may have revealed significant results.

Theoretical Explanation for Primary Findings 5.3

The overall increase in total ORCA Primary scores in the combined instruction condition was greater than the increase in the Print Comprehension Instruction Condition or the New Literacies instruction condition. This finding suggests that the Combined Strategy Instruction approach is may be more effective at promoting online comprehension levels then teaching Print or New Literacies comprehension strategies in isolation. These findings can be explained by theoretical views presented in the Literature review. Theorists such as Leu et al, (2015: 2), Leu et al, (2013c: 1167) and Leu et al (2011: 7) have suggested that successful online comprehension requires readers to employ both print and online research strategies. Leu et al (2015: 2) propose that print based strategies are necessary for online comprehension when online reading ‘occurs as isolated reading acts’ for example when reading a single webpage. Conversely, when online reading involves ‘inquiry and problem solving’ readers need to employ ‘additional’ New Literacies comprehension strategies (Leu et al, 2013c: 1164). The comprehension of a single webpage ‘is little different from offline reading comprehension’ (Leu et al, 2011:6). This is because the reader is comprehending ‘a fixed and limited text, with little or no social interaction, no connection to other texts, no searching for information and little if any control by the reader about what to read’ (Leu et al, 2011:6). When the reader comprehends a single webpage or non-hypertext the reader should employ print based comprehension strategies (Leu et al, 2013c: 1167). This claim that print based comprehension strategies are required to successfully comprehend static online texts is supported by qualitative results from this study. Thematic analysis revealed that participants applied the determining importance, clarifying, making connections and questioning strategies when comprehending single web pages or static online texts. When reading online involves ‘problem-based inquiry’ the reader will need to apply additional comprehension strategies and skills in order to ensure successful comprehension (Leu et al, 2013c: 1164). The online ‘problem-based inquiry’ process requires additional comprehension strategies

Because information is so vast online, it requires new reading skills to locate the specific information that you require. And, because anyone may publish anything online, it also requires additional new reading skills to critically evaluate the information that you locate. We also read and synthesize information in new ways online. In fact, we actually construct the texts that we read by the links we follow in our quest. And finally, online reading nearly always takes place while we are also composing messages: email, IM, blogs, discussion boards, and much more.

This claim that New Literacies online research and comprehension strategies are required to successfully comprehend when researching online is supported by qualitative results from this study. Thematic analysis revealed that participants felt that the New Literacies online research and comprehension strategies were most useful for online research purposes.

Analysis of Qualitative Findings 5.4

Thematic Analysis of Focus Group and reflective log data identified one theme, The Application of Individual Comprehension Strategies in Online Comprehension and Research. Within this theme three subthemes were identified; *Strategies used for Online Research*; *Strategies used for Online Comprehension* and *Ineffective Online Comprehension and Research Strategies*. Strategies that emerged under the subtheme, *Strategies used for Online Research* include; the Reading to Identify Important Questions Strategy, the Reading to Locate Online Information Strategy, the Reading to Critically Evaluate Online Information Strategy, the Reading to Synthesise Online Information Strategy and the Reading and Writing to Communicate Online Information Strategy. Strategies identified under the Subtheme, *Strategies used for Online Comprehension*; include Determining Importance, Monitoring, Making Connections and Questioning. Under Subtheme Three; *Ineffective Online Comprehension and Research Strategies*, two strategies emerged. Those strategies include Prediction and Inferring. Subtheme three will be presented later in the section.

The claim that print based comprehension strategies are required to successfully comprehend static online texts is supported by qualitative results from this study. Thematic analysis revealed that participants applied the determining importance, clarifying, making connections and questioning strategies when comprehending single web pages or static online texts. Participants reported that when they employed the ‘Determining Importance’ strategy their cognitive load was reduced and their online comprehension improved, *It’s best if you only read the important parts and don’t read the other parts*. Thematic analysis also revealed how participants applied the monitoring strategy to decode challenging words when reading static text ‘*You can declunk on the internet, like swimming pool, you break it into swimming and pool.*’ Analysis of participant discourse and log entries suggested that the making connections strategy was used in the comprehension of static online texts. Participant responses captured the similarities in ‘making connections’ in the print and online environment *When you’re reading on the internet like about my pet dog and we have a pet dog as well then you can make a connection just like in a book*. Finally, thematic analysis indicated that participants

use the questioning strategy for the comprehension of static online texts. Participants highlighted how they used the questioning strategy to facilitate their comprehension of static online texts *'you can ask I wonder questions on the internet like when we read on Britannica about the wolf like are there grey wolves in Ireland? How fast is the Grey Wolf?'* Thematic analysis clearly indicates that participants used the determining importance, clarifying, making connections and questioning strategies Print Comprehension strategies to comprehend static online text.

The claim that New Literacies online research and comprehension strategies are required to successfully comprehend when researching online is reinforced by qualitative results from this study. Thematic analysis revealed that participants felt that the New Literacies online research and comprehension strategies were most useful for online research purposes. Participants cited how the Reading to identify important Questions' strategy helped them in conducting online research *'...like if you were curious about something you can ask a question on the internet.'* Other participants explained how the 'Reading to Critically Evaluate Online Information' strategy facilitated their online research comprehension. Participants described how the Critically Evaluate Online Information strategy allowed them to tell *'if you can trust a website or not.'* Thematic analysis also identified the role of the 'Reading to Locate Online Information Strategy' in online research comprehension. Participants highlighted using the RLI strategy helped them save time when researching online *'You should only read the important parts and don't read the other parts otherwise it will take too long to find your answer.'* Thematic analysis also identified how the RSI and RCI strategies facilitated online research comprehension. Participants alluded to how they applied the RSI strategy to gather and integrate online information during online research. An analysis of Reflective log entries and focus group transcripts also suggested that participants used the RCI strategy for research purposes. Several participant responses centred on the sharing of ideas to answer research questions online. Thematic analysis of qualitative data has clearly indicated that participants applied New Literacies comprehension strategies for online research purposes.

Theory outlined in the Literature review coupled with qualitative findings Qualitative and Quantitative findings strongly suggest that statistical significant increase in post OCRA levels in the Combined condition was likely to be caused by the application of New Literacies online research and comprehension strategies for online research purposes and print comprehension strategies for the comprehension of static online text.

Previous studies conducted in the area such as such as Coiro (2007) and Coiro (2011) support the claim that online comprehension features a complex mix of Print and New Literacies comprehension skills. Coiro (2007, as cited in Kingsley, 2011:116) ‘found a significant correlation between prior reading achievement on standardized reading assessments and her online reading comprehension measures (ORCA-Scenario I and II).’ Coiro (2011) found similar results reporting that offline reading comprehension contributed a statistically significant amount of variance to the prediction of online reading comprehension. While these quantitative studies indicated that online comprehension involves a mix of both print and New Literacies strategies they did not elaborate on how this would affect online Comprehension Strategy Instruction or what suite of strategies should feature as part of effective Online Comprehension Strategy Instruction. However, the findings of this study are notable because they offer a quantitative insight into how the complex mix of traditional and online research comprehension skills can be distilled into a practical comprehension strategy instruction programme.

There are a number of qualitative studies that support the claim the successful online comprehension involves the application of both New Literacies and print based comprehension strategies. These studies include Schmar-Dobler, (2003), Coiro (2007), Zhang and Duke (2008) and Byeong-Young (2013). These qualitative studies generally involved using think-aloud protocol to document what strategies and skills were employed by successful online readers. Afflerbach and Cho (2008: 212) carried out an extensive analysis of 46 online think-aloud protocol studies. This analysis suggested that successful online readers use a combination of traditional print based strategies and novel online strategies. The strategies that emerged from the analysis were ‘identifying and learning text content, evaluating, monitoring... realizing and constructing potential texts to read... determining the most appropriate reading path, and managing a shifting problem space.’ However, it is important to note that these qualitative studies simply described the online comprehension strategies employed by successful online readers. These studies did not investigate whether a model of online comprehension strategy instruction featuring both New Literacies and Print strategies could enhance the online comprehension levels of online readers. Unlike previous studies in the area of online comprehension, the findings of this study provide quantifiable

results to suggest that effective online comprehension strategy instruction must include both print and new literacies comprehension strategies.

Under Subtheme Three; *Ineffective Online Comprehension and Research Strategies*, two strategies emerged. Those strategies were Prediction and Inferring. Thematic analysis indicated that that Condition 2 and 4 participants found that the Prediction strategy was ineffective online. Participant suggested that the Prediction strategy was difficult to apply in an online environment, '*On the internet it's kind of hard to predict*' and '*I don't think prediction is helpful on the internet.*' The prediction strategy may be less effective online because prior knowledge plays less of a role in online comprehension than paper-based comprehension (Coiro, 2011). The role of prediction in print based comprehension is to activate readers' schema relating to the text content (Courtney and Gleeson, 2010). However, studies such as Bilal (2000, 2001) and Coiro (2011) have reported that prior topic knowledge plays less of a role in online comprehension than in print based comprehension. This is because readers can access domain specific knowledge through search engines online (Willoughby et al, 2009). These findings would suggest that prediction based on activating prior topic knowledge is not as effective online. Rather future studies should aim to develop prior knowledge of how to navigate hypertexts and gather information online which has been shown to promote online comprehension performance (Coiro, 2011).

Thematic analysis also indicated that the 'Inferring Strategy' did not facilitate online comprehension or research. Participants suggested that inference strategy was not '*useful*' in an online environment. Participants were taught how to make inferences on the basis of content presented both in written and pictorial form. These types of content based 'bridging inferences' may play less of a role in online comprehension than in print based comprehension (Tierney, 2014: 265). This is because online comprehension is more reliant on the reader's use of 'forward inferences' (Coiro and Dobler, 2007: 242). Forward inference refers to predictions made about the possible path of hyperlinks and the information potential paths will unearth (Tierney, 2014: 265). These findings suggests that if the inferring strategy is to be effective for online comprehension purposes it must be adapted to include forward inference processes.

Examination of Age and Gender 5.5

A review of the age breakdown revealed no significant difference between age groups in post ORCA scores in Condition 2 (Print Comprehension Strategy Instruction), Condition 3 (New Literacies Comprehension Strategy Instruction) and Condition 4 (Combined Comprehension Strategy Instruction). However, there was a significant difference between age groups in Condition 1 (Control Condition). An examination of mean rank scores across all conditions indicates that 7 to 8 year olds scored consistently lower than 9 to 10 year olds in internet skill ability ratings. This claim is supported by much empirical evidence which suggests that because 7 to 8 year olds have more limited access to the internet they tend to score lower on measures of internet ability than their pre-adolescent counterparts (Espinosa, García and González, 2015). Espinosa, García and González (2015: 157) reported that participants in their study aged from 10 to 12 years of age ‘have more ...probabilities of using Internet with a mobile phone, whereas the device is a great aspiration between the young children who do not possess a smartphone.’ Data collected as part of the Webwise 2008 Survey of Children's Use of the Internet in Ireland suggests that as children mature their internet usage becomes more frequent due to increased access (Ó Briain and Nitting-Fulin, 2008). In the survey 94% of 9-12 year olds claimed to have access to the internet while 97% of 13-16 year olds had access.

Livingstone and Bober, (2005: 3) claim that ‘the older children get the more time they spend online.’ Data collected as part of this study corroborates this claim. The Internet Usage and Ability Questionnaire included items that required participants to record the number of devices connected to the internet in their household and how frequently they used the internet at home. These figures indicated that participants aged between 7 and 8 years recorded a lower degree of access (number of devices connected to the internet in their household) and a lower frequency of using the internet at home than 9 to 10 year olds. Thus it is possible that 7 to 8 year olds scored lower on internet skills ability ratings due to the more limited internet access associated with this age range.

Another possible explanation for the low scores of participants aged 7 to 8 years may have related to the validity and reliability of the ORCA Primary for this age group. The researcher did not have time to pilot the adjustments made to the ORCA Elementary Revised to account for the inclusion of 7 and 8 year olds. Castek (2008) and Kingsley (2011) used the ORCA

Elementary and ORCA Elementary revised to assess the online comprehension 9 and 10 year olds. Castek (2008) piloted the ORCA elementary with participants aged 9 to 10. Castek (2008) did tests for reliability which revealed an 'inter-rater reliability coefficient of .790 suggesting a moderate level of internal consistency. Castek (2008) also engaged in a vigorous process to assess the validity of the ORCA elementary. This process involved piloting the ORCA elementary on two pupils within the appropriate age bracket and a review process liaising with members of the expert panel and teachers involved in the research process. However, the researcher in this study did not pilot the ORCA Primary with children aged from 7 to 8. Therefore, it is unclear as to whether the ORCA Primary is a valid and reliable measure of online comprehension and research amongst 7 to 8 year olds. This may have accounted for the low internet ability ratings of participants aged 7 to 8 years.

Gender analysis of post ORCA scores revealed that there was a significant difference between male and female post ORCA scores in Condition 4 (Combined Comprehension Strategy Instruction). Analysis of Internet Usage and Ability Questionnaire ratings revealed that females outperformed males on a number of skill areas including the ability to apply the Reading and Writing to Communicate Online Information strategy. These findings are consistent with previous findings relating to gender differences in the use of reading comprehension strategies in the print environment. Studies including Spearritt (1977) and Hyde and Linn (1988) have reported a gender difference in reading comprehension performance with females typically outperforming males in reading comprehension tasks. Furthermore, Hedges and Nowell's (1995) meta-analysis of gender differences in studies of reading comprehension reported that studies generally reported significant differences with females outperforming males. While print comprehension strategy instruction studies have reported a gender difference, it remains unclear if such a gender difference exists for online comprehension strategy use.

It is important to note that a review of the findings indicates that there was no significant difference in gender performance for post ORCA scores in conditions 1, 2 and 3. Although there was no significant difference in gender performance for post ORCA scores in conditions 1, 2 and 3 an examination of the performance of males and females in relation to specific strategies in these conditions indicates that females outperformed males on the majority of measures. An examination of mean rank scores suggests that males are more effective at applying the Reading to Identify Important Questions strategy than their female counterparts. On the item 'Using the internet to answer a question' males outscored females

in all conditions except Condition 3. However, in condition 3 the female and male mean ranks were very close standing at 11.05 and 10.95 respectively. Overall, these figures would suggest that males are better at applying the RIQ strategy than females. These findings are consistent with previous research including McDonald and Spencer (2000) and Jackson (2001) who found that males outperformed females in devising and answering research questions online. Jackson (2001) suggests that this is the case because ‘men are more information/task oriented than are women.’ Analysis of mean rank scores also suggests that females are more effective at applying the Reading to Locate Online Information Strategy than males. Females in Conditions 1, 3 and 4 recorded higher perceived rating scores on the item ‘Picking the best website from a list of results’ than did males. These findings contradict previous research in the area which suggests that as males typically spend more time using search engines they are more adept at selecting relevant sites from a search list (Faulkner and Lie, 2006). A review of mean ranks scores based on the application of the Reading to Critically Evaluate Online information revealed that females consistently outscored males. In all four conditions females rated themselves higher at ‘Telling if information found on the internet is trustworthy.’ These findings are not consistent with previous research in the area of critical thinking. For example, Ingle (2007) and Loken (2005) reported no gender differences in critical thinking and Facione (1990) reported that males scored significantly higher on measures of critical thinking. However, these studies have examined gender differences in critical thinking offline, this may mean that females are better at critically evaluating online. Further studies are necessary to fully investigate the reliability of this finding. Finally, a comparison of male and female ratings for applying the Reading to Synthesise Online Information strategy revealed that females outscored males. Again in all four conditions females outscored males on their ability to ‘bring together information from different websites on the internet.’ These findings reflect the results presented by Kingsley (2011: 120) who reported that regression analysis revealed that ‘gender did not play a role in online reading performance’ but that female participants had a ‘stable advantage’ over males in the application of individual online comprehension strategies. A review of quantitative and descriptive statistics suggests that female participants were better at applying the majority of individual online comprehension strategies. This is especially true for the RCI strategy with females outperforming males on the application of the RCI strategy in every condition.

An analysis of Internet Usage and Ability Questionnaire responses strongly suggests that females are more adept at applying the Communicating strategy than males. Across all four

Conditions females rated their proficiency for ‘Telling a friend how to read, write and share ideas on the internet’ higher than their male counterparts. Furthermore, in Conditions 1, 2 and 4 females reported greater proficiency for ‘writing and sending emails’ than did males. These findings very much reflect previous findings in the area. McSporrán and Young (2001: 3) and Weiser, (2000) have reported that females are better at communicating online. Several large scale surveys including the Pew Research Centre’s (PRC) Internet and American Life Project conducted in 2016 and the Nielsen Social Media Report conducted in 2012 have indicated that females typically engage in more online communication than their male counterparts. PRC (2016) reported that adult females use social media more often daily than males surveyed. Similar figures were reported for adolescent females with a PRC survey of American teens revealing that females are more likely to use social networking sites such as Instagram and Tumblr. According to Thayer and Ray (2006: 433) women use the internet for communication purposes because their internet usage is driven by ‘a need for interpersonal communication.’ This contrasts with males who typically use the internet for building web page, searching for romance, reading the news, and playing games’ (Thayer and Ray, 2006: 433).

Limitations 5.6

ORCA Primary Validity 5.6.1

The ORCA Primary was used to assess the pre and post online comprehension scores of participants. The ORCA primary was adapted from the ORCA Elementary (Castek, 2008) and Kingsley’s (2011) ORCA Elementary revised. The researcher made revisions to Castek’s (2008) ORCA Elementary and Kingsley’s (2011) ORCA Elementary Revised to cater for the 7 to 11 age range of participants. It is important to note, that Castek (2008) designed the ORCA Elementary to assess the online comprehension and research skills of pupils aged between nine and ten while Kingsley’s (2011) designed the ORCA Elementary revised for participants aged ten. Castek (2008) engaged in an extensive piloting process, after which the ORCA Elementary was deemed a valid measure of online research and comprehension among samples aged nine to ten. However, due to time constraints the researcher did not pilot the ORCA Primary on pupils aged between 7 and 8 years of age. As a result, the validity of the ORCA Primary must be questioned. Another aspect of the ORCA Primary that may undermine the validity of the scale is the range of strategies and skills assessed by the ORCA Primary. Based on Kingsley’s (2011) ORCA Elementary Revised, the four tasks in the

ORCA Primary assess the Reading Online to Identify Important Questions,’ ‘Reading online to Locate Information,’ ‘Reading online to critically evaluate information’ and the ‘Reading Online to Synthesise Information’ strategies. The ‘Reading and Writing to Communicate Online information’ strategy is not assessed by the ORCA Primary. This is a major flaw associated with the ORCA Primary as the RCI strategy is ‘inextricably linked to aspects of online research and comprehension’ (Leu et al, 2015: 4). Without the inclusion of the communicating strategy the validity of the ORCA Primary is undermined. These queries over the validity of the ORCA Primary not only bring into question the non-significant Kruskal-Wallis results but also the significant result produced by the Wilcoxon signed rank test which reported a significant difference in pre and post scores in the Combined Instruction Condition.

Length of Intervention Time 5.6.2

In this study the participants in the treatment conditions were taught how to use Print and New Literacies comprehension strategies in one hour sessions over an eight week period. This intervention time is short when compared to the periods of intervention used in previous studies. In terms of print comprehension strategy instruction intervention studies that achieve positive results typically last from between three months (See Anderson, 1992) and a year (See Brown et al, 1996). New Literacies studies that have reported positive results for online research and comprehension instruction interventions have typically taken place over a year (Reinking and Bradley, 2004). Studies that did not reveal positive effects were generally shorter. For example Castek’s (2008) fifteen week intervention produced inconclusive results with the control group outperforming the experimental group on some measures of online comprehension. Furthermore, the Building Bridges of Understanding (Courtney and Gleeson, 2008) framework adapted by the researcher for print comprehension strategy instruction purposes advises that ‘thoroughly’ teaching comprehension strategies should involve the instruction of ‘fewer strategies... over a year.’ Allington and McGill-Franzen (in Israel and Duffy 2014:566) support this view stating that ‘effectively developing reading comprehension proficiencies...takes substantial time.’ This is because the aim of comprehension strategy instruction is the automatic and independent use of strategies. Hoffman (in Israel and Duffy, 2014: 67) suggests that in order to achieve strategy automaticity readers have to go three stages; how to use the strategy in context, when to use the strategy and how to use the strategy with increasing effectiveness and sophistication. Progression through these stages requires extensive ‘practice and experience’ over a lengthy

period of time (Hoffman, in Israel and Duffy, 2014: 67). Therefore, in this study it is likely that participants did not achieve automaticity in strategy use which may have hindered their performance on the ORCA Primary. These claims suggest that had longer intervention periods featured as part of this study a significant difference between conditions may have emerged.

Extraneous Variables 5.6.3

The researcher endeavoured to limit the effect of extraneous variables by assessing participants' prior topic knowledge and pre-existing internet skill levels. After measuring participants' prior topic knowledge and pre-existing internet skill levels, the researcher completed a regression analysis to assess if either variable made a significant contribution to the dependent variable of post ORCA scores. Regression analysis revealed that neither variable significantly contributed to the variance in the dependent variable. As a result the researcher felt that it was not necessary to account for the effect of prior topic knowledge and pre-existing internet skill levels when completing primary data analysis. However, while the researcher considered the possible effect of prior topic knowledge and pre-existing internet skill levels on the dependent variable the effect of other extraneous variables were not accounted for. The researcher failed to consider how the dependent variable may have been affected by offline reading ability and internet usage.

The researcher wished to control for the effect of offline reading ability. However, as a result of school policy it was not possible to acquire the reading ability levels of the participants. It is therefore possible that participants' offline reading ability levels varied across conditions. A number of studies have reported that offline reading achievement ability is a predictor of online comprehension performance. This claim is supported by the findings of Leu et al (2015: 7) who found that the Connecticut Mastery Test (CMT) a state reading measure of offline reading achievement was significantly associated with ORCA scores. Similar results were reported by Coiro and Dobler (2007) and Kingsley (2011: 98). Coiro and Dobler (2007: 244) reported that their findings indicated a 'relationship between standardized scores of printed text comprehension and measures of Internet text comprehension'. Kingsley (2011: 98) also reported that standardised reading achievement scores was a predictor of online comprehension performance. These findings suggest that in order to accurately measure online comprehension levels it is necessary to control for the effect of offline reading achievement ability. This study failed to do so and as a result the offline reading achievement

ability of participants may have interfered with the measurement of the dependent variable of online comprehension levels and skewed results.

The research did not put measures in place to control for the effect of internet usage on measurement of online comprehension scores. Previous studies have indicated that internet usage is a predictor of online comprehension performance. Kingsley's (2011: 98) regression analysis revealed that internet use significantly contributed to variance in ORCA Elementary Revised scores. Leu et al (2015: 7), Henry (2007) and Leu and Reinking (2005) have also reported that internet usage is a predictor of online reading comprehension. The findings of these studies suggest that participants' internet usage levels may have caused increases in the dependent variable of online comprehension scores. This limits the conclusions the researcher can draw about the effect of the independent variable; type of comprehension strategy instruction on online comprehension scores. Future studies and replications must put more stringent control measures in place to accurately measure the relationship between comprehension strategy instruction and online comprehension performance.

Sample Size 5.6.4

The findings of this study suggest that effective online comprehension strategy instruction should feature instruction in both New Literacies and Print based comprehension strategies. However, these findings should be interpreted with caution due issues with population generalizability. O' Dwyer and Bernauer (2014:88) suggest that in order for researchers to make claims of population generalizability they must consider the extent to which their sample population represents their target population, their sampling method and 'the degree to which the sample remains representative throughout the duration of the study.' According to (McBride, 2012:136) the target population 'is the population that the researcher wishes to generalise the results of the sample of the study to.' When researchers fail to recruit a sample that reflects their target population this may interfere with the external validity of the researcher's findings (McBride, 2012:136). O' Dwyer and Bernauer (2014:88) claim that in cases where the research sample is too small it cannot be representative of the target population. This study had a small sample size with only 40 participants in each condition which greatly limits the generalisability and external validity of the study's findings. Scott and Morrison (2006: 250) suggest that 'if sampling error is detected then the researcher is less entitled to claim that their results can be generalized to the wider population.'

Quality and Depth of Qualitative Data 5.6.5

This study was based on an embedded mixed methods design. Qualitative data was collected from two sources; focus groups and reflective logs. However, the quality and richness of the qualitative data was somewhat lacking. This is especially true of reflective log entries. Many participants recorded one word answers or replied ‘no’ to reflection log question prompts. This very much limited the conclusions that could be drawn from reflective log data. The lack of data produced by reflective log entries may have been caused by the participants’ inability to reflect independently. Costa and Kallick (2008) argue that children require teacher support to effectively reflect on learning experiences. Costa and Kallick (2008: 17) suggest that with teacher support children are more likely to ‘reflect on their learnings, to compare intended with actual outcomes, to evaluate their metacognitive strategies, to analyse and draw causal relationships, and to synthesize meanings and apply their learnings to new and novel situations.’ Furthermore, reflection is a complex process that children do not engage in naturally. Rather they have to receive explicit instruction in the practice of reflection. Such explicit instruction should involve teacher modelling, discussion and teacher guided reflections (Costa and Kallick, 2008). Participants in this study did not receive teacher support when completing reflective logs or explicit instruction in the practice of reflection. This limited the participants’ ability to adequately complete reflective log entries. As a result, reflective log entries proved not to be a rich source of qualitative data.

Focus group data was also limited. This may have been caused by the moderator’s lack of experience. While the researcher had previous experience in moderating focus groups, this experience was very limited. This lack of experience may have resulted in limited data production in focus group sessions. Burke-Johnson and Christensen (2014: 235) support this view suggesting that an experienced moderator ‘knows how to facilitate group discussion’ in order to gain depth and breadth of data. This view is supported by Vaughn et al (1996: 16) who claim that an experienced moderator has ‘the potential to add depth and dimension to the knowledge gained.’ The poor quality and quantity of qualitative data very much limited the conclusions that could be drawn from qualitative data sources in this study.

Conclusion 5.7

An analysis of the main findings of this study suggest that the combined New Literacies and Print Comprehension Strategy Instruction Condition was most effective at promoting online comprehension levels. Review of the literature, suggests that the main findings are consistent with theoretical suggestions put forward by Leu et al (2015) and Leu et al (2013b) and with

the qualitative findings of this study. In order to further interpret the main findings of this study, the researcher analysed the ability of participants to apply individual online comprehension strategies across all four conditions. This analysis was based on the findings of the Internet Usage and Ability Questionnaire and the ORCA Primary Subscales. Analysis of findings revealed that participants in the New Literacies and Combined Comprehension Strategy Instruction Conditions were better enabled to apply the Reading to Identify Important Questions, Reading to Locate Online Information, Reading to Critically Evaluate Online Information, Reading to Synthesise Online Information and Reading to Communicate Online Information strategies than those in the control and print conditions. An analysis of findings relating to age suggested that the significant difference in post ORCA Primary scores for age in Condition 1 was due to an over-representation of 7 to 8 year olds in that condition. While a review of findings in relation to gender revealed that females outperformed males on the application of a number of online comprehension strategies, the most notable difference in scores between genders was seen in relation to the RCI strategy. Finally, an analysis of study limitations suggested that different results may have been obtained had a more suitable measure of online comprehension been used or had extraneous variables been more stringently controlled for. This analysis also suggested that greater insight into study results would have been gained if qualitative data of a higher standard had been acquired.

Chapter Six

Conclusion

Introduction 6.0

This chapter will outline a summary of findings, conclusions based on those findings, recommendations for pedagogical practice and national and international literacy policy and suggestions for future research. The summary of findings will include a synopsis of the study's quantitative and qualitative findings. The conclusion section will outline the main and subsidiary conclusions drawn from the study's quantitative and qualitative findings. This chapter will then discuss recommendations for pedagogical practice arising from the main findings of this study. This section will also include recommendations for national and international literacy policy. Finally, areas for future research are highlighted.

Summary of findings 6.1

The researcher hypothesised that a combined New Literacies and Print comprehension instruction intervention would increase the online comprehension levels of a sample of Irish pupils aged between seven and eleven years of age. The null hypothesis was rejected as the results of a Wilcoxon Signed Rank Test revealed a statistically significant increase in online comprehension levels from Time 1 to Time 2 in the combined Print and New Literacies comprehension instruction condition. However, these findings should be interpreted with caution as a Kruskal Wallis test revealed no significant difference in post ORCA scores between the control and combined instruction conditions. Further analysis included an examination of the age and gender variables. An analysis of age and post ORCA scores revealed no significant difference between age groups in Conditions 2, 3 and 4. However, there was a significant difference between age groups in condition 1. In relation to gender, findings indicated that there was no significant difference in gender performance for post ORCA Primary scores in Conditions 1, 2 and 3. It is important to note that in condition 4 gender analysis of post ORCA Primary scores revealed that there was a significant difference between male and female scores.

Conclusions 6.2

- The findings of this study suggest that Print and New Literacies comprehension strategy instruction programme promotes online comprehension levels. Statistical analysis revealed a significant gain in post ORCA Primary scores from pre to post intervention in the Combined Comprehension Strategy Instruction Condition. These findings suggest that teaching a Combined New Literacies and Print Comprehension Strategy Instruction programme can improve pupil online comprehension performance. However, the findings of this study should be interpreted with caution due to a number of limitations inherent in the study's methodology.
- According to the findings of this embedded mixed methods investigation the combined Print and New Literacies comprehension strategy instruction programme was most effective at promoting online comprehension levels. Findings from the pre and post ORCA primary and Internet Questionnaire Skills subscale scores suggest that the Combined Comprehension Strategy Instruction Programme was more effective at enhancing online comprehension levels than either Print based Comprehension Strategy Instruction or New Literacies based Comprehension Strategy Instruction.
- Further conclusions arising from this study are based on findings regarding age. The main conclusion arising from analysis of the variable of age is that participants aged between 9 and 10 years of age consistently outperformed participants aged from 7 to 8 in Online Comprehension measures.
- Findings based on gender led the researcher to conclude that females are typically better at applying online comprehension strategies than males especially at applying the Reading and Writing to Communicate Online Information strategy.
- A review of the post intervention ORCA Primary scores of participants in the Print, New Literacies and Combined conditions suggest that participants in each of the treatment conditions exhibited notable gains in post ORCA primary scores. These findings suggest that the instructional framework used in this study was successful at delivering online comprehension strategy instruction. However, the findings of this

study should be interpreted with caution due to a number of limitations inherent in the study's methodology and due to issues with population generalizability.

- Quantitative and Qualitative data acquired in this study has provided educators with information regarding the individual comprehension strategies that should feature as part of effective online comprehension strategy instruction. Those strategies include New Literacies' Reading to Identify Important Questions (RIQ), Reading to Locate Information (RLI), Reading to Critically Evaluate Information (RCE), Reading to Synthesize Information (RSI), and Reading and Writing to Communicate Information (RCI) and the print based strategies of monitoring, synthesising, making connections, determining importance and questioning. Qualitative data suggested that the prediction and inferring strategies did not facilitate online comprehension. However, it is important to note that the findings in relation to the prediction and inferring strategies are based on a limited pool of qualitative data and future studies will need to fully investigate the legitimacy of these claims.

Recommendations- Implications for Pedagogical Practice 6.3

Online Comprehension Strategy Instruction should feature a combination of Print and New Literacies Strategies

The findings of this study suggest that Print and New Literacies comprehension strategy instruction programme promotes online comprehension levels. This finding has important implications for pedagogical practice.

- Based on the findings of this study teachers should include both print and New Literacies comprehension strategies in their Online Comprehension strategy Instruction.
- Arising from the results of this study the researcher recommends that when using a Combined Print and New Literacies Comprehension Strategy Instruction programme teachers should provide instruction on the following strategies; *New Literacies' Reading to Identify Important Questions (RIQ), Reading to Locate Information (RLI), Reading to Critically Evaluate Information (RCE), Reading to Synthesize Information (RSI), and Reading and Writing to Communicate Information (RCI) and the print*

based strategies of monitoring, synthesising, making connections, determining importance and questioning. Qualitative data suggested that the prediction and inferring strategies did not facilitate online comprehension. However, it is important to note that the prediction and inferring strategies have been omitted based on limited qualitative findings.

Pupils aged 7 to 8 years require greater support and more targeted instruction in the area of online comprehension

- The findings of this study suggest that 7 to 8 year olds scored consistently lower than 9 to 10 year olds on a range of comprehension related skills including the ability to critically evaluate, communicate and locate information online. In light of these findings it is recommended that pupils aged 7 to 8 years receive greater support and more targeted instruction in the area of online comprehension instruction especially in relation to the application of higher order online comprehension strategies such as Reading to Critically Evaluate Online information.

Male pupils require targeted instruction in the area of locating information online, critically evaluating information online, synthesising online information and communicating online.

- Education practitioners should note that the findings of this study suggest that male pupils would benefit from targeted instruction in the areas of locating information online, critically evaluating information online, synthesising online information and communicating online.

Female pupils should receive extended instruction in the application of the Reading to Identify Important Questions strategy

- According to the results of this study when teaching online comprehension teachers should ensure that females receive supplementary instruction in the application of the Reading to Identify Important Questions strategy.

Recommendations- Implications for Educational Policy 6.4

Inclusion of Online comprehension in the Primary Language Curriculum for 3rd to 6th class.

Based on the findings of this study, the pending 'Primary Language Curriculum,' (PLC) for third to sixth class pupils should consider the inclusion of online comprehension and more specifically online comprehension strategy instruction as appropriate curricular content.

- First and Foremost, the PLC for third to sixth class pupils should recognise the role of the internet and its associated technologies in modern literacy instruction by including reference to and explanation of the New Literacies framework in the senior PLC. This recommendation is in line with counsel from a specially commissioned curriculum advice paper which stated 'given the prevalence of digital media, including the internet, in our daily lives it is important to consider a new literacies framework' in the new curriculum (Kennedy et al, 2012:40).
- The senior PLC should include a clear and definitive definition of online comprehension. This will ensure that teachers understand what online comprehension entails and include it as part of their literacy instruction.
- The PLC for third to sixth class pupils should feature a definitive list of online comprehension strategies to be taught over within the three year period from third to sixth class. The findings of this study suggest that the following strategies should be considered for inclusion within the PLC: *New Literacies' Reading to Identify Important Questions (RIQ), Reading to Locate Information (RLI), Reading to Critically Evaluate Information (RCE), Reading to Synthesize Information (RSI), and Reading and Writing to Communicate Information (RCI) and the print based strategies of monitoring, synthesising, making connections, determining importance and questioning.*
- The senior PLC should feature a model for online comprehension strategy instruction that includes the gradual release of responsibility model, the think-aloud approach, collaborative inquiry and the use of authentic practice situations.

Development of Continuing Professional development (CPD) framework offering training in in the implementation of online comprehension instruction programme

- The findings of this study suggest that online comprehension strategy instruction may be an effective way to develop online comprehension. In order for online comprehension instruction to be delivered effectively, it is necessary for Irish educational policy makers to design and implement a Continuing Professional Development (CPD) framework offering training in New Literacies and more specifically in the implementation of an online comprehension instruction programme.

Recognition and Inclusion of Online Comprehension and Online Comprehension Strategy Instruction in international curricula.

- In America the CCSS do not include online texts as a core reading text and fail to reference the development of online comprehension skills and strategies (Drew, 2012). The American CCSS should include a definition of online comprehension as well as a model for online comprehension strategy instruction. According to the findings of this study, the model should feature both New Literacies and print based comprehension strategies.
- In the Australian curriculum Digital Literacy Skills are an important component of the English curriculum. Under the English Learning Area, students are required to use ‘a range of digital technologies to create, publish and present their learning.’ In addition, throughout the English achievement standards there are several references to ‘online texts.’ Despite this, there is ‘limited evidence that online comprehension skills should be developed’ within the English curriculum (Leu et al, 2011:10). The Australian English learning area should outline a definitive list of the online comprehension strategies that should be taught under the English learning area. Based on the findings of this study the strategies that should be included are: *New Literacies’ Reading to Identify Important Questions (RIQ), Reading to Locate Information (RLI), Reading to Critically Evaluate Information (RCE), Reading to Synthesize Information (RSI), and Reading and Writing to Communicate Information (RCI) and the print based*

strategies of monitoring, synthesising, making connections, determining importance and questioning.

- The British English Curriculum does not include any reference to internet, digital, multimedia or multimodal text (Berry, 2013: 15). Within the National Curriculum, the internet and its associated skills are framed as a technology issue taught through the subjects of computing and design and technology. The findings of this study suggest that online comprehension can be effectively taught through literacy instruction. Based on these findings, it is recommended that the National curriculum consider placing internet based skills such as online comprehension with the literacy curriculum.

Areas for Future Research 6.5

Replication studies are necessary to determine if the findings of this study are reliable and valid. The researcher queried the reliability and validity of the ORCA primary as it was not piloted on pupils aged between 7 and 8 years of age. Future studies must consider assessment tools that provide both reliable and valid measures of the online comprehension performance of pupils aged 7 to 8. This may mean the development and piloting of new online comprehension performance assessment tools as there is currently a very limited pool of measurement tools to assess the online comprehension of primary aged pupils. This view is supported by Kingsley (2011: 129) who suggests that ‘more work is needed to determine how to best measure the complexities of online reading and expand measures to assess a wide variety of age groups.’ However, Coiro (2011: 371) cautions that we face many ‘challenges’ in ‘developing ecologically valid and reliable measures of new literacies.’ One such challenge highlighted by Leu et al (2015: 18) is the issue of ‘whether online research and comprehension should be combined on a single scale with offline reading or represented on a separate scale to more precisely chart the development of online research and comprehension skills.’ A further challenge associated with the design of a reliable measure of online comprehension is the design of a measure that can keep pace ‘with the rapid evolution of new texts’ (Coiro, 2011: 371). Furthermore, valid measures of online comprehension performance will also ‘need to evaluate students’ ability to conduct collaborative online research’ (Leu et al, 2015: 18). According to Kingsley (2011: 129) ‘established performance-based measures’ such as the ORCA-Elementary ‘have only begun to investigate potential

possibilities for online reading assessment'. It is imperative that future research seeks to address the many issues associated with designing valid and reliable measures of online comprehension performance.

In a time when online reading skills are of 'paramount importance,' it is essential that pupils of disadvantaged background have the opportunity to learn these new skills (Kingsley, 2011: 3). Studies such as Henry (2007) and Leu et al (2015), have reported that a 'separate and independent achievement gap exists for online reading, based on income inequality' (Leu et al, 2015: 1). Leu et al (2015:1) found that 'a significant achievement gap in online research and comprehension persisted when pre-test differences in the most likely predictors of success: CMT reading scores, prior knowledge scores, and CMT writing scores.' The presence of this online reading achievement gap means that pupils from underprivileged backgrounds become 'doubly disadvantaged' (Leu, 2011: 10). This is because these students have 'less access to the Internet at home, and, when they come to school, our schools do not always prepare them for...online reading comprehension' (Leu, 2011: 10). Future research must investigate effective ways to improve online comprehension instruction for pupils from disadvantaged backgrounds. This will ensure that 'technology becomes a powerful tool that can heighten learning and decrease economic and social inequities' (Kingsley, 2011: 3).

Many online texts have multimodal features. Walsh (2009: 2) describes online texts with multimodal features as 'hybrid texts that may involve an interchange of modalities and processes.' Walsh (2009: 2) cites the example of an online blog which 'may include written text, images, graphics, video and sound and can be read, listened to and responded to by others with text, images, video or sound.' In order to fully comprehend online texts readers must also be able to comprehend features of multimodal texts. Sefrani (2010: 86) claims that the 'extensive design and visual elements' of multimodal texts requires readers to apply a specific set of comprehension strategies. Whitin, (2009: 408) concurs stating that 'strategies that support comprehension of written texts will not be sufficient to help readers comprehend the various modes of representation incorporated in multimodal texts.' This is because readers are required to 'work across multiple sign systems and use different strategies for navigating and comprehending these texts' (Sefrani, 2011: 343). Unsworth and Chan, (2009:252) reported that without strategy instruction many students failed to engage in 'integrative reading of language and images in constructing meaning.' Alvermann and Wilson (2011: 119) suggest that 'when conceptions of comprehension strategy instruction are

expanded to address multimodal texts, students can be more fully supported in strategically approaching' the reading of online texts. Therefore, future studies in this area should investigate if the application of multimodal comprehension strategies can enhance online comprehension performance.

Conclusion 6.6

The findings of this study suggest that combined Print and New Literacies comprehension strategy instruction programme promotes online comprehension levels. Furthermore, the Combined approach was the most effective comprehension strategy instruction programme when compared to a Print online comprehension strategy instruction programme and a New Literacies comprehension strategy instruction programme. Other conclusions arising from the findings of this study included the individual comprehension strategies that should feature as part of effective online comprehension strategy instruction. Those strategies include New Literacies' RIQ, RLI, RCE, RSI, and RCI strategies and the print based strategies of monitoring, synthesising, making connections, determining importance and questioning. Finally, some secondary conclusions relating to age and gender were noted; females are generally better at applying online comprehension strategies especially the RCI strategy and pupils aged 7 to 8 performed worse than pupils aged 9 to 10 on measures of online comprehension. A number of recommendations for pedagogical practice arose from the findings of this study. Those recommendations include when delivering online comprehension instruction teachers should use the 'The Gradual Release of Responsibility Model' (Pearson and Gallagher, 1983), the Think-Aloud approach, collaboration and authentic practice situations. Other pedagogical recommendations included a need for more targeted instruction on the RCE strategy and greater teacher support for pupils aged 7 to 8 during online comprehension strategy instruction. Further recommendations centred on implications for national and international literacy curricular development and policy. Recommendations centred on the inclusion of online comprehension strategy instruction in national and international literacy curricula. Recommendations for pedagogical practice and policy were followed by a discussion on areas for future research. These areas included replication with reliable assessment tools, investigation of the effect of online comprehension strategy instruction using a disadvantaged socio-economic sample and the investigation of the application of multimodal comprehension strategies in online comprehension strategy instruction.

Concluding Remarks 6.7

This study has found that combined Print and New Literacies comprehension strategy instruction promotes online reading levels among pupils aged 7 to 10 years. This study has also reported that a Combined Print and New Literacies comprehension strategy programme is more effective at enhancing online comprehension levels than either a Print or New Literacies based instruction programme. These results offer a valuable insight into effective online comprehension instruction but are not definitive and future replication studies are necessary to establish the legitimacy of findings reported in this study. It is hoped that this study will stimulate further empirical research in the area of online comprehension strategy instruction including replication studies. The researcher hopes that these results and future replications will encourage teachers to incorporate combined online comprehension strategy instruction into their daily literacy teaching. However, there are a number of significant challenges that will need to be overcome before teachers can integrate online comprehension instruction into their literacy instruction.

Those challenges include that lack of a Continuing Professional development (CPD) framework offering training in New Literacies and more specifically in the implementation of an online comprehension instruction programme. Without the necessary CPD training teachers will not have the relevant know how or tools to correctly implement online comprehension instruction (DES, 2008a). Furthermore, lack of internet access and IT equipment in Irish primary schools will limit the ability of teachers to effectively deliver a combined online comprehension programme (ERC, 2013:5). The researcher also hopes that the results of this study and subsequent replications will prompt curricular development bodies to recognise the potential of online comprehension strategy instruction programmes. As to date both national and international curricula have largely ignored the role of online comprehension in reading instruction. For example, The Primary Language Curriculum (NCCA, 2015) failed to specifically include reference to internet or online texts and made no explicit mention of online comprehension. Similarly, the American CCSS omitted online texts as a core reading text and failed to reference the development of online comprehension skills and strategies (Drew, 2012). If national and international curricular bodies ‘hope to prepare all students for the literacy futures they deserve’ they cannot continue to ignore the potential of online comprehension instruction (Leu et al, 2013:1169).

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Appendix A: Principal Information Sheet



Mary Immaculate College,
South Circular Road,
Limerick,
Tel: 061 204300
ceire.devey@micstudent.mic.ul.ie



My name is Céire Devey, and I am a Postgraduate student attending Mary Immaculate College. I am currently studying for a Master's in Education by Research. I am completing research in the area of Digital Literacy with third class pupils. This research will form the basis of my thesis. This research project will be overseen by my supervisor Dr. Martin Gleeson.

The objective of the study is to investigate if teaching pupils a digital comprehension strategy programme can improve digital comprehension levels. Schools, parents and pupils are free to withdraw participation, for any reason or no reason at all without any consequence from the researcher or the school. Please be assured that your child's identity and confidentiality will be respected at all times. No personally identifiable information will be gathered by the researcher thus ensuring your child's anonymity. Access to any information recorded in this research will be strictly limited to the researcher, supervisor and examiners.

This study hopes to extend our understanding of how pupils read and comprehend internet and multimodal texts (tests with sound, video, music, pictures). Children who participate, will partake in digital comprehension teaching sessions using a variety of technology devices and applications including iPads. The instruction will take place during the school day, on a weekly basis for the next ten weeks. Pupils who participate will also be asked to complete a scale measuring their ability to comprehend information presented online.

The data collected as part of the research will be combined with that of the other participants in this study and used to form the results section of my thesis. Summary data only will appear in the thesis; individual participant data will not be shown. As the researcher is affiliated to Mary Immaculate College, data collected as part of this research will be securely stored for the duration of the research plus a further three years. This data retention period is in accordance with the MIC Record Retention Schedule and current data protection legislation. After this retention period, data from the research will be destroyed.

If you have any questions or queries about the research or wish to view the final report and results of this research please contact the researcher at ceiredevey@mic.ul.ie or her supervisor at Martin.Gleeson@mic.ul.ie. If you have concerns about this study and wish to contact someone independent, you may contact: MIREC Administrator Mary Immaculate College South Circular Road Limerick 061-204515 mirec@mic.ul.ie.

Appendix B: Parent Information Sheet



Mary Immaculate College,
South Circular Road,
Limerick,
Tel: 061 204300
ceire.devey@micstudent.mic.ul.ie

My name is Céire Devey, and I am a Postgraduate student attending Mary Immaculate College. I am currently studying for a Master's in Education by Research. I am completing research in the area of Digital Literacy with third class pupils. This research will form the basis of my thesis. This research project will be overseen by my supervisor Dr. Martin Gleeson.

The objective of the study is to investigate if teaching pupils a digital comprehension strategy programme can improve digital comprehension levels. Participation in this study is voluntary. Parents and pupils are free to withdraw participation, for any reason or no reason at all without any consequence from the researcher or the school. Please be assured that your child's identity and confidentiality will be respected at all times. No personally identifiable information will be gathered by the researcher thus ensuring your child's anonymity. Access to any information recorded in this research will be strictly limited to the researcher, supervisor and examiners.

This study hopes to extend our understanding of how pupils read and comprehend internet and multimodal texts (tests with sound, video, music, pictures). Children who participate, will partake in digital comprehension teaching sessions using a variety of technology devices and applications including iPads. The instruction will take place during the school day, on a weekly basis for the next ten weeks. Pupils who participate will also be asked to complete a scale measuring their ability to comprehend information presented online.

The data collected as part of the research will be combined with that of the other participants in this study and used to form the results section of my thesis. Summary data only will appear in the thesis; individual participant data will not be shown. As the researcher is affiliated to Mary Immaculate College, data collected as part of this research will be securely stored for the duration of the research plus a further three years. This data retention period is

in accordance with the MIC Record Retention Schedule and current data protection legislation. After this retention period, data from the research will be destroyed.

If you have any questions or queries about the research or wish to view the final report and results of this research please contact the researcher at ceire.devey@micstudent.mic.ul.ie or her supervisor at Martin.Gleeson@mic.ul.ie. If you have concerns about this study and wish to contact someone independent, you may contact: MIREC Administrator Mary Immaculate College South Circular Road Limerick 061-204515 mirec@mic.ul.ie.

Appendix C: Parental Informed Consent Form



Mary Immaculate College,
South Circular Road,
Limerick,
Tel: 061 204300
ceire.devey@micstudent.mic.ul.ie

Dear Parent/Guardian,

As outlined in the **parent/guardian information sheet** the current study will investigate the effect of teaching a digital literacy comprehension strategy programme on Irish primary third class pupils digital comprehension levels. I wish to seek your **written consent** to allow your child to partake in this research.

The **parent/guardian information sheet** outlines what activities pupils will be engaged in as part of the research. The information sheet should be read fully and carefully before providing consent for your child to take part in the research. You are reminded that parents and pupils are free to withdraw participation, at any time.

Please be assured that your child's identity and confidentiality will be respected at all times. All information gathered will remain confidential and will not be released to any third party. In accordance with the MIC Record Retention Schedule all participant data will be stored for the duration of the project plus three years at which time it will be destroyed.

Please **read** the following statements before signing the consent form.

- I have read and understood the **parent/guardian information sheet**.
- I understand what the project is about, and what the results will be used for.
- I am fully aware of **all** of the procedures involving my child, and of any **risks and benefits** associated with the study.
- I know that my child's participation is voluntary and that I can withdraw my child's participation from the project at any stage without giving any reason.
- I know that my child's participation is voluntary and that he/she can withdraw their participation from the project at any stage without giving any reason.

- I am aware that my child's results will be kept confidential

Name (PRINTED):

Name (Signature):

Name of School:

Date:

Appendix D: Sample Lesson on how to apply the Reading to Critically Evaluate Online Information online comprehension strategy

Time Estimate: 60 minutes

Overview: In this lesson, students will learn how to determine the authenticity of a website.

Key teaching points:

- Demonstrate the use of the ‘5 W’s of Cyberspace’ questions- Who, What, Where, When and Why to critically evaluate a website’s authenticity.
- Model how to use website features to identify hoax websites.
- Model and explain the cross-check technique for checking the validity of a website

Resources:

- *Is This a Hoax?*-Readwritethink.org Worksheet
- Tablets/Laptops with internet access
- Interactive Whiteboard/projector

Instructional Plan:

Phase 1: Teacher Modelling and Think-Aloud

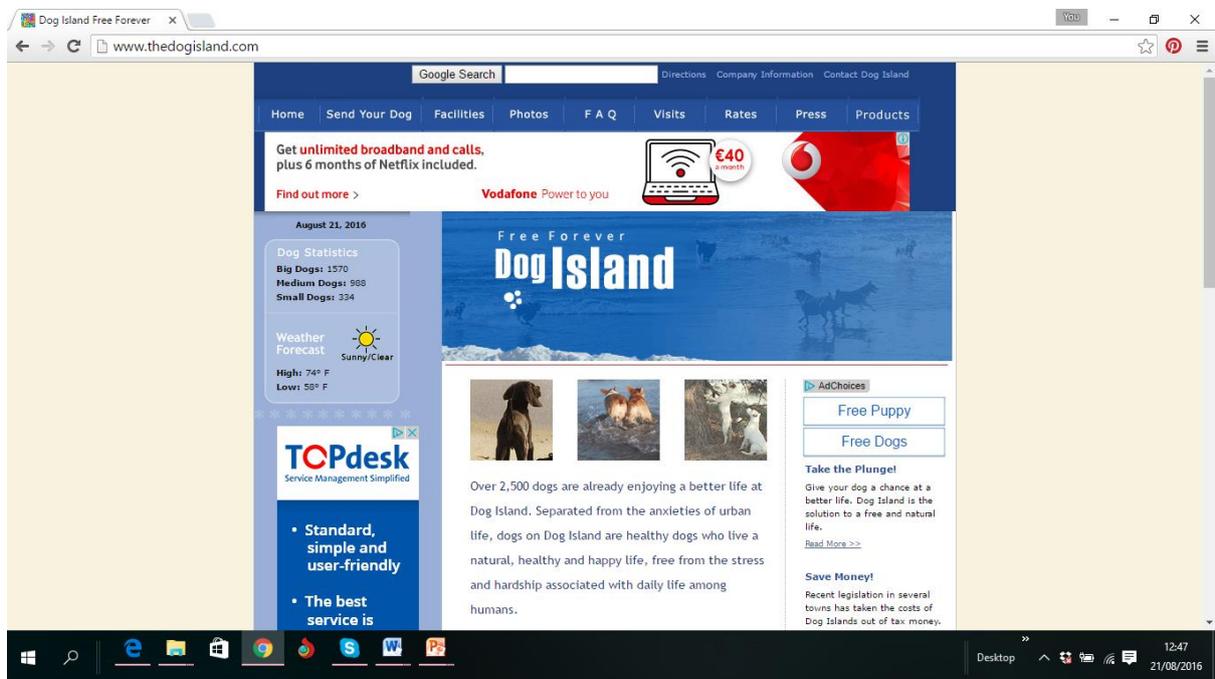
Phase 2: Student Collaboration/Guided Practice

Phase 3: Independent practice using authentic practice situation

Phase 1

- The teacher will present begin with a teacher-led discussion about the trustworthiness of information presented online. This discussion should lead pupils to the conclusion that not all information presented online is trustworthy.
- The teacher will then present the ‘5 W’s of Cyberspace’ questions- Who, What, Where, When and Why as a means to critically evaluate a website’s authenticity.
- The teacher will use the *Is This a Hoax?*-Readwritethink.org Worksheet to explain how to apply the ‘5 W’s of Cyberspace’ questions.

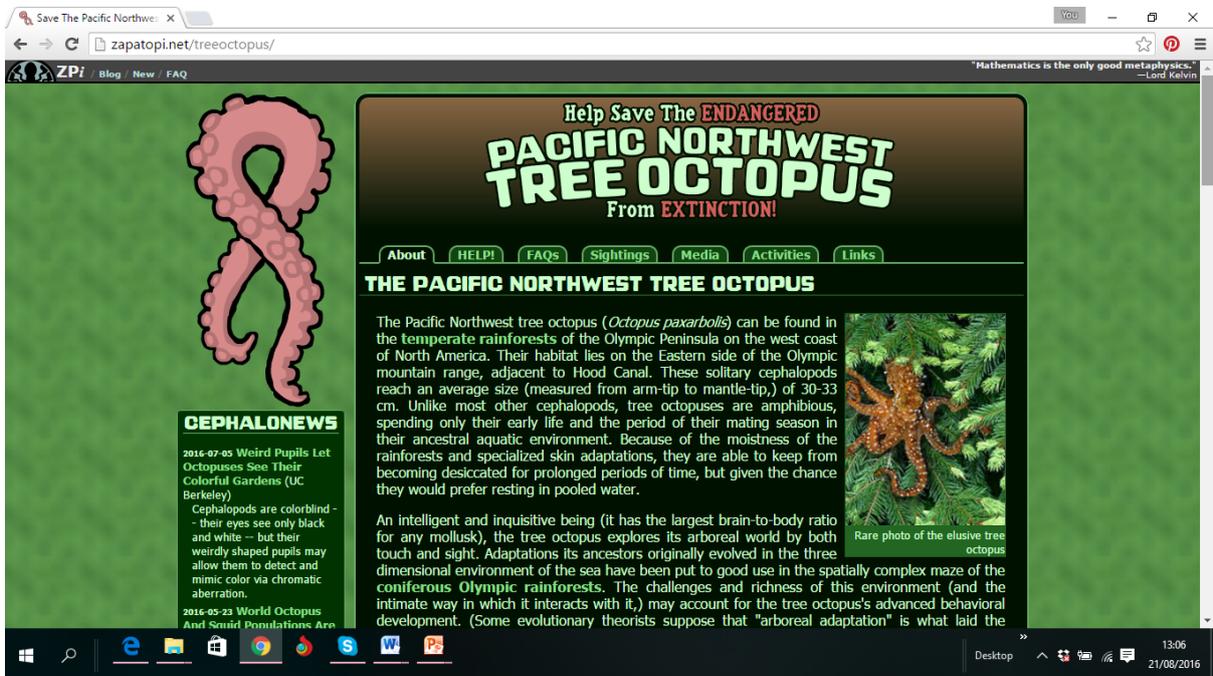
- The teacher will then use the ‘5 W’s of Cyberspace’ template to do a think-aloud assessing the authenticity of the website www.thedogisland.com
- The teacher will then model how to use the dog island website features to identify if it is a hoax website. The teacher will model how to check the website’s frequently asked questions section, directions, website visitor rates and statistics and copyright date. Before using think-aloud to model how to synthesize the gathered evidence to identify the website as a hoax.
- Then the teacher will demonstrate the cross-check technique which involves checking the validity of the site by looking for three other sources that corroborate information found on the original website.



Phase 2: Student Collaboration/Guided Practice

- The teacher will present the hoax Tree-Octopus website (<http://zapatopi.net/treeoctopus/>) on the Interactive Whiteboard.
- At whole class level the teacher will invite pupils to use the website features to ascertain the reliability of the website. The teacher will then inform the pupils the website is a hoax website.
- The teacher will distribute the tablets.

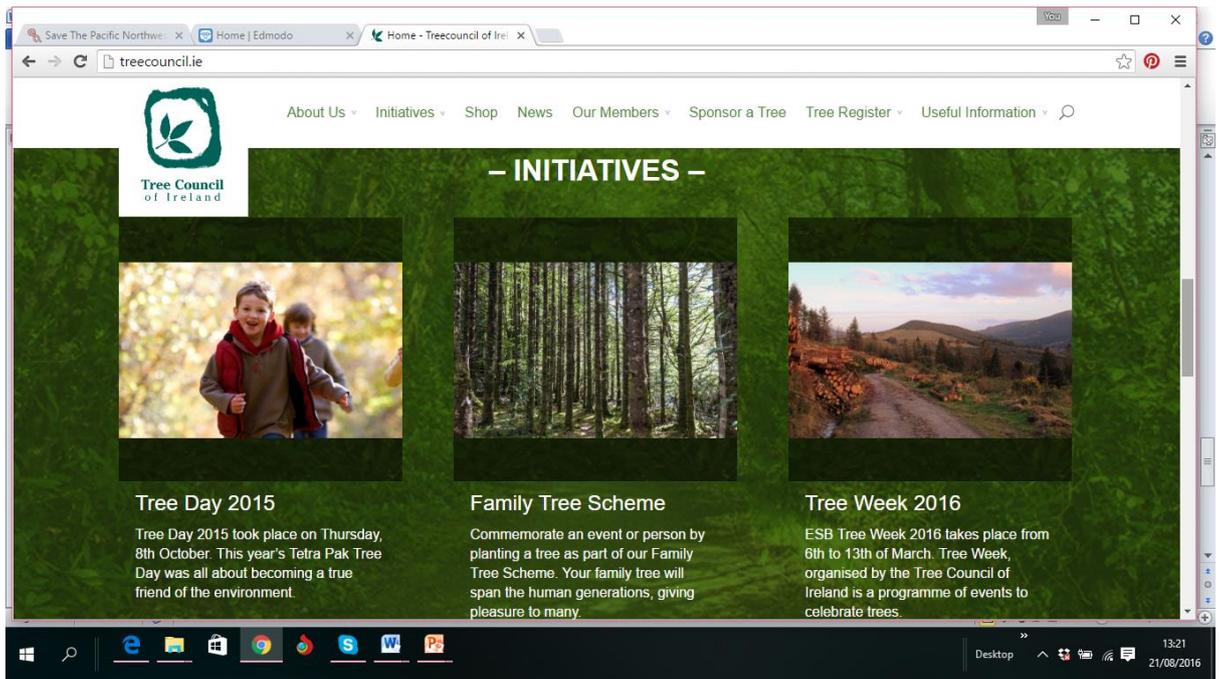
- The teacher will then ask pupils to form their collaborative groups and find three other websites that discredit the hoax Tree-Octopus website.
- The teacher will liaise with the different groupings to assess their application of the RCE strategy and to check their progress with the collaborative task.



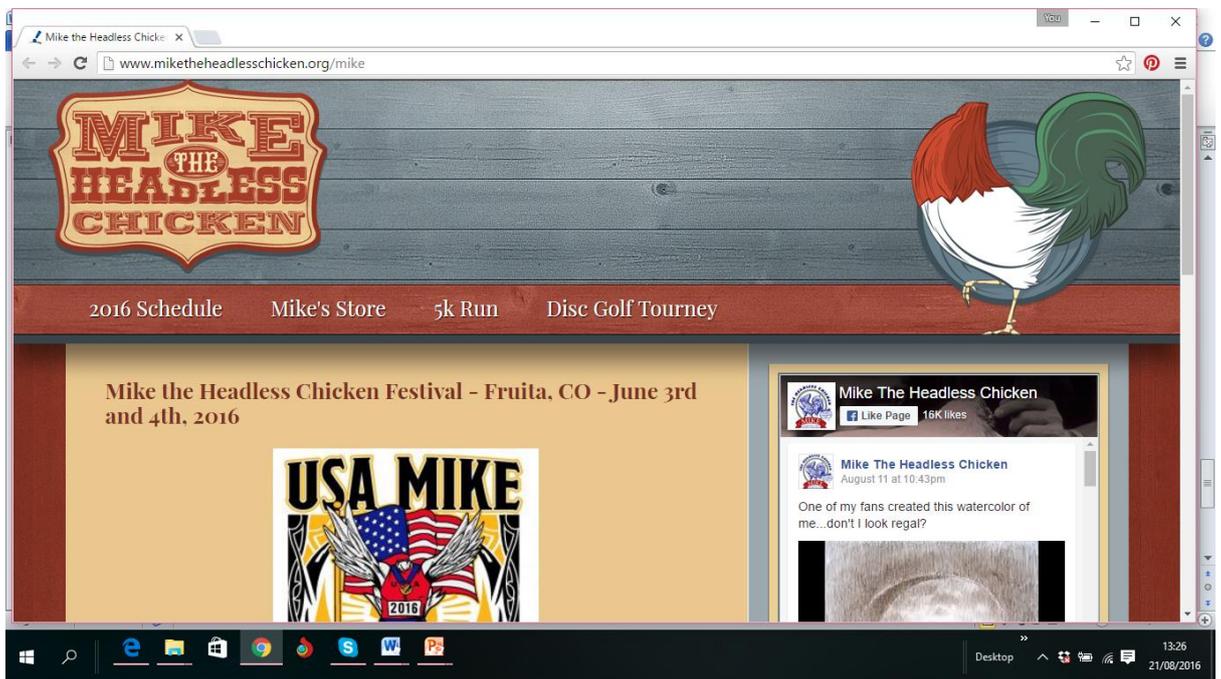
Phase 3: Independent practice using authentic practice situation

- The teacher will ask participants to return their assigned places.

The teacher will then present and explain the independent task on the interactive whiteboard. The independent practice task will require pupils to login to their Edmodo accounts and click on the three links provided:



www.treecouncil.ie



<http://www.miketheheadlesschicken.org/mike>



<http://allaboutexplorers.com/>

- The pupils will have to evaluate the reliability of each of the websites and post why they think each website is real or fake and what technique they used to inform their decision.
- The teacher will present the three websites on the interactive whiteboard and will discuss pupils' post and the techniques they used to determine website authenticity.

Appendix E.1: ORCA Primary (Pre Testing)

Task 1

We are in third class in Co. Cork. We are looking for a website we lost called Wildlife Finder made by the BBC.

Can you:

- **Use a search engine to find the website.**
- **On the website search the Snow Leopard**

Answer the following three questions on the discussion board:

- 1. What is the website's address?**
- 2. How often do snow leopards eat?**
- 3. Why are snow leopards in danger?**

Task 2

We are in 3rd class in Drogheda, Co. Louth. We are doing a project on otters and want to know how many species of otters there are.

Our teacher says that the websites we get information from should be made by experts. We found one website, but we're not sure if we can trust it.

Can you:

- Use a search engine to find one or more websites that will tell you how many species of otter there are.

Answer the following three questions below:

1. How many otter species are there?
2. Is there another website that gives the same number of species?
Write down the name of the website
3. Explain why you think the websites you found are reliable and are telling the truth?

Task 3

We are in third class in Exmouth, Australia. We know that otters live in most areas of the world but they don't live in Australia or Antarctica. We want to find out about the otters that live in Ireland.

Can you:

- **Use a search engine to find the National Parks and Wildlife Service, Ireland.**

- **In the website search otters, then select Otter Leaflet 4**

Answer the following four questions below:

1. **What is the web address of the otter leaflet?**

2. **Who made the otter leaflet?**

3. **Are the maker's experts?**

4. **How do you know?**

Appendix E.2: ORCA Primary (Post Testing)

Task 1

We are in second class in Co. Wicklow. We are looking for a website we lost called Wildlife Finder made by the BBC.

Can you:

- **Use a search engine to find the website.**
- **On the website search the Giant Panda**

Answer the following three questions on the discussion board:

1. What is the website's address?

2. What size is a baby Giant Panda?

3. Why are Giant Pandas in danger?

Task 2

We are in 3rd class in Clonmel, Co. Tipperary. We are doing a project on penguins and want to know how many species of penguins there are.

Our teacher says that the websites we get information from should be made by experts. We found one website, but we're not sure if we can trust it.

Can you:

- Use a search engine to find one or more websites that will tell you how many species of penguin there are.

Answer the following three questions below:

1. How many penguin species are there?
2. Is there another website that gives the same number of species?
Write down the name of the website
3. Explain why you think the websites you found are reliable and are telling the truth?

Task 3

We are in third class in Essex, England. We are doing a project about deer. We want to find out about the deer that live in Ireland.

Can you:

- **Use a search engine to find the deerworld website**

Answer the following four questions below:

5. **What is the web address of the deerworld website?**
6. **Who made the deerworld website?**
7. **Are the maker's experts?**
8. **How do you know?**

Appendix F: Internet Usage and Ability Questionnaire

1. My age is:

- 6
- 7
- 8
- 9
- 10
- 11

2. I am a:

- A girl
- A boy

3. Do you think you are:

- A very good reader
- An ok reader
- A poor reader

4. When you read on the internet are you:

- A very good reader
- An ok reader
- A poor reader

5. How many computers or tablets in your house are connected to the internet?

- 0
- 1
- 2
- 3 or more

6. I use the internet in the following places:

- School
- Home
- Library
- Internet café/Community Centre
- Friend's house
- Relatives' House
- I don't use the internet

7. Where do you use the internet the most?

- Home
- School

Tick the box

8. How often do you use the internet? Tick the box

	Never	Less than once a week	Once a week	A few times each week	Once a day	Lots of times a day
I use the internet at school						
I use the internet outside of school						

Tick the box

9. Searching for information on the internet e.g. about dogs

Beginner	1	2	3	4	5	6	Expert

10. Searching for certain information on the internet using a question e.g. (How large pug dogs grow to be?)

Beginner	1	2	3	4	5	6	Expert

11. Picking the best website from a list of results

Beginner	1	2	3	4	5	6	Expert

12. Bring together information from different websites on the internet

Beginner	1	2	3	4	5	6	Expert

13. Writing and sending emails

Beginner	1	2	3	4	5	6	Expert

14. Typing

Beginner	1	2	3	4	5	6	Expert

15. Using the internet to answer a question

Beginner	1	2	3	4	5	6	Expert

16. Telling if information found on the internet is trustworthy

Beginner	1	2	3	4	5	6	Expert

17. Telling a friend how to read, write and share ideas on the internet

Beginner	1	2	3	4	5	6	Expert

Appendix G: Reflective Log

Week 1 Reflective log

Please Fill in the Questions Below

What I learned?

What was important about what I learned?

Week 2 Reflective log

Please Fill in the Questions Below

What I learned?

What was important about what I learned?

Week 3 Reflective log

Please Fill in the Questions Below

What I learned?

What was important about what I learned?

Week 4 Reflective log

Please Fill in the Questions Below

What I learned?

What was important about what I learned?

Week 5 Reflective log

Please Fill in the Questions Below

What I learned?

What was important about what I learned?

Week 6 Reflective log

Please Fill in the Questions Below

What I learned?

What was important about what I learned?

Week 7 Reflective log

Please Fill in the Questions Below

What I learned?

What was important about what I learned?

Week 8 Reflective log

Please Fill in the Questions Below

What I learned?

What was important about what I learned?

Appendix H: Prior topic knowledge Assessment

Name: _____

Age: _____

Class: _____

How often do snow leopards eat?

Where do Snow leopards live?

Why are snow leopards in danger?

How many otter species are there?

What do otters eat?

What do baby otters eat?

Appendix I: ORCA Primary Administration Protocol

Protocol for Administering Online Reading Comprehension Assessment (ORCA-Primary) adapted from Kingsley's (2011) Protocol for Administering Online Reading Comprehension Assessment (ORCA-Elementary Revised)

Task Administration

1. As students come in and are seated, instruct them NOT to touch their iPads until they have heard all directions and are asked to begin.
2. Provide each student with a copy of their email address and password for logging in to the Edmodo Groups page.
3. Give the following directions:

Over the next few days, you will communicate with other 1st, 2nd, 3rd and 4th class students and their teachers using an edmodo discussion board. You will have 30 minutes to complete each of the tasks. Before starting, you will be told about each of the tasks. Once you have been given the directions, you will work on your own to complete the tasks. Each of the tasks will require you to post a response to the students on the discussion board. You will not be given specific directions on how to do this, simply try what you think is best.

Prepare kids to pace themselves. A sample set of directions follows:

We understand that all students have different amounts of skill for using the Internet. The tasks you will complete may require you to do things that you have never learned to do before. Just do the best you can. We are trying to get a better idea of what is easy for you and what is hard for you. Just do your best. Although you may not finish, you are expected to work hard and try your best. By the end of the year, you will have learned more about using the Internet and you'll have the opportunity to complete these tasks again. For now, work hard and try your best.

4. Then, explain: If you do not understand something, please raise your hand. Does anyone have any questions before we continue?
5. Provide an overview of the individual task the students will complete during any given administration block. Tell them the title of the task they are to do.
6. Take students to the login screen for Edmodo. In the set-up procedure, this page will be bookmarked.
7. Explain to students that they are to login to the assessment page using their email address and password given to them on their post-it note.

Please read all the directions carefully before you begin. You will notice there are specific things the students want you to do and specific things they'd like you to tell them in your response back to them. Be as specific as possible in your response.

Once all directions have been given:

You can start now. Raise your hand if you have any questions.

Responses to student questions:

1. Try to figure that out.
2. Do your best to tell the kids what they want to know.
3. That's a good question, can you figure it out?

About 3 minutes before the 30 minutes are up, give the following directions:

1. It's about time to wrap up.
2. If you are typing your response, please stop where you are and send your work.
3. Please leave the Internet window open and someone will come around to reset things.
4. Thank you so much for trying

Appendix J: Participant Information Sheet for Conditions 2, 3 and 4



Mary Immaculate College,
South Circular Road,
Limerick,
Tel: 061 204300
ceire.devey@micstudent.mic.ul.ie

Hello everybody. My name is Ceire Devey and I am here to talk to you about a piece of work I am doing. If during our talk, there are any words that you do not know or understand please ask me to explain what they mean. I am doing my piece of work on how we read on the internet and how we read e-books.

I am looking at different ways of helping us to become better readers of information on the internet and of e-books.

As part of my piece of work I will ask you to do a quiz on an iPad. I will ask you to complete the quiz twice before we start to learn about how to read using technology and after we have learned how to read using technology. The quiz has four tasks and will take about fifteen minutes to do. As part of the quiz you will use the internet and read e-books.

The quiz is not a test and I will not tell anyone the answers you give me. I will not share your answers with your teachers or parents or friends. When I write up my piece of work I will never use your names. When you are helping me with this piece of work, your teacher will be here at all times.

Only those of you who have permission from your parents can take part in my piece of work. For those of you who may not get permission to take part in this piece of work your teacher and I will organise another activity for you to do.

Even if your parents have given you permission to take part in this piece of work you can choose not to take part. If you choose to take part, you may stop at any time without having to say why. You do not have to answer all the questions on the quiz. No one will be disappointed or angry with you if you do not want take part. You should not agree to take part in this piece of work until you have all your questions answered and fully understand what you will be doing.

If you have any questions or want to know anything else about what you will be doing in this piece of work please ask me. Or if you would prefer you can ask your parents or teacher to contact me by e-mail at ceire.devey@micstudent.mic.ul.ie

Please **keep** this sheet in case you or your parents want to ask me or my supervisor Dr. Martin Gleeson, (Martin.Gleeson@mic.ul.ie) any questions about this piece of work in the future.

Appendix K: Participant Written Consent Form



Mary Immaculate College,
South Circular Road,
Limerick,
Tel: 061 204300
ceire.devey@micstudent.mic.ul.ie

(Read by Researcher) Please listen **carefully** to each sentence. If you agree with the sentence tick the box at the end of the sentence. If you do not agree with the sentence put X in the box at the end of the sentence.

- I understand what the project is about
- I understand that I can stop taking part in the project whenever I want
- I understand that any information I give the researcher will not be shared with anyone

Name:

Name Class:

School:

Date:

Appendix L.1 : Parental Debriefing Form



Mary Immaculate College,
South Circular Road,
Limerick,
Tel: 061 204300
ceire.devey@micstudent.mic.ul.ie

Dear Parents/Guardians,

Title of study: A Mixed Methods Investigation of Effective Online Comprehension Strategy Instruction within the Irish Primary School Context.

Thank you for allowing your child to participate in this study.

The objective of the study is to investigate if teaching pupils an online comprehension strategy programme can improve online comprehension levels. The results of this research project will be found by comparing the online comprehension levels of the pupils who received an online comprehension strategy instruction programme to the online comprehension levels of the pupils who did not receive online comprehension strategy instruction. I expect to find that the online comprehension strategy instruction programme will improve pupil online comprehension. The online comprehension strategy instruction programme involved teaching pupils how to apply print comprehension strategies and internet specific comprehension strategies.

If you wish to view the final report and results of this research please contact the researcher or her supervisor at the above e-mail addresses. However, you should be aware that the results of this research reflect the findings of one, single piece of research. Therefore, firm conclusions cannot be drawn in this area until further research is conducted.

If you wish to learn more about online comprehension you can consult the online comprehension strategy guide available at <http://www.readwritethink.org/professional-development/strategy-guides/reading-online-30096.html#strategy-practice>.

If you have any questions or queries about the research or wish to view the final report and results of this research please contact the researcher at ceiredevey@mic.ul.ie or her supervisor at Martin.Gleeson@mic.ul.ie. If you have concerns about this study and wish to

contact someone independent, you may contact: MIREC Administrator Mary Immaculate College South Circular Road Limerick 061-204515 mirec@mic.ul.ie. Once again thank you for co-operation in this matter.

Yours Sincerely,

Céire Devey

Appendix L.2: Participant Debriefing Form



Mary Immaculate College,
South Circular Road,
Limerick,
Tel: 061 204300
ceire.devey@micstudent.mic.ul.ie

Thank you for taking part in my piece of work. I could tell that you all worked very hard and listened carefully to all I had to say so well done and thank you.

This piece of work was looking at best way to teach boys and girls how to understand what they read on the internet. I expect to find that teaching boys and girls how to use book and internet strategies will be the best way to help them understand what they read on the internet.

If you have any questions or want to know anything else about this piece of work please ask me. Or if you have any further questions or want to know the results of this piece of work you can ask your parents or teacher to contact me or my supervisor (Dr. Martin Gleeson) by e-mail. Once again thank you very much for taking part in this piece of work.

Please keep this sheet in case you or your parents want to ask me any questions about this research project in the future.

Appendix M

Table 4.10

Table outlining how often participants use the internet in school settings per condition

I use the internet at school.....	Never	Less than once week	once a week	A few times each week	Once a day	Lots of times a day
Condition 1	16%	16%	20%	18%	10%	20%
Control						
Condition 2	27%	8%	45%	7%	3%	11%
Print Comprehension Strategy Instruction						
Condition 3	39%	7%	16%	8%	0%	23%
New Literacies Comprehension Strategy Instruction						
Condition 4	21%	15%	31%	10%	12%	11%
Print and New Literacies Comprehension Strategy Instruction						

Appendix N

Table 4.11

Table outlining how often participants use the internet at home per condition

I use the internet at home.....	Never	Less than once week	once a week	A few times each week	Once a day	Lots of times a day
Condition 1	34%	8%	16%	18%	4%	20%
Control						
Condition 2	20%	23%	13%	4%	24%	16%
Print Comprehension Strategy Instruction						
Condition 3	18%	9%	15%	27%	4%	27%
New Literacies Comprehension Strategy Instruction						
Condition 4	18%	14%	17%	17%	16%	8%
Print and New Literacies Comprehension Strategy Instruction						

Appendix O

Table 4.12

Table outlining Condition 1 pre and post intervention internet skill self-ratings

		Beginner	Slightly Competent	Moderately competent	Competent	Very Competent	Expert
Searching for information on the general internet	Pre	17%	17%	17%	10%	7%	41%
	Post	16%	16%	20%	20%	8%	20%
Searching for certain information on the internet	Pre	17%	17%	7%	13%	13%	13%
	Post	13%	17%	24%	8%	17%	21%
Picking the best website from a list of results	Pre	17%	7%	14%	14%	7%	41%
	Post	16%	24%	16%	8%	20%	16%
Bring together information from different websites on the internet	Pre	14%	7%	24%	14%	7%	34%
	Post	21%	13%	13%	17%	8%	29%
Writing and sending emails	Pre	50%	10%	10%	0%	3%	27%
	Post	33%	4%	17%	13%	13%	21%
Typing	Pre	13%	6%	6%	16%	3%	36%
	Post	13%	8%	13%	24%	13%	29%
Using the internet to answer a question	Pre	19%	4%	53%	4%	11%	33%
	Post	16%	12%	24%	16%	12%	20%
Telling if information found on the internet is trustworthy	Pre	21%	3%	14%	10%	3%	48%
	Post	13%	24%	21%	13%	8%	21%
Telling a friend how to read, write and share ideas on the internet	Pre	19%	11%	24%	4%	0%	38%
	Post	17%	21%	21%	8%	8%	24%

Appendix P

Table 4.13

Table outlining Condition 2 pre and post intervention internet skill self-ratings

		Beginner	Slightly Competent	Moderately competent	Competent	Very Competent	Expert
Searching for information on the general internet	Pre	15%	8%	8%	31%	0%	38%
	Post	6%	0%	28%	17%	17%	33%
Searching for certain information on the internet	Pre	31%	0%	31%	8%	8%	23%
	Post	12%	18%	17%	17%	18%	18%
Picking the best website from a list of results	Pre	31%	23%	8%	23%	0%	15%
	Post	16%	17%	17%	17%	17%	18%
Bring together information from different websites on the internet	Pre	8%	8%	8%	31%	8%	38%
	Post	6%	0%	17%	12%	28%	39%
Writing and sending emails	Pre	53%	8%	8%	0%	8%	23%
	Post	33%	12%	17%	12%	6%	22%
Typing	Pre	8%	0%	15%	8%	23%	46%
	Post	6%	12%	12%	12%	12%	44%
Using the internet to answer a question	Pre	15%	8%	31%	8%	8%	31%
	Post	6%	18%	18%	18%	0%	39%
Telling if information found on the internet is trustworthy	Pre	15%	8%	15%	15%	5%	32%
	Post	12%	6%	33%	6%	22%	22%
Telling a friend how to read, write and share ideas on the internet	Pre	8%	15%	0%	15%	8%	38%
	Post	12%	12%	33%	12%	6%	28%

Appendix Q

Table 4.14

Table outlining Condition 3 pre and post intervention internet skill self-ratings

		Beginner	Slightly Competent	Moderately competent	Competent	Very Competent	Expert
Searching for information on the general internet	Pre	25%	8%	17%	8%	8%	33%
	Post	8%	8%	13%	8%	17%	38%
Searching for certain information on the internet	Pre	42%	0%	17%	17%	0%	25%
	Post	14%	5%	19%	14%	10%	3%
Picking the best website from a list of results	Pre	25%	0%	17%	17%	25%	17%
	Post	19%	5%	10%	19%	5%	38%
Bring together information from different websites on the internet	Pre	8%	25%	8%	8%	17%	33%
	Post	15%	10%	5%	10%	15%	45%
Writing and sending emails	Pre	42%	0%	25%	8%	8%	17%
	Post	24%	5%	24%	14%	10%	24%
Typing	Pre	23%	0%	38%	0%	0%	38%
	Post	15%	5%	5%	5%	5%	65%
Using the internet to answer a question	Pre	25%	0%	17%	0%	42%	17%
	Post	5%	14%	14%	5%	33%	24%
Telling if information found on the internet is trustworthy	Pre	17%	0%	8%	38%	8%	23%
	Post	5%	0%	14%	33%	14%	33%
Telling a friend how to read, write and share ideas on the internet	Pre	23%	0%	23%	17%	17%	17%
	Post	10%	5%	10%	19%	5%	48%

Appendix R

Table 4.15

Table outlining Condition 4 pre and post intervention internet skill self-ratings

		Beginner	Slightly Competent	Moderately competent	Competent	Very Competent	Expert
Searching for information on the general internet	Pre	14%	1%	0%	43%	29%	14%
	Post	33%	0%	0%	0%	33%	33%
Searching for certain information on the internet	Pre	33%	17%	0%	0%	17%	33%
	Post	14%	17%	0%	43%	14%	29%
Picking the best website from a list of results	Pre	43%	0%	14%	0%	14%	29%
	Post	18%	18%	0%	0%	9%	55%
Bring together information from different websites on the internet	Pre	17%	13%	30%	11%	0%	29%
	Post	0%	0%	14%	17%	29%	40%
Writing and sending emails	Pre	29%	14%	14%	0%	0%	43%
	Post	50%	0%	0%	0%	0%	50%
Typing	Pre	17%	17%	17%	17%	17%	33%
	Post	0%	0%	33%	0%	0%	67%
Using the internet to answer a question	Pre	0%	10%	50%	16%	17%	17%
	Post	0%	0%	10%	14%	33%	43%
Telling if information found on the internet is trustworthy	Pre	33%	0%	17%	0%	33%	17%
	Post	14%	0%	14%	0%	29%	43%
Telling a friend how to read, write and share ideas on the internet	Pre	29%	14%	0%	14%	14%	29%
	Post	17%	0%	0%	17%	17%	33%

Appendix S

Table 4.16

Table outlining Condition 1 post mean ranks scores contrasting overall internet skill self-ratings between participants aged 7 to 8 years participants aged 9 to 10 years.

	Participants aged 7 Mean Rank Score N=40	Participants aged 8 Mean Rank Score N=40	Participants aged 9 Mean Rank Score N=40	Participants aged 10 Mean Rank Score N=40
Searching for certain information on the internet	3.58	6.50	7.00	9.25
Picking the best website from a list of results	3.00	4.33	9.08	10.81
Bring together information from different websites on the internet	3.50	4.25	9.75	10.93
Writing and sending emails	3.50	4.42	8.00	11.00
Using the internet to answer a question	3.67	6.00	8.43	10.21
Telling if information found on the internet is trustworthy	4.08	3.50	7.00	9.25
Telling a friend how to read, write and share ideas on the internet	4.00	4.00	9.25	9.25

Appendix T

Table 4.17

Table outlining Condition 2 post mean ranks scores contrasting overall internet skill self-ratings between participants aged 7 to 8 years participants aged 9 to 10 years.

	Participants aged 7 Mean Rank Score N=40	Participants aged 8 Mean Rank Score N=40	Participants aged 9 Mean Rank Score N=40	Participants aged 10 Mean Rank Score N=40
Searching for certain information on the internet	9.08	10.81	12.08	17.50
Picking the best website from a list of results	10.00	8.75	11.63	12.58
Bring together information from different websites on the internet	10.00	9.08	10.33	13.06
Writing and sending emails	8.17	11.42	12.56	13.00
Using the internet to answer a question	6.00	10.50	11.19	12.08
Telling if information found on the internet is trustworthy	8.00	11.50	13.00	13.00
Telling a friend how to read, write and share ideas on the internet	3.00	9.50	13.13	11.00

Appendix U

Table 4.18

Table outlining Condition 3 post mean ranks scores contrasting overall internet skill self-ratings between participants aged 7 to 8 years participants aged 9 to 10 years.

	Participants aged 7 Mean Rank Score N=40	Participants aged 8 Mean Rank Score N=40	Participants aged 9 Mean Rank Score N=40	Participants aged 10 Mean Rank Score N=40
Searching for certain information on the internet	8.75	10.00	11.63	12.58
Picking the best website from a list of results	6.50	10.83	10.00	13.25
Bring together information from different websites on the internet	9.08	10.00	10.33	13.06
Writing and sending emails	8.17	11.42	12.56	13.00
Using the internet to answer a question	6.00	10.50	11.19	12.08
Telling if information found on the internet is trustworthy	8.00	11.50	13.00	13.00
Telling a friend how to read, write and share ideas on the internet	3.00	9.50	13.13	11.00

Appendix V

Table 4.19

Table outlining Condition 4 post mean ranks scores contrasting overall internet skill self-ratings between participants aged 7 to 8 years participants aged 9 to 10 years.

	Participants aged 7 Mean Rank Score N=40	Participants aged 8 Mean Rank Score N=40	Participants aged 9 Mean Rank Score N=40	Participants aged 10 Mean Rank Score N=40
Searching for certain information on the internet	10.50	11.33	13.08	22.50
Picking the best website from a list of results	9.00	10.75	13.83	13.42
Bring together information from different websites on the internet	2.50	11.89	14.17	21.50
Writing and sending emails	12.75	13.11	13.50	13.50
Using the internet to answer a question	10.50	12.75	13.08	13.50
Telling if information found on the internet is trustworthy	7.00	11.78	14.21	17.25
Telling a friend how to read, write and share ideas on the internet	7.25	10.00	14.50	15.96

Appendix W

Table 4.20

Table outlining Condition 1 post mean ranks scores contrasting overall internet skill self-ratings between male and female participants.

	Female Mean Rank Score N=40	Male Mean Rank Score N=40
Searching for certain information on the internet	5.58	6.50
Picking the best website from a list of results	6.33	4.00
Bring together information from different websites on the internet	6.25	4.50
Writing and sending emails	6.42	3.50
Using the internet to answer a question	5.67	6.00
Telling if information found on the internet is trustworthy	6.08	5.50
Telling a friend how to read, write and share ideas on the internet	6.00	5.00

Appendix X

Table 4.21

Table outlining Condition 2 post mean ranks scores contrasting overall internet skill self-ratings between male and female participants

	Female Mean Rank Score N=40	Male Mean Rank Score N=40
Searching for certain information on the internet	9.65	9.10
Picking the best website from a list of results	9.77	8.80
Bring together information from different websites on the internet	10.12	7.90
Writing and sending emails	9.62	9.20
Using the internet to answer a question	9.23	10.20
Telling if information found on the internet is trustworthy	9.81	8.70
Telling a friend how to read, write and share ideas on the internet	9.85	8.60

Appendix Y

Table 4.22

Table outlining Condition 3 post mean ranks scores contrasting overall internet skill self-ratings between male and female participants.

	Female Mean Rank Score N=40	Male Mean Rank Score N=40
Searching for certain information on the internet	10.23	11.85
Picking the best website from a list of results	10.95	11.05
Bring together information from different websites on the internet	11.35	10.68
Writing and sending emails	11.25	10.77
Using the internet to answer a question	11.05	10.95
Telling if information found on the internet is trustworthy	11.80	10.27
Telling a friend how to read, write and share ideas on the internet	12.05	9.85

Appendix Z

Table 4.23

Table outlining Condition 4 post mean ranks scores contrasting overall internet skill self-ratings between male and female participants.

	Female Mean Rank Score N=40	Male Mean Rank Score N=40
Searching for certain information on the internet	15.25	11.50
Picking the best website from a list of results	14.45	12.03
Bring together information from different websites on the internet	13.27	12.60
Writing and sending emails	12.53	13.70
Using the internet to answer a question	11.85	13.77
Telling if information found on the internet is trustworthy	14.53	10.70
Telling a friend how to read, write and share ideas on the internet	15.87	8.70