

School of Education

**E-Learning and Literacy: An Investigation into the Impact of
Actively Learn to Raise Reading Comprehension Levels
of High School Students**

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This thesis is presented for the degree of

Doctor of Education

Curtin University

November 2020

Declaration

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgment has been made.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

The research presented and reported in this thesis was conducted in accordance with the National Health and Medical Research Council National Statement on Ethical Conduct in Human Research (2007) – updated March 2014. The proposed research study received human research ethics approval from Curtin University Human Research Ethics Committee (EC00262), Approval Number HRE2017-0589.

Signature:

Date: 20/11/2020

Abstract

In the changing literacy landscape, where digital reading is the ‘new normal’, concerns arise about students who begin secondary school without the comprehension skills that set them up to be able to ‘read to learn’. The purpose of this investigation was to examine the development of reading comprehension skills using the online platform *Actively Learn*. The platform was used by four Year 9 and three Year 10 English classes with students of varying ability levels, in a New Zealand secondary school setting. The action research methodology used interviews with students and teachers, comprehension test results, and survey instruments to gauge the effectiveness of the characteristics of *Actively Learn* in improving reading comprehension. The investigation found that students enjoyed the use of immediately available support tools, and the agency to choose tools that were appropriate for them. They preferred opportunities to exercise autonomy when answering questions as they read. The ability to connect with other students, as a form of peer-mentoring, was also viewed as a positive aspect of the platform. Students appreciated the capacity of the teacher to give ongoing feedback and support as they worked through the texts. This finding demonstrates the centrality of the teacher, even when digital tools are used to support learning. The investigation found that this platform, while useful for middle ability students, had limited effect for students with very low-level reading ability. Providing a text-to-speech tool afforded these struggling decoders the opportunity to engage as part of the class in a text that might otherwise be beyond their reading level, however, it did little to improve the reading of these low-achieving students. The study provides a model that synthesises student agency and autonomy, connectedness, and the role of the teacher in the development of metacognitive skills to support reading comprehension. The model may also provide a means of evaluating the efficacy of other digital tools.

Acknowledgements

As I come to the end of this doctoral journey, there is a whakatauki (Māori proverb) I must begin this thesis with:

Ehara taku toa, i te toa takitahi, engari he toa takitini
My success should not be bestowed onto me alone,
as it was not individual success but success of a collective.

Completing my Doctor of Education degree would not have been possible without both funding and support and I am grateful to the following people and organisations.

Firstly, I wish to acknowledge the contribution of an Australian Government Research Training Program Scholarship in supporting this research. I feel privileged to have had funding from the Research Training Program to cover my doctoral fees.

I am grateful to the Ministry of Education, New Zealand, for granting me a Study Support Grant as I carried out this research, and also for the Study Award I received in 2019 which enabled me to work as a fulltime student and write this thesis.

I am also thankful to Fulbright New Zealand. Being provided with the experience of going to Indiana University, Bloomington, Indiana in 2014 as part of a Distinguished Award for Teachers, opened an opportunity for further study. My United States Capstone Project provoked further questions about digital learning and literacy that I wanted to investigate. The Indiana University experience sparked the doctoral process, and I am grateful to the people I met there, particularly Sanaa Hissame, Remya Parameswar Iyer and Taina Wewer.

This process would not have been possible without the excellent support of my supervisor Dr Paul Gardner. Distance education requires strong support, and through Skype, Zoom and email, regular contact and quick responses, insightful ideas and even the brief emails with a reading to follow up or a study to investigate, I have appreciated great support. Despite having a substantial research project workload, Paul always managed to fit in answering my questions, responding to emails, reading each chapter iteration, and providing insightful feedback. I also appreciate the editing support of my Assistant Supervisor, Dr Sender Dovchin, and

her attention to detail. I extend my thanks to Dr Julian Chen, Dr Rob Cavanagh, Dr Graham Dellar and Dr Kathryn Dixon, whose coursework papers helped lay the foundation upon which this thesis could develop.

I would like to acknowledge the two Principals and the Board of Trustees of the school in which I conducted this study and thank them for their support and permission to conduct my research. I am grateful to my participants, both students and teachers, without whom this investigation would not have been possible. I also appreciated the honest and insightful input from the students. Teenagers are wonderful people to work with, and I have loved listening to the voice recordings as I transcribed the participants' thoughts and ideas.

I appreciate the following educationists who have given me support in one way or another during my journey: Dr Pat Churchill, Cath Braddock, Aaron Mead, Dr Rose Hipkins, Anita Titter, Kim Kelly, Che Ray, Lynley Ball, and Kate Cormack.

I am so grateful for the support of my close friends and family, Kate Couling, Susan Handisides, Darlene Shepherd, Anna Carter, and John Carter, who encouraged me and listened to my ramblings as I was consolidating ideas about the implications of my findings.

I also appreciate my local friends, and the wonderful ladies in my book club, for keeping me connected to the community throughout the self-imposed hermitic lifestyle of doctoral study and working as a teacher.

I am also grateful to my parents, John and Mary Carter, for encouraging reading from a young age; parents start the reading journey for their children.

This whole process would not have begun without the support of my wonderful family, the loves of my life. My son Luke and daughter Annalisa always had faith in me. I am so proud of the adults they have become. Each in their field shows a strong work ethic and determination. We are a family of learners.

And finally, my husband, Scott, my co-pilot in life. I will be eternally grateful for his matter-of-fact belief that of course I could do this, and his encouragement for me to follow this path; for his belief that I'm more capable than I realise; for cooking dinner and taking charge of the household; for inspiring me to keep going if I wavered; for believing in the importance of education, despite leaving school at the age of 16. My life is so much better for having him in it.

I end with another whakatauki, a proverb that has inspired me and that I share with my students to encourage them:

**Kaua mā te waewae tūtuki, engari mā te ūpoko pakaru
Persevere with determination, don't be put off by small obstacles.**

This thesis is dedicated to the memory of Sanaa Hissame, a Fulbright Scholar from Morocco who was my roommate and friend in Indiana. A young woman who brought joy with her wherever she went, who loved her family, education, and travel, and was tragically taken too soon. I plan to visit her homeland one day and meet her family, inshallah.

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Chapter 1 – Introduction

Overview

This thesis investigates the efficacy of developing students' reading comprehension and the thinking skills necessary for 'deep reading'. The participant school was awarded a Teacher-Led Innovation Fund (TLIF) grant from the New Zealand Ministry of Education to investigate ways e-Learning tools could have an impact on personalising learning for students. A small group of teachers who were part of the project began to examine how digital tools could support literacy development, in particular, reading comprehension. In so doing, a systematic study was made of *Actively Learn*, an online reading programme created in the United States and used in a New Zealand secondary school. While no tool will meet all students' needs all of the time, having searched through the literature to find the core components of successful reading, *Actively Learn* was chosen due to having features that reflected a Universal Design for Learning (UDL) (CAST, 2018). This included providing options for engaging with the text through providing texts that were personalised and socially engaging. It also offered students ways to customise the display by varying the layout, colour, and graphics and provided an auditory option. Students were supported in expressing themselves with the support tools embedded in the platform. The platform provided several functions, including opportunities for teachers to chunk texts into smaller segments, a means for students to change the way a text looked through altering style and size of the font, a vocabulary support tool, a text-to-speech tool, and the opportunity for students to reflect on what they had read, as well as monitor understanding, whilst reading. The variability in terms of assistive devices, and the focus placed on thinking during the reading process, led to a group of teachers choosing to trial the *Actively Learn* platform as a reading comprehension resource. Chapter One outlines the background to the study and identifies current concerns about the state of literacy education and its impact on some students' ability to read for meaning at secondary school, where there is an expectation they will be relatively independent learners. The rationale discusses the importance of reading comprehension at the secondary level when students face increasingly complex texts. A summary of the methodological approach to this investigation is included, followed by an explanation of the significance of the study. The objectives and

research questions provide the purpose for the study, with the chapter ending with the structure of the thesis signposting the chapters that follow.

Background

The prevalence of computers, in everyday life, has not reduced our need for reading. Indeed, it could be argued that because of computers we are faced with text every day. This makes the need for reading, and understanding what is being read, more important than ever. When students arrive at secondary school, not only is there an assumption by teachers that they can already read, there is an expectation that students can use their reading to support their learning (Chall, Jacobs, & Baldwin, 1990; May, 2002; Rose & Martin, 2012). It has been found that the most prominent area of difficulty for secondary students is in reading comprehension and its associated areas of vocabulary, developing background knowledge and engagement in reading (Biancarosa & Snow, 2006). Whereas early literacy skills focus on the development of the ‘constrained processes’ of decoding skills, once the ability to decode has been learned, the later years require the development of the ‘unconstrained processes’ of thinking and metacognitive skills that build understanding (Dymock & Nicholson, 2012; McDonald, Thornley, Ciriza, Behumi, & Staley, 2011; Snow & Matthews, 2016). This concept will be further developed in Chapter Two.

At high school, many students face the challenge of a disparity between their reading ability and the type of texts they encounter (Frankel, 2016; Mastropieri, Scruggs, & Graetz, 2003). Without the metacognitive knowledge required for reading with understanding, some high school students struggle to use reading as a tool for learning. In short, being able to decode is not enough; processing ideas at a deep level is what builds understanding. One of the issues for this study then was to harness the use of digital technology, as a tool for learning, while also encouraging students to read at a deep level. As well as the need for the critical skills of reading and writing, technological changes have introduced new literacies which allow for interactions through multiple modes including paper, live and digital means (Bull & Anstey, 2019). The 21st-century student is required to be skilled in navigating digital media. A focus on multiliteracies, digital technology used for communication, and using multiple modes of communication and expression, is viewed as being a necessary aspect of literacy in modern times (Cope & Kalantzis, 2000).

The Progressive Achievement Test of Reading Comprehension (PATC) (Darr, McDowell, Ferral, Twist, & Watson, 2008), a norm-referenced standardised test, is used in the study school to gain diagnostic information at the start of each academic year for Year 9 and Year 10 cohorts. Students with higher achievement scores can respond to abstract information and use multiple pieces of information that are often implied within the text. This may involve the ability to reject competing information. Students at the lower levels require more precise information on familiar topics. They require content that is more explicit with fewer pieces of information (Darr, McDowell, Ferral, Twist, & Watson, 2008).

For the intervention school, PATC assessment data revealed that approximately one-third of students in Years 9 and 10 begin the year achieving at stanines 1-4. Of this subgroup, approximately 45% were performing at stanines 1-3. A concern is that this result is consistent over time, with six years of records, from 2012 to 2017, showing a relatively static result.

According to the OECD (2019b), this issue is more widespread than just the school in this study. This emphasises the importance of investigating tools that could support the amelioration of reading comprehension difficulties. New Zealand has a long tail of under-achievement, whereby the gap between the high-achievers and low achievers is wide (Tunmer, Chapman, Greaney, Prochnow, & Arrow, 2013). The lack of equitable outcomes in reading achievement can be linked to socio-economic circumstances, with a relatively high disparity between the achievement of students from affluent backgrounds compared with those from low socio-economic backgrounds (Ministry of Education, 2017). The Progress in International Reading Literacy Study (PIRLS) tests students in their fourth year of schooling. Students who achieve the advanced level can interpret, integrate and evaluate story plots and information in complex texts (Mullis, Martin, Foy, & Hooper, 2017). Students who exhibit fundamental skills can locate ideas and information in a text and make straightforward inferences (Mullis, Martin, Foy, & Hooper, 2017). The PIRLS results reveal that the trend in reading comprehension for New Zealand in 2016 has shown a decrease in three aspects of reading. The areas of concern are retrieving information, making complex inferences, and generating interpretations when reading text (Mullis, Martin, Foy, & Hooper, 2017).

A summary of the 2018 Programme for International Student Assessment (PISA) results (OECD, 2019b) reveals that 81% of New Zealand 15-year-olds gained

proficiency at Level 2 in reading; this is above the OECD average. A further finding is that 13% of New Zealand 15-year-olds were top performers in reading, attaining Level 5 or 6 in the PISA reading test. This achievement requires students to be able to comprehend lengthy texts, deal with abstract concepts and distinguish between fact and opinion. Despite this seemingly positive outcome, evidence shows that the mean performance in reading in New Zealand steadily declined between 2000 and 2018 (OECD, 2019a). Furthermore, of primary concern is that a rapid decline in reading has been observed amongst the lowest-achieving students (OECD, 2019a; OECD, 2019b). The students performing at the top level remained constant; however, there has been an increase in the number of students identified as low performing.

According to the PISA results, girls outperformed boys in reading, a trend that was also reflected in New Zealand. However, the gender gap in 2018 was lower than in 2009. This was not because the performance of boys had improved, but because the performance of girls had declined (OECD, 2019b). A further interesting finding related to school climate where 30% of New Zealand students reported that the teacher must wait a long time for the students to quieten down. In New Zealand, students who reported this scored 24 score points lower in reading than students whose teacher rarely had to wait for the class to quieten down (OECD, 2019b). It is also concerning that 32% of students in the New Zealand survey reported being bullied a few times a month, compared to a 23% average in the OECD countries (OECD, 2019b). As will be discussed later, the issue of ‘classroom climate’ was found to be a factor that affected students’ reading in this study.

A Ministry of Education response to the PISA results reiterated the concern that the impact of bullying has on learning and commented that an increasing number of learners in secondary schools were struggling with reading, particularly students from a background of socio-economic disadvantage (Ministry of Education, 2019). The response further articulated the importance of early literacy as the foundation for improving all learning and that all children must receive quality teaching, tools and resources (Ministry of Education, 2019).

In a study of 373 primary school students who had been successfully discontinued from the Reading Recovery programme, Jesson and Limbrick (2014) investigated the maintenance of reading gains, two, three or four years later. The follow-up to the Reading Recovery discontinuance found that only one third (35%)

of students performed the PATC at or above the mean stanine level. Even considering that many schools deemed 'average' performance to be between stanines four and six, approximately 40% performed below-average levels in reading comprehension. According to the 2012 Resource Teacher of Literacy (RTLit) Annual Report, (Cowles, 2013), 4,504 students were involved in the programme during the year. An increased proportion of older primary school students received indirect support, up from 64% in 2011 to 83% in 2012 (Cowles, 2013). Of these students, 77% received support for reading processing, and 62% received support for reading comprehension.

Wolf (2018a) has suggested that in the digital age, skim-reading has become the new normal, and it may be that the prolific use of the strategy by young people is one reason why some read at a superficial level. She further explains that screen reading allows people to view multiple sources and skim-read thousands of words a day (Wolf, 2018b), which leads to people 'word spotting' or 'browsing'. Through this fast-paced form of reading, not all of the information is processed; people are less analytical and become susceptible to false information (Wolf, 2018b). Moreover, this style of skim reading, which is exacerbated by screen reading, does not allow people to become 'in-depth' readers (Wolf, 2018b). Seaboyer (2020) confirms this concept by stating that skim reading is suitable for information retrieval, but does not support in-depth reading. The analytic skills developed by contemplating texts are lost to people who skim read (Seaboyer, 2020). Seaboyer (2020) clarifies that screen reading becomes a problem when it replaces the need for deep reading. In-depth reading is a slower process than skim reading and creates neural circuits that allow people to think, rather than a shallow form of reading where people are told what to think (Seaboyer, 2020).

Davidson and Sternberg (1998) highlight the importance of slowing down to process more deeply any material that is difficult or unfamiliar. The need for understanding overcomes the need for speed, and for understanding to occur, the text needs to be processed deeply. Students who do not self-monitor their comprehension while reading may skip over material they find challenging. This can lead to an illogical mental model of the text being constructed (Davidson & Sternberg, 1998). More skilled readers would stop and re-read confusing material.

Reading is a complex cognitive and social practice (Schoenbach, Greenleaf, & Murphy, 2012) through which knowledge and skills continue to develop during a

lifetime. It requires an active brain, whereby meaning is constructed from the written text through the connection to the reader's experiences, prior knowledge and motivation (Zygouris-Coe, 2001). The brain is focused, images are forming, and new ideas are connecting to previously held concepts. Words can be glazed over when seeking to find a relevant piece of information, but for understanding to take place, the reader needs to slow down, the text needs to be processed and connected to what is already known. Keene and Zimmerman (2013) emphasise the importance of teaching comprehension strategies explicitly, thus resulting in teachers raising their expectations of all students through developing the skills of thinking while reading.

Problem Statement

The problem underpinning this investigation was three-pronged. Firstly, despite eight years of formal education, some students arrive at high school without the depth of thinking required for their reading to be meaningful. At the secondary school where I teach, six years of diagnostic testing of reading comprehension identified that approximately one-third of students entering the school had reading comprehension lower than expected for their age level. A concern is that for this low-achieving group, the result of the PATC in Year 10, the final year in which this diagnostic test is administered, is mainly static. The low achievers show little, or no progress when tested by a standardised test of reading comprehension.

When pondering the question 'What is so important that it cannot be left to chance?' the answer was clear: reading and reading comprehension; having the ability to read to learn. Adolescents must acquire a level of reading to enable them to become successful, interactive, participating members of society with the ability to learn anything, as they have a repertoire of literacy skills that can be used for independent life-long learning. If it is true that 95% of all children can be taught to read (Moats, 1999), why do we have, at a secondary school in New Zealand, approximately 30% of students below their expected level in reading comprehension? As stated by Fisher, Frey, and Hattie (2016), literacy is the key antidote to poverty as it makes your life better, enables more choices, teaches thinking skills, and is the foundation for further learning. This makes effective reading a non-negotiable achievement in 21st-century education.

The second aspect of the problem is that technology has changed the way teaching and learning takes place. In the 21st century, the definition of literacy

extends beyond reading and writing, as critical thinking and digital literacy are components of being a successful 21st-century scholar (Kivunja, 2014; Trilling & Fadel, 2009). Many schools have a policy of Bring Your Own Devices (BYOD), and there is an expectation that digital technology is incorporated into all aspects of learning. However, the prevalence of online reading has led to reading becoming a quick, shallow, browsing process, even for many adults (Schoenbach, Greenleaf, & Murphy, 2012; Wolf, 2018a). The browsing style of reading compounds the problem for struggling teenage readers who need to learn to read deeply to aid their comprehension. Yet, the reading they interact with most frequently is fast-paced, quick flicking between screens and posts, with little depth or even the reading of a complete article. Skimming, scanning, and scrolling quickly through text does nothing to develop the skills of deep comprehension.

Finally, the plethora of technological tools available is not necessarily a problem if the technology that is used can assist learning. However, if the drive to use technological tools outruns the efficacy of a tool to produce the desired learning effect, teachers are playing a trial and error game of sorting the gimmick tools from those which have an impact on learning. With many digital applications on the market, teachers must sift through the options to find those that are pedagogically effective. Rather than selecting tools haphazardly, the intention underpinning this study was the systematic investigation of a digital platform, *Actively Learn*, and its evaluation from a practitioner's perspective. I wanted to find out what areas of difficulty students had when reading at secondary school and if any digital supports made reading more accessible or more engaging.

Rationale Behind the Study

The rationale for this study is that if we do not address the situation of low comprehension in reading, students will have difficulty reading texts across different subjects in the curriculum. Being exposed to more complex texts at the secondary level may make learning difficult for students. The limited number of studies outlining the impact of using digital tools to influence teenagers' reading development guided the direction of this study.

Although the PATC test is only a snapshot of a student's reading in a moment in time, it provides a reference point for analysing reading comprehension. As stated

above, the concern about reading comprehension arose due to approximately one-third of students in Years 9 and 10 consistently achieving below the mean achievement level, that is, stanine four and below, over the previous six years. The question arose as to what could be done differently to boost students' comprehension, particularly those students at stanines 3 and 4, who were just below the mean. We should not assume that because some students sit at the lower end of a bell curve, they should be left to fail. The curve needs to shift so that even those at the lower end of reading comprehension ability, are still succeeding as readers.

Many secondary school teachers may not have the same self-efficacy for teaching reading as primary teachers due to a focus on content-area teaching or a lack of knowledge in teaching the basics (Hansen, 2005; Massey & Heafner, 2004; May, 2002; Schoenbach, Greenleaf, & Murphy, 2012). There is an expectation that reading skills should already be in place before students begin at secondary school (May, 2002; Schoenbach, Greenleaf, & Murphy, 2012). Thus, there has been a lack of integration of literacy teaching across the disciplines as the focus has primarily been on general literacy, rather than subject-specific literacy (Moje, 2008). Reading is the cornerstone of academic success (Moats, 1999); yet, competent reading instruction as part of high school literacy programmes is limited. This is often due to the expectation that when students arrive at secondary school, they all have sufficient competence in reading to access the curriculum fully.

Therefore, this research aimed to investigate a single digital platform that claimed to develop reading comprehension and support in-depth reading; reading that involves understanding, analysing ideas within a text and being able to apply the knowledge (Actively Learn, 2017; Sran, 2015). It was a way of finding out if the core skills of literacy could be incorporated into a digital tool and whether this combination was efficacious for comprehension development.

The research objectives guiding the study were to:

- explore challenges faced by students when encountering texts at secondary school;
- investigate the characteristics of *Actively Learn* that students found useful, or not useful when developing their reading comprehension;
- identify if reading comprehension achievement is positively impacted by using a digital platform;

- discuss the implications for teachers and students of using digital tools for literacy development.

Context of the Study

The study was conducted in a New Zealand co-educational secondary school over two years. New Zealand uses the decile system (a ten-point scale) to classify the socio-economic position of the community in which the school is located and is used for funding purposes. Decile 1 schools have a high proportion of students from low socio-economic backgrounds, whereas Decile 10 schools have very few students from low socio-economic backgrounds (Ministry of Education, 2020). The participant school was a Decile 8 suburban secondary school with the predominant ethnicity being New Zealand European Pākehā; 15% of students identified as Māori, and 3% as of Pacific heritage.

In 2016, having been awarded a Teacher-Led Innovation Fund (TLIF) grant from the New Zealand Ministry of Education, a small group of teachers who were part of the project began to examine how digital tools could have an effect on the persistent low reading comprehension results of a segment of the school's Year 9 and 10 population. A commercial online reading package programme was investigated; however, it required ongoing payment that the school could not afford. A free online news programme that provided adaptive text was briefly used. Providing audiobooks to support the reading of more complex texts was also explored. The various add-ons and extensions offered by the Chrome suite to promote literacy, such as Read&Write, were also reviewed.

During this investigative process, one of the teachers discovered the digital platform *Actively Learn*. With a focus on raising comprehension levels in the school, we saw potential in this platform as it had many supports that students could choose to use if needed, and it focused on thinking while reading. There was room for the personalisation and flexibility of texts which allied with the TLIF project. The platform met the UDL (CAST, 2018) variability criteria we sought, such as providing alternative supports for accessing texts, encouraging personal thinking and responses, the ability to engage students through personalisation of reading material for classes, and options that allowed communication between peers. These aspects aligned with the three core principles of UDL (CAST, 2018): multiple means of engagement, multiple means of representation and multiple means of action and

expression. ‘Multiple means of engagement’ was supported in *Actively Learn* through providing choices, incorporating students’ interests, the option of defining words while reading and the option to revise any answers and make changes. ‘Multiple means of representation’ was evidenced in the assistive technology options available for engaging in texts such as text-to-speech, variation in font size, the ability to change the background colour and the chunking of texts. ‘Multiple means of action and expression’ was supported in *Actively Learn* through open-ended questions and the ability to engage with others in the class. It was decided that a systematic study of the programme was necessary to gauge its pedagogic value.

A significant issue with emerging technologies is the absence of systematic evaluation processes to measure their educational efficacy. As they are still developing, research may not have been conducted to discover the value or lack of value, that a tool may have. While carrying out this research, I was a teacher at the school and a member of the TLIF team. For ease of management, a purposive sampling approach was chosen for this study which included students from four Year 9 ($n = 40$) and three Year 10 ($n = 20$) classes over the two-year study. This pragmatic approach meant the students in the classes of the English teachers who were part of the TLIF inquiry were involved in the study. Convenience and pragmatism played a role in the selection of the school and the participants. The platform was trialled from 2017 to 2018 to see if it had an impact on developing reading comprehension.

Response to the Problem

Without research into digital tools, teachers face the continual process of trial and error when choosing what tools will be useful for their students. The new platforms may have gadgets and widgets that enhance the learning of students, or they may simply be gimmicks that have a negligible impact on learning.

Actively Learn is an online tool that claims to support the development of reading comprehension. The developers purport that this tool will add depth to the reading experience; that is, enable understanding, develop analytical skills and allow for the application of knowledge that is gained (Actively Learn, n.d.). This study focused on the free version of *Actively Learn*, which has limited access to the platform’s resources. In doing so, it was possible to identify the usefulness of the tool for schools with limited budgets. Digital tools that require ongoing payment add to

the digital divide as wealthy schools can afford to pay for access to resources and schools with more limited funds go without these extra supports.

Although without a subscription, access to the full range of the platform's features was limited, the free version afforded several functions. Settings allowed the students to choose the background colour of the text, change the margin and spacing sizes between words, add paragraph numbering and change the font style and size, including using dyslexic settings. Students were able to ask for a revision if they were not happy with their answer. Once they had answered a question, they were able to read the responses of the other students in their class. The facility was available to annotate the text, ask a question or make a statement on a note that they could either share with the class or create as a private note which only the teacher could see. Students had access to a text-to-speech tool whereby they could choose to listen to the text while they were reading. Synchronised highlighting of text and speech was a facility available for students to choose. The speed in which the reading was spoken could be altered, and a selection of voice options was available. A definition tool was available for use when encountering an unfamiliar word. A translation tool allowed the English text to be highlighted and translated into one of 104 other languages, including Māori, Chinese, and Spanish. When teachers graded or commented on an answer, students received a notification and could check this at any stage of the reading. Chapter Three presents a detailed explanation of the features of the platform.

Research Questions

As this study focused on secondary school students, it was beyond the scope of this investigation to address the early reading skills of alphabetic knowledge and phonemic awareness. The study aimed to determine the aspects of reading that students found difficult at the secondary level and whether digital tools could support the development of their reading comprehension through incorporating thinking skills and comprehension strategies as part of reading.

The investigation focused on the following research questions:

- 1) What characteristics of *Actively Learn*, if any, meet the reading comprehension learning needs of Year 9 and 10 students?
- 2) In what ways, if any, can using *Actively Learn* focus on development of reading comprehension strategies of Year 9 and 10 students?
- 3) To what extent does *Actively Learn* have an impact on the reading engagement of Year 9 and 10 students?
- 4) To what extent, if any, does *Actively Learn* improve the reading comprehension of Year 9 and 10 students?

Overview of Methodology

A practical action research methodology (Creswell, 2012) was employed as it suited a practitioner approach and allowed the teacher to become the researcher (Stenhouse, 1975). Action research is a means for those who are practitioners in the field to seek answers to problems that occur in their setting. Action research allows an action to be put in place and reflected upon, thus incorporating a systematic process of change, with the opportunity to investigate the impact this change has. This methodology allowed for reflexivity during the research process and for adaptations to be made as the need arose. According to Butin (2010), we need more practitioners who can link theory and practice to ensure that daily practice and academic research are connected. The focus of this investigation was on the digital platform *Actively Learn* and whether it had an impact on reading comprehension for junior secondary students. The spiral process of inquiry, which will be explained further in Chapter Three, allowed researchers to observe a practice that required improvement, in this case, reading comprehension. The next step was to focus on planning and implementing changes to practice, then finally observing and evaluating the effect (Cohen, Manion, & Morrison, 2017; Herr & Anderson, 2005a).

Despite being an interpretivist methodology, and in keeping with the flexibility of action research, data were collected in both qualitative and quantitative forms. In this study, 60 students and five teachers participated in semi-structured interviews which were voice-recorded. Students and teachers answered open-ended questions to explain their attitude towards using the digital platform. Questions sought to identify characteristics of the platform that were useful, and conversely,

any attributes of the tool that had a negative impact. The participants' responses were coded and analysed using the NVivo 12 Pro qualitative data analysis software. Emergent themes were explored following the interpretive paradigm, to gain an understanding of whether there were ways in which digital tools could have an impact on reading comprehension. The themes revealed the importance of autonomy and agency when students were reading using a digital platform. It also emerged that the ability to connect with others was a supportive factor when reading. Furthermore, it was revealed that the teacher's role remains critical and is not superseded by the use of digital technology.

Quantitative data, collected in the form of online surveys and test results, provided additional data streams. An initial survey on reading behaviours in students' life, both at school and home, was conducted before the intervention. A second survey was conducted, post-intervention, to ascertain students' reflections about using the platform.

Before the intervention, the Electronic Assessment Tool of Teaching and Learning (e-asTTle) (Auckland UniServices, 2007-2009) was used to gauge areas of strength and weakness in students' reading. Post-tests were carried out at the end of the two-term intervention with data used as a before and after comparison tool.

Previous studies of adolescent reading have found that many students who can decode fluently are not able to comprehend the ideas within the text (Biancarosa & Snow, 2006; Williams & Atkins, 2009). For this reason, at the start of every academic year, Year 9 and 10 students in the study school sit the PATC, which provides teachers with diagnostic data on reading comprehension. The tests involved students reading a short or extended passage of text and answering multiple-choice questions. In the study school, this was performed using a paper format; however, a digital format is available. The PATC includes three types of questions: 1) Retrieval questions, whereby no inference is needed as the text wording provides the answer; 2) Local inference questions, whereby the reader must comprehend some implied information from small sections of the text; and 3) Global inference questions, whereby the reader is required to understand information from across large sections of the text (Darr, McDowell, Ferral, Twist, & Watson, 2008). The difficulty of the texts is decided upon using the Elley and Croft Noun Frequency Method (1989, as cited in Darr, McDowell, Ferral, Twist, & Watson, 2008).

Normative information in the form of stanines (a standardised distribution with nine levels) allows students' results to be compared with the achievement of a national reference group at each year level. Scale scores that represent the average of a year level are assigned a stanine of between four and six, with the mean in this normal distribution being five. Thus, students performing at stanines seven to nine are well above the average for the year, and conversely, those at stanines one to three are well below the year level average.

Significance of the Study

This research is significant as it addresses a decades-old problem in New Zealand education, that of reading ability, and specifically looks at ways secondary students can be supported to develop their reading and thinking skills. Despite being a country where the most capable students do well and perform amongst the highest in the world (OECD, 2019b), New Zealand has not achieved a level playing field with students from different backgrounds having an equitable chance of being a fluent reader. New Zealand researchers have argued that the literacy achievement gap has been influenced by the predominant use of whole language-based instructional approaches to the teaching of literacy skills (Chapman, Arrow, Braid, Greaney, & Tunmer, 2018; Chapman, Greaney, Arrow, & Tunmer, 2017; Chapman & Tunmer, 2014; Tunmer, Chapman, Greaney, Prochnow, & Arrow, 2013). As we move into a more digital age, where tools are available to support students, we need to know if these tools provide effective scaffolds for reading development, or whether they merely compensate for students' gaps in knowledge and thereby bypass the need to read. New Zealand education has begun to move away from the strict constructivist approach to the teaching of reading that occurred in the 1980s and 1990s, yet we are still encountering secondary school students who find reading difficult and struggle to use reading as a tool to assist their learning. It is important to find out if enough is being done to enable students to have success and confidence in literacy, in such a way that their literacy skills can take them on to be continuous learners throughout life.

This study aimed to investigate the characteristics of *Actively Learn* that support reading, as a means of identifying how digital tools, more generally, can be used to scaffold students' reading development, at the secondary school level. The findings have informed the design of reading programmes for teachers of English in

the study. The findings also support cross-curricular literacy development in a whole school approach to literacy, rather than reading development being the sole responsibility of English teachers.

The participants were offered formal support in reading through being taught reading comprehension strategies. They also had access to a digital tool that enabled all students to participate at their own pace. A New Zealand study has found that secondary students are offered few reading activities that require them to engage in extended texts (McDonald, et al., 2008). Many secondary schools focus on content areas, and yet a focus on continuing to develop literacy skills is essential as advanced reading skills do not evolve automatically (Shanahan & Shanahan, 2008). By being a participant in this study, students had the opportunity to read and respond to texts and had opportunities to use thinking skills in the moment of reading.

The findings will be useful to teacher educators to help address the long-term issues New Zealand has had in the teaching of reading. The study provides elements of what to look for when using a digital tool to support reading. Using digital tools without a pedagogical platform will make little difference to students' learning and will simply be 'talk and chalk' by another name.

If we want equitable learning outcomes, regardless of socio-economic status, we need to consider systemic issues and education policy. This is a topic of national importance as even in the 21st century, we still have students failing to read fluently and with understanding. School is working well for many. However, if equity of educational success is a tenet by which we stand, we need to address why some students are not thriving and find ways to address the gap.

Researcher Positioning

A background in primary education before becoming a secondary educator supported my interest in the importance of literacy skills. Core literacy skills are part of every primary school's daily programme and are deemed to be essential skills for living. It surprised me to discover that test results at a high school in New Zealand annually revealed a group of students who were low achievers in reading comprehension. I heard a secondary teacher once say, "I expect students to be able to read when they arrive at college. I never learned how to teach them to read." This made me consider the process of teaching reading and how secondary-level teachers could continue the development of thinking skills associated with deep and skilful reading.

With technology becoming ubiquitous in education, I wondered if digital tools might scaffold the literacy of students who still struggled to understand what they read, despite eight years of education. I also had a belief that digital tools must support teacher beliefs of learning (Mead & Jeffries, 2018), rather than merely being a fun gimmick that adds variety. Choosing to use a digital tool to support reading comprehension development was a step into the unknown of whether this could have an impact greater than the maturation level expected from simply attending school. With a focus on 21st-century skills in education, my bias was that reading is the fundamental 21st-century skill and that digital tools, if used correctly, may support learning.

My position in this research was one of participant researcher. I possessed a participant's view through being one of the teachers involved yet was also the lead researcher. My position was akin to an auto-ethnographic role. For data reliability, teacher interview transcripts were returned to each teacher to allow for an opportunity to clarify or change their responses. A peer audit was undertaken with two teachers who reviewed the methodology section to ensure the process reported was indeed the process that took place. The Methodology chapter further elaborates on ways trustworthiness has been addressed in this study.

As a researcher, I have pursued an objective, descriptive account of the investigation into the use of a digital platform to support reading comprehension. I acknowledge that my background as a primary teacher, an English teacher, and being a participant in a Teacher-Led Innovation project investigating how e-Learning can be used to personalise learning may have caused unintended bias towards the use of digital tools. To combat any effect of bias, I have reported negative case analysis and have not excluded data that were negative in their findings.

A further belief I hold that may have an impact on the research is that unless a person is cognitively impaired, developing the skills of reading should be accessible. The PAT Reading Comprehension Scale (Darr, McDowell, Ferral, Twist, & Watson, 2008) represented in Figure 1.1 shows that 40% of students will be below stanine five. However, according to Murphy and Murphy (2018) "reading is not about a statistical distribution; it is about practical necessity" (Murphy & Murphy, 2018, p. 111). If it were possible to shift all students in their reading skills, effectively moving the normal distribution curve, we might not have what the 2015 PISA results show as a decreasing trend in reading scores (May, Flockton, &

Kirkham, 2016). Thus, a bias towards the importance of reading skills has led to this research and curiosity as to whether digital tools can assist students in a way that may not be as readily available in paper format.

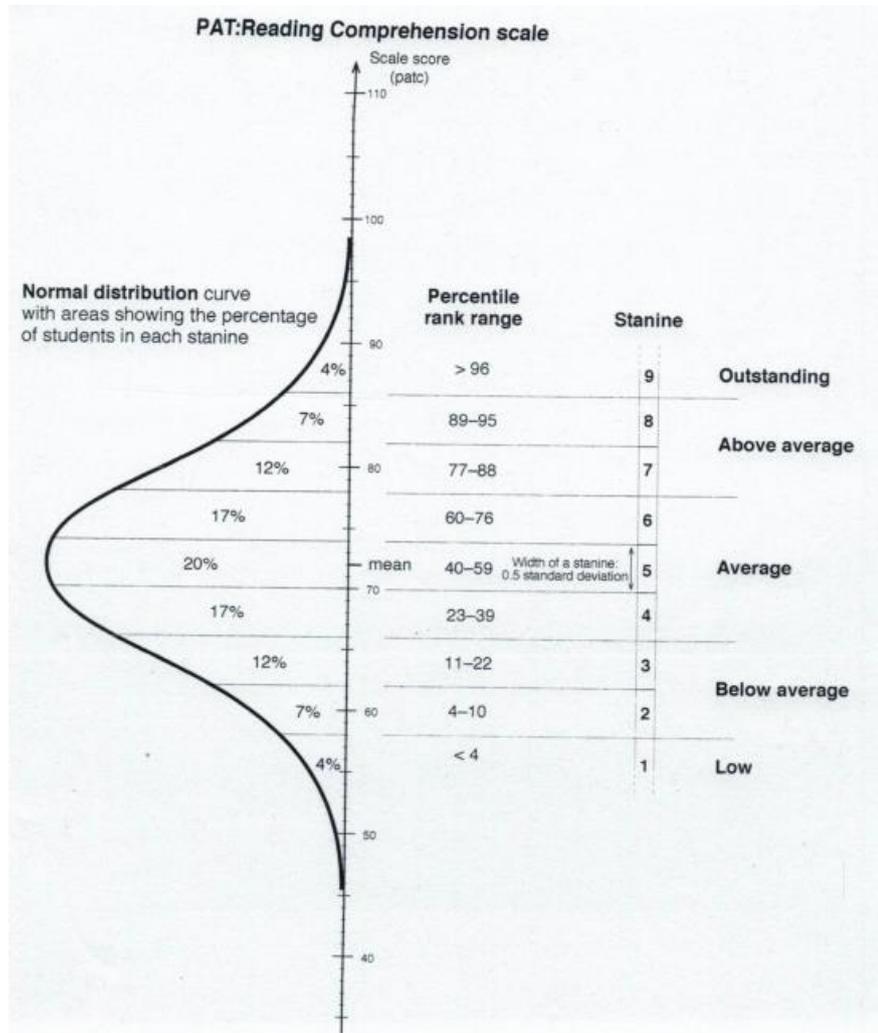


Figure 1.1. PAT Reading Comprehension Scale

(Used with permission NZCER)

Structure of the Thesis

This thesis is presented in five chapters. The first chapter provides both the background and the rationale for the study and why this study is important. The introduction then discusses issues associated with digital technology in literacy and explains the context in which the research takes place. The chapter briefly summarises the methodology of the study, and the methods used to gather data. The significance of the study and its contribution to adolescent literacy is explained.

Chapter Two examines the literature explaining what is currently known about reading comprehension, specifically in a secondary school context. Theoretical perspectives are presented as they relate to reading comprehension and it becomes clear that a single framework is not enough to describe the multiple strands that connect to allow decoding, thinking, and understanding to create the construct we know as comprehension. The literature review identifies that the definition of literacy has changed in the 21st century, and the new literacies are discussed. The chapter examines contradictory arguments in debates around the impact of digital technology as a means of improving literacy and students' engagement as readers.

In Chapter Three, I describe the methodology of practical action research and the reasons this suits a practitioner investigation. The participants and setting are described, as well as my position as a participant researcher. The data collection methods are described, along with a description of the data analysis methods using the NVivo qualitative analysis tool to support the coding of data. Ethical considerations are discussed, as are some of the limitations of the methodology.

Chapter Four presents the findings of the data in three sections. Firstly, interview data from student participants are presented using 'in vivo' quotes to display the participants' voices and create a narrative that explicates the views of the students. The data are presented as they represent the emergent themes. The second section of the findings contains the results of interviews with participant teachers. These data are also displayed under the emergent themes, yet this time presenting teacher perspectives, challenges, and an area of caution. The concluding section of the results presents the quantitative data in the form of survey results and test results, as they address three of the research questions.

The concluding chapter mirrors the presentation of the results chapter and presents the analysis of the findings as revealed in the emergent themes. A conceptual model that emerged from the findings is presented, and the theoretical framework is linked to this model. The analysis of each theme conveys the answers to the research questions. Limitations of the results are revealed, and suggestions are made for future research. This chapter ends with the conclusion of the thesis, and the significance of the findings for the field of adolescent literacy is explored.

Chapter 2 – Literature Review

Chapter Overview

The ability to read for meaning, and to read to learn, is an essential pre-requisite for high school students. On arrival at high school, it is expected that all students will have mastered the alphabetic code, have the phonological knowledge necessary for decoding and reading fluency, and be able to make inferences. Literature in this chapter is reviewed against evidence of the importance of reading comprehension for high school students. Research reveals that many students struggle to comprehend the increasingly complex texts they will encounter at high school (Biancarosa & Snow, 2006; McMaster, et al., 2015; Snow, 2002; van Dijk & Kintsch, 1983). When investigating struggling high school readers, Biancarosa and Snow (2006) found that for nearly seventy per cent, the difficulty was with reading comprehension.

Adolescents who struggled with reading were less likely to have difficulty in the area of decoding but were more likely to have problems with background knowledge, vocabulary, engagement, fluency and comprehension (Biancarosa & Snow, 2006).

Moreover, increasing vocabulary demands and sentence complexity in subject-specific texts require teachers to teach vocabulary knowledge to combat these lexical demands explicitly. Background knowledge provides familiarity with the concepts faced, and this affects reading comprehension (Arya, Hiebert, & Pearson, 2011). Becoming a competent reader of the diverse text types found across the secondary curriculum is a complex undertaking. Students not only need to be able to locate information and have a literal recall of what they read, but they must also make deductions and inferences (Anderson & Pearson, 1984; Clarke, Truelove, Hulme, & Snowling, 2014; Tovani, 2000). Furthermore, they need to respond analytically and critically to texts (Freire, 1983; Kinzer, 2010; Snyder, 2008; Wolf, 2016). As students encounter subject-specific vocabulary, they require strategies to access the meanings of new terms (Fisher, Frey, & Hattie, 2016; Murphy & Murphy, 2018; Nation I., 2006). Additionally, they need to self-monitor and regularly check comprehension as they read, identifying gaps in understanding (O'Reilly & McNamara, 2007; Palincsar & Brown, 1984). The ramifications of not manipulating multiple reading skills and strategies simultaneously can impact students' achievements and, ultimately, their chance in life (Snow, 2002).

In addition to exploring the above themes, the ensuing discussion of the complexity of literacy will interrogate reading theories, culminating in the possibility of melding both constructivist and cognitive perspectives of learning into a fresh approach to conceptualise the teaching of reading comprehension in secondary schools. A construct such as reading comprehension is not able to be explained by a single theoretical framework. The literature reviewed includes theoretical models and frameworks that support the development of reading skills required for comprehension. Theoretical frameworks addressed include Vygotsky's (1978) Sociocultural Theory of Cognitive Development, Rosenblatt's (1982) Reader-Response Theory, Schema Theory (Rumelhart, 1980a), and the Construction-Integration Model created by van Dijk and Kintsch (1983). With the impact of the digital age on reading and the tools and platforms available, Siemens (2004) Connectivism Theory highlights the innovations that technology can offer which support learning. The section on the theoretical background ends with the unification of the models under the umbrella of the Reading Apprenticeship Framework (Schoenbach, Greenleaf, & Murphy, 2012). It reveals the complexity of the connections made between the frameworks that lead to understanding how the thinking process is a fundamental basis for comprehension. As a result of this study, a diagram has been created to represent the intertwining aspects of the reading comprehension theories working together to support high school students' reading development.

This chapter then presents the relevant background to the concept that the nature of literacy has changed and continues to evolve as digital technology becomes more widespread, leading to an increasing range of digital and multimodal texts. In the age of 'multiliteracies' (Bull & Anstey, 2019; Cope & Kalantzis, 2000), what counts as literacy has to be re-thought (Street, 1997) along with the repertoire of reading comprehension strategies necessary for the 21st century (Wolf, 2018b). Despite being in a digital age with its assumed educational advantages for the learner, one key factor that emerges from the literature is the continued importance of the teacher and their knowledge and ability to scaffold students' literacy development effectively. A discussion of literature concerning reading comprehension will focus on discrepancies and the lack of consensus about digital tools' efficacy for learning.

Finally, the widespread use of technology as a tool for learning has increased the resources teachers can employ in their teaching, including digital tools and the pedagogical strategies associated with digital learning. In the context of this discussion, the pedagogical components of the tool, *Actively Learn*, the platform used in this study, will be described, along with its application to reading comprehension.

Issues Surrounding the Increasing Complexity of Texts at Secondary School

Increasingly complex texts that struggling readers face when arriving at secondary school bring about numerous challenges that must be overcome. One challenge is the disparity between the reading materials that students face and their reading ability (Frankel, 2016; Mastropieri, Scruggs, & Graetz, 2003). Another difficulty is that many secondary school texts are not user-friendly. They are densely packed with information, as well as containing a large amount of new vocabulary with little explanation (Mastropieri, Scruggs, & Graetz, 2003). As the journey through secondary education progresses, texts become increasingly demanding, with students encountering more sophisticated vocabulary, syntax and textual structures.

For students to demonstrate their learning, they are expected to be able to use and apply the newly acquired sophisticated language accurately. In Science, for example, it has been found that more vocabulary is introduced in a single year than in the first year of a foreign language class (Yager, 1983, in Mastropieri, Scruggs & Graetz, 2003). In congruence with this study, research investigating reading comprehension in science texts for third-grade students in the US found lexical complexity, that is vocabulary difficulty and the frequency of difficult words, had an impact on understanding. Too many unknown words resulted in a limited meaning base from which a student could infer meaning (Arya, Hiebert, & Pearson, 2011) thus making the text challenging to access.

However, when students were exposed to syntactically complex texts, that is, with complex sentence constructions that may contain more ideas and more connective structures, their reading comprehension performance was not affected (Arya, Hiebert, & Pearson, 2011). The connective cues aided understanding by making relationships between ideas more explicit and requiring less inference. Although this study revealed that it was difficult to explain what was happening across the different levels of syntactic complexity, it suggested that prior knowledge

of vocabulary could influence the lexical difficulty of a text (Arya, Hiebert, & Pearson, 2011). This conveys the concept that vocabulary complexity may have a greater impact on the breakdown in understanding for students than variations in text structure and sentence length. Expository texts pose a challenge due to the new and complex nature of the vocabulary that is often outside students' everyday language use (Dymock & Nicholson, 2010).

In addition, secondary students are faced with reading and understanding complex content at a rapid pace (Denton, et al., 2015; Frankel, 2016; Wexler, Vaughn, & Edmonds, 2008) and this can be a challenge for students who are struggling readers. The need to process subject-specific text types and language places higher demands on students' literacy. The tasks students face in secondary schools can be complicated. Added to this complication is the requirement of presenting their findings in a variety of ways (McDonald & Thornley, 2005), and this can be overwhelming for some students. The need to develop cross-curricular teaching of literacy skills has been acknowledged by past research (Biancarosa & Snow, 2006; Frankel, 2016; McDonald & Thornley, 2005). Older students need to be able to understand the meanings of challenging words and be able to find the meanings of unfamiliar words encountered in various situations (Vaughn, et al., 2015b). These students benefit from comprehension strategies such as monitoring, summarising text, and generating questions (Vaughn, et al., 2015b). The studies discussed in the research by Vaughn et al. (2015b) suggest that it is very difficult to make progress with older readers who struggle, and the treatment effects are either very small or not statistically significant. Small to moderate gains were made in one study that included daily intensive reading comprehension instruction for a whole school year (Vaughn, et al., 2015b). Despite this improvement, the students involved continued to read at levels well below average. This research provides a sobering prospect for high school students who have reading difficulties and implores educators to find ways to reduce the achievement gap.

Definition of Reading Comprehension

The goal of reading is comprehension, the ability to gain meaning and understanding from texts. It is the opportunity for a reader to interpret what is on a page or screen and construct meaning from the ideas presented. Such a sophisticated skill as reading comprehension needs further elaboration as numerous aspects underpin the core

components of this complex task. Figure 2.1 provides a synthesis of studies that address reading comprehension aspects to visually reinforce the complexity of skills required to engage with texts and understand ideas presented when reading successfully.

Not only does reading comprehension require thinking and understanding, but the successful reader must also take an active role in the process. Cognitive dispositions indicate the characteristics of brain activity that are required to create a successful understanding of texts.

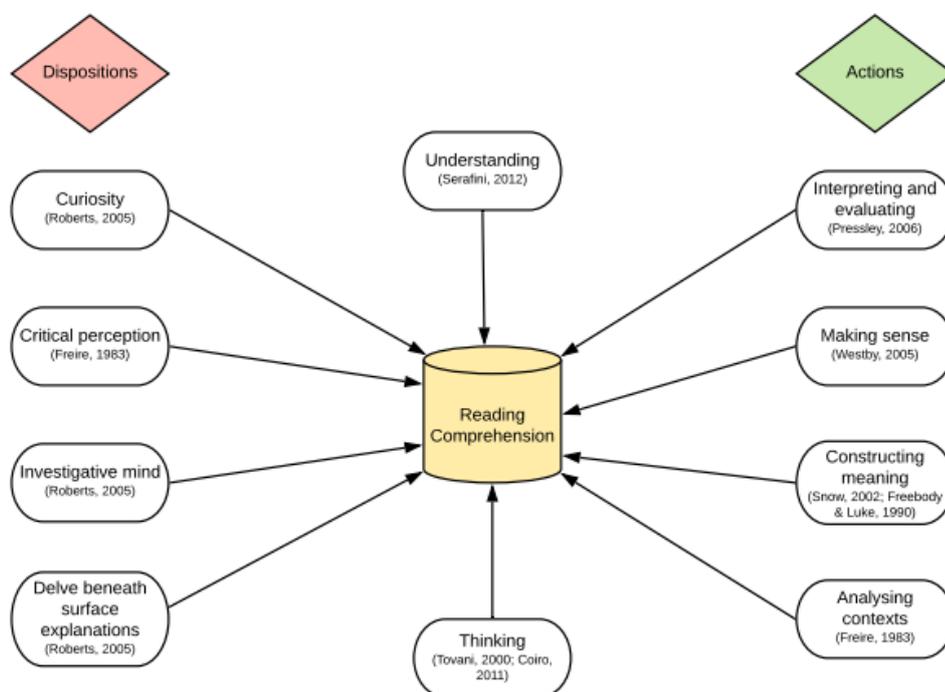


Figure 2.1. A synthesis of studies that address reading comprehension

Serafini (2012) points out that the terms “comprehending, understanding, constructing meaning and making sense are often used interchangeably to define the act of interpretation” (p. 155). He expands on this to state that understanding is something that is “taken away from every successful reading event” (Serafini, 2012, p. 156). His view that comprehension is an act of interpretation proposes that a reader has a level of personal agency when reading. This aligns with Rosenblatt’s (1982) Reader-Response Theory, whereby what the reader brings to the text is part of the interpretation process. Tovani (2000) states that reading comprehension involves

thinking, which leads to constructing meaning. Coiro (2011) reinforces that reading is a thinking process, and without active thinking, concepts in texts will not be unlocked.

Upon considering the active process of reading, a useful definition is that reading comprehension is “the process of simultaneously extracting and constructing meaning through interaction and involvement with written language” (Snow, 2002, p. 11). Freebody and Luke (1990) agree with this concept and purport that reading is not merely the ability to decode printed text but must involve constructing meaning and analysing sociocultural contexts. Rather than being a solitary act, it is posited that literacy is a set of social practices, and thus requires interaction around a text (Freebody & Luke, 1990). Freire (1983), the Brazilian educationist, contends that reading implies an understanding of the relationship between the text and the context, thus being able to ‘read’ the situation. A further action involved in being a skilled reader is making interpretations and evaluations that lead to the construction of meaning (Pressley, 2006). This requires the use of prior knowledge and the active and conscious processing of text. Westby (2005) reinforces the need to move beyond literal meanings to interpret and analyse a text. She states that “if students are to read to learn, they must also expect texts to make sense” (p. 158).

When considering the dispositions required for successful reading, Freire (1983) takes this further to posit that reading always involves critical perception; that a person must interpret what they are reading for any reading to have taken place. Thus, not everyone who claims to be reading is genuinely reading. Roberts (2005) clarifies this claim by asserting that merely repeating words without attempting to understand them in a social context is not what Freire would define as true reading. He goes on to say that *knowing* is when a reader has delved beneath surface-level explanations (Roberts, 2005). As such, reading requires a curious and investigative mind.

Understanding text is a complex process where heavy demand is placed upon “attention, memory, and high-level language processes” (Castles, Rastle, & Nation, 2018, p. 21). Decoding is an essential skill in reading but is not enough for comprehension to take place. The cognitive aspect of reading, including higher-order thinking skills of analysing, synthesising, and evaluating (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956), is what the current study explores and is expanded upon below.

Distinct Levels of Comprehension

Reading comprehension is how a reader processes text and understands its meaning. Understanding is the aim of all reading and to be successful, students need to monitor their comprehension, be aware when understanding is lost, and take steps to repair their understanding. Three levels of reading comprehension have been identified by previous studies where comprehension is gained through literal, inferential or interpretive means. A basic level of being a successful comprehender is being able to understand the literal content of the text by retrieving information that is explicitly stated (Basaraba, Yovanoff, Alonzo, & Tindal, 2012; Rose & Martin, 2012). This shallow form of comprehension means being able to recall what has happened in a story or article and create a “minimally coherent mental representation” (King, 2007, p. 268). Using this lower-order skill (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956), students can recall events or facts from what they have read on a page or screen and also describe and explain what has occurred.

The next level of comprehension is being able to draw inferences from the text. Inferencing goes beyond identifying the facts to using the information to garner the author’s meaning from other parts of the text (Basaraba, Yovanoff, Alonzo, & Tindal, 2012; Rose & Martin, 2012). By employing ideas in the text, and their prior knowledge or general knowledge, readers can connect their understanding to the text and add greater depth by combining ideas that may not be explicitly stated (Graesser, 2007; Oakhill, Cain, & Elbro, 2015; Perfetti & Stafura, 2014). It is the ability to use clues from the text to form a conceptual understanding (Anderson & Pearson, 1984; King, 2007). Inferences may be local, dealing with a small section of the text, such as sentences or paragraphs. Global inferences are those in which connections are made across larger parts of the text that are not all visible at one time (Kispaal, 2008; Oakhill, Cain, & Elbro, 2015). Clarke et al. (2014) point out two distinct kinds of inference. Firstly, the ability to link pieces of information within a text (text-connecting inferences); and secondly, inferences that use general knowledge to add to the understanding (gap-filling inferences).

A final level of comprehension is that of interpretive or evaluative comprehension (Basaraba, Yovanoff, Alonzo, & Tindal, 2012; Rose & Martin, 2012) which relates to Bloom’s (1956) higher-order skills of evaluating, synthesising and analysing. Evaluative comprehension involves comparing new information with prior knowledge through active thinking and being able to project one’s thoughts upon

what is happening in the text. This reveals the capability of the reader to draw conclusions from a text, analyse ideas and critically interpret what the author has presented (Basaraba, Yovanoff, Alonzo, & Tindal, 2012; Rose & Martin, 2012). Skilled comprehension involves this active form of processing and the ability to have interpretive and evaluative thinking skills when reading (Pressley, 2006).

The Importance of Reading Comprehension When Addressing Adolescent Literacy Difficulties

A concern at the secondary level of education is that although students may have learned to read when they were younger, there are sometimes gaps in their skills in “the transition from learning to read to reading to learn” (Chall, Jacobs, & Baldwin, 1990, p. 14). Reading to learn requires students to have the ability to understand new words and increasingly complex sentences (Westby, 2005). Being able to read and understand unfamiliar information is the reading skill that supports new learning. It is during this process where poor comprehenders become disadvantaged (Clarke, Truelove, Hulme, & Snowling, 2014). While we expect most high school students to have mastered the phonological awareness skills associated with letter-sound correspondences and transform them into sounds and meaning, they now need to use this skill for learning. This requires an active process of gaining meaning from texts and then applying the understanding they have gleaned.

As previously stated, reading comprehension becomes increasingly important as students encounter progressively more complex topics and language at the secondary school level. Vaughn et al. (2015a) reported on the National Assessment of Educational Progress (NAEP) results, a common measure across student achievement across the USA, which is often called ‘The Nation’s Report Card’ (National Center for Education Statistics, 2019). They noted that the 2011 results indicated that approximately one-third of fourth and eighth-graders did not adequately comprehend texts they would be expected to at their grade level (Vaughn, et al., 2015a). Substantial numbers of older students do not read sufficiently well to understand and learn, which has an impact on their success and engagement in school (Vaughn, et al., 2015a). Much of the research is focused on emergent reading skills and rectifying early reading difficulties. However, the challenge is to improve students’ reading comprehension, particularly as text and content demands increase as students get older (Biancarosa & Snow, 2006; Schoenbach, Greenleaf, & Murphy,

2012; Tovani, 2000; Vaughn, et al., 2015a). At high school, students are required to research using books or the internet, locate relevant information and filter out less applicable information for a topic being studied in an arts-based subject, or the sciences (Clarke, Truelove, Hulme, & Snowling, 2014). Reading comprehension, therefore, provides a springboard for further learning to take place. As students get to secondary education, the expectation that they become increasingly independent learners, capable of under-taking research, further exemplifies the necessity for developed reading comprehension ability.

Students who struggle with reading at the secondary level are rarely provided with reading instruction, thus widening the gap between their achievement and that of their peers (Edmonds, et al., 2009). One reason for this is that many secondary teachers report they have little preparation to teach struggling readers as their focus is on content knowledge (Hougen, 2015; Mastropieri, Scruggs, & Graetz, 2003). The expectation is that students can read confidently by the time they reach high school.

Students must also develop an ever-increasing knowledge of their world, know why they are reading, and expect the text to make sense (Westby, 2005). Chall and Jacobs (1983) purport that the greatest needs in reading are for the meanings of difficult words and precision in word recognition and definitions. If reading problems are not addressed, high school education is where a widening of the achievement gap becomes more pronounced. This widening gap can be described as the Matthew effect, a term used by Stanovich (1986) based on the Biblical passage that refers to the rich getting richer and the poor getting poorer. Students who do not have strong reading skills tend to read less than those with advanced reading skills, and thus their development plateaus. Their peers, who have developed competent reading skills, keep reading and therefore keep growing in ability from strength to strength. It has been suggested by Nation (2005) that students who have low-level comprehension have substantially less reading experience than students who are capable comprehenders. Lupo et al. (2018) posit that to improve comprehension ability, readers need more opportunities to read what may be considered challenging texts rather than avoid them. This helps with vocabulary development and can have an impact on ameliorating the Matthew effect (Lupo, Strong, & Smith, 2018).

High school graduates need a high degree of literacy, including the capacity to comprehend complex texts (Frankel, 2016; Snow, 2002). Reading comprehension requires a reader to concurrently “decode words, access word meanings, and

construct meaning from sentences and larger sections of text while integrating this with prior text information and background knowledge, whilst monitoring meaning and repairing misunderstandings” (Denton, et al., 2015, p. 81). The ability to read and comprehend text remains a vital ingredient in the digital age. Print is encountered in paper format and on the internet, and is essential to operate in the modern world effectively. Sitting a driver’s licence, filling in a job application, reading a news bulletin, and booking travel online, all require reading and understanding, and often, in a digital format. Many children who learned to read in primary school encounter difficulty when the reading comprehension requirements become more complicated in structure, length and vocabulary (Biancarosa & Snow, 2006; McMaster, et al., 2015; Snow, 2002; van Dijk & Kintsch, 1983). Failure to become proficient in reading can have long-term negative consequences for the future life of a student (Snow, 2002).

Biancarosa and Snow (2006) state that in the United States, 10 per cent of students struggle with decoding. Yet, there is a large population of struggling students who decode accurately but continue to have difficulty with reading as they go further through their schooling. The implication here is that the higher-order thinking skills associated with accurate comprehension are what is needed to be focused on for adolescent learners. This finding is supported by Tovani (2000), who states that the material students encounter in secondary school “is complicated and not understood by just ‘reading the words’. It requires a variety of thinking processes, many of which need to be taught” (p. 14). Tovani (2000) describes students who have mastered decoding, yet do not understand that reading involves thinking, as “word callers” (p. 15). They can pronounce the words and their primary strategy for reading is recognising the letter-sound correspondence rules in words; they have fluent decoding, yet a lack of comprehension (Williams & Atkins, 2009). When they do not understand or remember what they have read, or struggle to do tasks that require them to think, they can become frustrated and feel defeated by the tasks they face.

The Role of Vocabulary Knowledge in Reading Comprehension

The development of vocabulary knowledge is a life-long process. As people learn more and expand their understanding of new concepts and ideas, so too does their development of vocabulary knowledge expand. Language skills and vocabulary

knowledge have been identified in terms of ‘constrained’ and ‘unconstrained’ processes (Dymock & Nicholson, 2012; Paris, 2005; Snow & Matthews, 2016). A constrained process includes skills which are easily teachable such as the letters of the alphabet and associated sounds. These decoding skills are finite, and children can learn them all; they can be learnt early and once learnt, little further learning of the process is required. By contrast, unconstrained skills such as vocabulary knowledge and background knowledge acquisition can take a lifetime to develop and are never entirely mastered (Fisher, Frey, & Hattie, 2016; Snow & Matthews, 2016; Tunmer, Chapman, Greaney, Prochnow, & Arrow, 2013). Such knowledge can be built up over many years. As children grow older, and particularly as they arrive at high school, they need to understand words they have rarely encountered and to incorporate new ideas into their currently held knowledge (Snow & Matthews, 2016). As such, this makes reading comprehension a complex issue, with multiple areas where understanding can break down.

Nation (2006) has investigated the amount of unknown vocabulary that can be tolerated before the text becomes incomprehensible to the reader. She found that 98% of text understanding, i.e. one unknown word in 50, is required for adequate comprehension. This finding is supported by further research which points out that children with limited understanding of the words of spoken language will have difficulty constructing meaning from text (Castles, Rastle, & Nation, 2018; Tunmer, Chapman, Greaney, Prochnow, & Arrow, 2013). Nation (2005) found that poor comprehenders were not efficient at reading irregular words or low-frequency words. From this, it becomes clear that when students are developing reading comprehension ability, it is important to be developing vocabulary knowledge. Having good decoding skills without words holding meaning is of limited value. When students know the words they are decoding, they can draw meaning from the text (Murphy & Murphy, 2018). Yet this only works if there are fewer than 5-10% of unfamiliar words in a text (Murphy & Murphy, 2018); otherwise reading is slow and arduous, and meaning is lost. Students who skip over unknown words continue to have issues with comprehension due to the gaps they are creating. Filling a complicated noun by using contextual skills is fraught with the potential for error.

Vocabulary development is an integral part of improving students’ learning. Both constrained and unconstrained skills are required for effective reading instruction (Fisher, Frey, & Hattie, 2016). However, for older students who struggle

with reading comprehension, it can sometimes be vocabulary knowledge or lack of, that gets in the way of understanding. It has been found that for older students, “increasing vocabulary, world knowledge and active use of comprehension strategies that require the reader to actively interact with the content of the text” are essential components of successful comprehension (Caccamise & Snyder, 2005, p. 6). Learning in subjects at secondary school requires specific subject knowledge to aid understanding, specific vocabulary to advance the subject knowledge, and fluency to assimilate content and develop skills (Murphy & Murphy, 2018). Lexical complexity has also been identified as affecting the readability of texts for dyslexic students (Gala & Ziegler, 2016). So much so that for dyslexic students, problems with comprehension are deemed to be connected to difficulties in decoding and word recognition (Gala & Ziegler, 2016).

In some texts, key words may be in a list, or written in bold font. Some are supported by a diagram. However, the following example of vocabulary from a Year 11 Biology workbook, where students encounter words about the human digestive system, exemplifies the complexity of vocabulary encountered as students continue through their education:

“Food is rolled in to a ball and swallowed by contraction of the muscles around the **oesophagus**. This is called peristalsis. In the stomach, **hydrochloric acid**, produced by the stomach cells, kills micro-organisms, helps break up some foods, and provides optimum conditions for stomach enzymes. The muscles in the stomach wall contract to mix the food and it becomes a liquid called **chyme**” (Bay & Scott, 2007, p. 49).

From a single chapter in a geography text for Year 13 students, about coasts that are dominated by waves, it is clear that new and complex vocabulary is encountered as students continue in secondary education. This particular text places a list of key terms at the front of the chapter. The words are also written in bold within the body of the text and sometimes supported by explanatory diagrams. As teachers work with students, they will focus on vocabulary. However, to understand the magnitude of vocabulary learning that is required in some senior secondary classes, the following words were found on two pages of the text: oscillatory waves,

translatory wave, diffraction, erosion, dissipative domain, destructive resonance, refraction, orthogonals, clapotis, and undulating (Beguely, 2005, pp. 64-65).

These examples reveal that high school students face a barrage of new terminology that may even appear complicated to an educated person if it is outside their sphere of expertise. Literacy is increasingly more complex as students move through secondary education. When students meet new concepts they may never have experienced before, they are also introduced to new subject-specific vocabulary not encountered at earlier levels of learning.

In a study of high school reading in New Zealand, Nicholson (1985b) found many students were confused by the text they faced, yet were unlikely to inform the teacher. Some were not aware of their misunderstandings while others ‘faked’ their way through lessons due to the complex reading demands of the high school curriculum. In a more recent study of high school students, varied proficiency was found when students engaged in reading tasks, and a disparity was exhibited in the use of comprehension strategies (Denton, et al., 2015). The struggle of many students is their failure to comprehend texts because they are not actively using reading comprehension strategies (Biancarosa & Snow, 2006). As a result, explicitly teaching comprehension is highlighted as an essential aspect of reading development for high school students (Frankel, 2016; Tovani, 2000).

It is important to understand that comprehension is not always effortless and fast, even for skilled readers (Graesser, 2007; Williams & Atkins, 2009). When proficient readers face technical texts in an unfamiliar field, they must slow down, and use repair strategies such as re-reading a sentence and being conscious of their thinking (Davidson & Sternberg, 1998; Williams & Atkins, 2009). They take deliberate steps to understand and connect the new concepts to what they know and even question the ideas presented. Through recognising words or understanding most sentences, shallow readers believe they have adequate comprehension (Graesser, 2007), and some will skim over material they find difficult (Davidson & Sternberg, 1998). This can occur in skilled adult readers as well as struggling adolescent readers. It is not only technical or complex texts that can cause the effortful struggle over individual words; high school is filled with complex content, and if all reading is slowed to a level of understanding individual words, comprehension is compromised.

According to Vaughn et al. (2015a), remediating reading difficulties in older students is challenging. Lang et al. (2009) highlight a study that revealed reading interventions for high-risk ninth-grade students lacked any statistical difference with a group not provided with targeted intervention. They did, however, find that students with a moderate risk of reading difficulty, meaning they had well-developed basic reading skills but needed support with comprehension strategies, made the largest gains in one intervention (Lang, et al., 2009). Despite some high-risk ninth-grade readers making substantial acceleration, the progress was not sufficient enough to move their designation to be at moderate risk (Lang, et al., 2009). Struggling high school readers have often had limited reading experience and require extensive interventions to increase their vocabulary and background knowledge to improve their comprehension of texts.

Explicit Teaching of Strategies

The role of the teacher is critical in helping students develop the skills to be a capable reader. The skills needed for depth of understanding and fluent reading require the direct and explicit teaching of decoding, comprehension and literature appreciation (Moats, 1999). Comprehension strategies are thinking strategies; ways to activate the thinking that helps deep understanding take place (Keene & Zimmermann, 2013). Strategies require explicit instruction and opportunities for practice. They include the development of inferential skills, genre knowledge, and the allocation of attention to key ideas within a text (van den Broek & Espin, 2012). The explicit teaching of strategies enables students to consciously and deliberately overcome obstacles when reading stops making sense (Graesser, 2007).

Classroom teaching can ameliorate reading difficulties if it includes research-based practices that have a proven record of making a shift in reading ability (Moats, 1999). Direct and explicit instruction of the code system of written English is a start. Yet, there is still a further need for students to have guidance in vocabulary development, word structure and meanings, and also comprehension strategies that include prediction, summarising, clarification, questioning and visualising (Moats, 1999; Pressley, 2006). Reading comprehension has often been found to be assessed using tests that include recall or retrieval questions and often at a surface content level (Bintz & Williams, 2005; Durkin, 1978). Bintz and Williams (2005) highlight that asking questions is a powerful way for both students and teachers to learn.

However, teachers need to be asking deep questions that explore students' ideas rather than questions which focus on students providing a simple answer. Nystrand et al. (as cited in Alexander, 2010) noted that what counts in learning is the extent to which students are required to think and not just report someone else's thinking (p.106). For older students, it is suggested that questions posed during the reading of a non-fiction text, enable students to focus on the information. For younger students, questions placed after the reading, rather than during the reading, are more effective (van den Broek, Tzeng, Risdien, Trabasso, & Basche, 2001).

A strategy is a "routine that represents a specific mental processing action" (McKeown & Beck, 2009, p. 11). Palincsar and Brown (1984) found that when reciprocal teaching strategies were explicitly taught, students were able to monitor and discuss their reading actively and add depth to their understanding. Further studies have focused on the reciprocal teaching strategies of identifying main ideas, summarising the passage of text, questioning, making predictions and clarifying any confusions that occurred (Duke & Pearson, 2008/2009; Palincsar & Brown, 1984; Palincsar & Brown, 1988). Other strategies, such as setting purposes, monitoring comprehension, visualising, and drawing inferences (Brevik, 2019) have also been found to be effective. This form of strategy training can be viewed as both problem-solving and cooperative learning (Palincsar & Brown, 1988). Dymock and Nicholson (2010) also emphasise the importance of explicit teaching of comprehension strategies, stating that activating background knowledge, questioning, analysing text structure, creating mental images, and summarising are their top five strategies to teach. These share some cross-over with the reciprocal teaching framework. However, they differ in ensuring there is a clear focus on activating prior knowledge, visualising, and analysing the text structure.

The current study draws upon the findings of Palincsar and Brown (1984), and Dymock and Nicholson (2010). It focuses on teachers incorporating the strategies of predicting, summarising, questioning, clarifying, visualising and making connections. Figure 2.5 provides a representation of the melding of the reciprocal teaching strategies with those seen by Dymock and Nicholson as necessary. These are used as a focus in the current research.

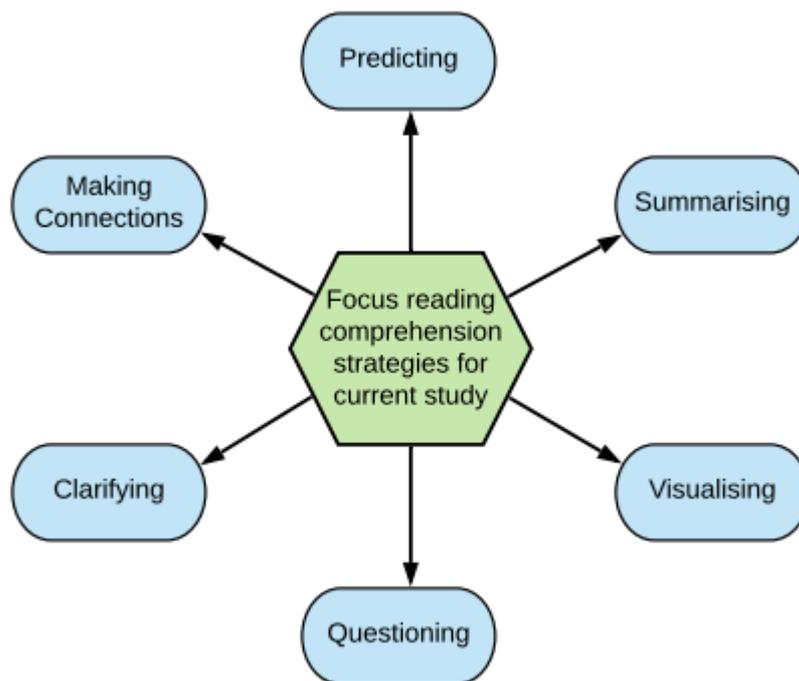


Figure 2.2. Reading comprehension strategies in the current research

Edmonds et al. (2009) found that struggling secondary school students can improve their comprehension when explicitly taught reading comprehension practices. Teaching strategies such as previewing a text to explore prior knowledge, clarifying, generating questions, summarising main ideas and using graphic organisers were found to be useful. The findings from many studies suggest that older struggling readers benefit from targeted and explicit instruction in comprehension strategies (Brevik, 2019; Dymock & Nicholson, 2010; Edmonds, et al., 2009; Palincsar & Brown, 1984). Such strategies encourage students to become actively involved in monitoring their understanding. Edmonds et al. (2009) state a way to improve reading comprehension for students with reading difficulties is to engage students in thinking about texts, learning from texts, and discussing what they know.

The application of deep comprehension strategies needs explicit teaching, but they also require practice and implementation on many texts to develop the thinking that is used by competent readers (Anderson & Pearson, 1984; Caccamise & Snyder, 2005; Dymock & Nicholson, 2010; Graesser, 2007; Oakhill, Cain, & Elbro, 2015). Tovani (2000) pointed out that when students do not have the comprehension

strategies to unlock meaning, the text becomes inaccessible. By teachers guiding students through approaches that can aid their understanding, it helps students resolve comprehension issues as they occur (Fisher, Frey, & Hattie, 2016). In schema theory-based studies of reading comprehension, Anderson and Pearson (1984) identified that for students to become good readers, teachers need to help students think more deeply about the way ideas connect in what is being read. Inference drawing leads to a coherent representation of text, and yet this is something that poor readers struggle to do (Anderson & Pearson, 1984; Tovani, 2000).

Using the reciprocal teaching framework (Fuchs & Fuchs, 2007; Palincsar & Brown, 1984; Palincsar & Brown, 1988), students read a passage of expository material paragraph by paragraph. During the process of reading, they generate questions, summarise, make predictions, clarify confusing parts, or word meanings and interact with other students as part of this process. By teaching these strategies and using them as part of the purpose of reading texts, teachers are providing practice time for students to use thinking skills in conjunction with reading.

Another aspect of teacher involvement is the teaching of discussion skills that link to thinking skills. In many classes, monologic talk, i.e. discussion prompting that is dominated by the teacher is the prevailing discourse, providing little opportunity for student-initiated interaction. Students in these situations are passive receivers of knowledge (Anstey & Bull, 2018). An alternative proposition is that of dialogic teaching (Alexander, 2010; Alexander, 2018; Alexander, 2019), which encourages students to engage in the learning process actively. A student-centred approach allows students to build on their current understandings to create new knowledge. As a result, learning becomes an active process and provides an opportunity for students to reflect on new knowledge learned by the students and taught explicitly by the teacher (Anstey & Bull, 2018). The teacher is a definitive part of the learning process, teaching the skills of discussion and interaction.

Mercer's 'Exploratory Talk' (1994) and Uzuner's 'Educationally Valuable Talk' (2007) both adhere to constructivist learning whereby students' thinking and interactions are involved in the construction of knowledge. Mercer defined exploratory talk as engaging critically but constructively with each other's ideas (Mercer, 2013). Mercer highlighted three aspects of 'talk': disputational talk, whereby speakers challenge each other without justifying their stance or offering new ideas; cumulative talk, whereby speakers continue a discussion by repeating or

agreeing with a previous comment; and exploratory talk, whereby new ideas are posed, further relevant information offered and even justified objections can be raised. By using talk to coordinate mental efforts, students can share their thoughts and argue productively about them (Mercer, 2013). It is also a chance for individuals in a group to gain new levels of understanding through interacting with others in the group. This may lead to the clarification of an idea as a result of interaction with others. Uzuner (2007) purports that Educationally Valuable Talk, in both social interactions and online discussions, will help students progress beyond information sharing to the construction of knowledge. She represents multiple ways of interacting in a way to bring forth discussion that represents thinking (see Appendix 1). The ideas expressed provide opportunities for students to connect with their prior knowledge and connect through their interactions with each other. For this to be useful for young high school students, adaptation is required. A purposeful discussion of a text, even in a digital space, can be a way for students to clarify their understandings (Fisher, Frey, & Hattie, 2016). By using the concepts of Educationally Valuable Talk, students can engage their thinking skills while interacting positively with others in their class using a digital means.

One way of developing greater accountability and comprehension in reading is to read smaller chunks, in short intervals under the watchful guidance of a teacher (Lemov, Driggs, & Woolway, 2016). Doing so allows a student to experience more difficult texts in a safe environment rather than read more texts of lower quality. It also leads to developing a habit of independent reading by supporting students to confirm their comprehension even after just a few lines of text. Limited sections of text enable comprehension to be checked and assessed more accurately and consistently (Lemov, Driggs, & Woolway, 2016). Schoenbach et al. (2012) support this idea when stating that reading fluency, even for readers with dyslexia, can be achieved by slowing down and chunking a text into smaller units. Similarly, difficult texts can be tackled if the topics are highly interesting and students come to them with some previously established knowledge (Schoenbach et al., 2012).

In the role of creating appropriate learning experiences when using digital technology in the classroom, the central role that teachers play will increase, not decrease (Leu, Kinzer, Coiro, & Cammack, 2004). Teachers must guide students through a complex information environment with multifaceted means of both receiving information and producing artefacts and assessments. This is quite different

from the print media dominated environment in which many teachers grew up. Rather than avoiding texts because they are challenging, teachers can support their students to develop the thinking skills to attack what might initially seem like difficult texts. Teachers may want to ‘protect’ their students from reading that is complex. Reading the text aloud, summarising a text into a visual presentation with bullet points, providing abbreviated notes, or finding videos of the content instead of exposing students to reading material, may appear to be helpful. However, these compensatory practices inadvertently limit students’ exposure to text (McDonald, Thornley, & Fitzpatrick, 2005; Schoenbach, Greenleaf, & Murphy, 2012). This may lead to ‘learned helplessness’ (Dweck, 2012), where a student believes they cannot achieve alone and therefore lacks motivation and makes little effort.

The instructional support provided by teachers, rather than the text difficulty, defines the zone of proximal development concerning reading comprehension and enables students to read texts more complicated than they would attack alone. Students reading difficult texts, with the support of their teacher and classmates, is possibly a way to help them improve their comprehension. Lupo et al. (2018) suggest that it is important to expose students to texts that may be considered more difficult than they would attempt alone, and through support, the initial struggle will turn to success. If students are not provided with opportunities to engage with complex texts, they are provided with fewer opportunities to read, and they have less comprehension instruction (Lupo et al., 2018). When teachers provide the supports, such as vocabulary building, prior knowledge building and comprehension strategies, students can engage with texts they might find too challenging if encountered on their own.

Theoretical Models of Reading Comprehension

Reading is a complex process and as such, cannot be explained by a single theoretical model, particularly when facing the multiplicities required when reading, understanding, and using texts at the secondary level. Reading comprehension combines multiple processes that shift according to text type and goals of the reading experience (van den Broek & Espin, 2012). This section begins by identifying theoretical models and frameworks that support the development of reading skills required for comprehension, including both cognitive and constructivist processes. Each model is discussed as a stand-alone entity that has a partial impact on reading

comprehension. The section ends with the unification of the models under the umbrella of the Reading Apprenticeship Framework (Schoenbach, Greenleaf, & Murphy, 2012). It reveals the complexity of the connections made between the frameworks that lead to an understanding of how the thinking process is a fundamental basis for comprehension.

Vygotsky's Sociocultural Theory of Cognitive Development.

In Vygotsky's (1978) Sociocultural Theory of Cognitive Development, students are active participants in the learning. Vygotsky (1978) asserts that it is through social interaction with more skilled individuals that allows learning to take place. In this model, teachers identify the current level of cognition of the learner and act as the 'more knowledgeable other' to scaffold the next steps (Wood, Bruner, & Ross, 1976). This enables the learner to move from what they can do alone, to what they can do with guidance and support and it is identified as the Zone of Proximal Development (ZPD) (Vygotsky, 1978). By collaborating with more expert others, students work together with teachers and peers, creating communities of learners. The ZPD is defined as the space between being able to perform a task with peer collaboration or adult guidance, and the ability to perform a task independently (David, 2014; Kivunja, 2014; Vygotsky, 1978). The ZPD is the space where learning takes place, and through the connections with people and shared experiences, learning becomes a reciprocal experience.

Vygotsky's (1978) theory suggests that interactions with others influence cognitive development, and thus, the active learner approach allows the construction of meaning through interaction with people and artefacts. The learner connects their current knowledge and prior experience to any learning experience, thus reshaping their understanding as a consequence of facing new content (Carroll, 2013; Gunduz & Hursen, 2015; Moll, 2013). The major theme of Vygotsky's theoretical framework is that through social interaction, cognitive skills can be developed, creating a dialogical method of learning (Blunden, 1997).

From the teacher being the holder of all the knowledge and bestowing this upon mostly willing recipients, to a more learner-centred approach, the 21st century has changed the way learning takes place. The link to social constructivist theory is even more powerful in this century. The role of teachers is to provide scaffolds whereby students' knowledge, understanding and thinking skills are developed.

The interesting aspect of social constructivist theory for secondary educators, particularly those with a focus on developing reading comprehension, is that it is relevant for all learners of all ages. By creating activities that have a social context, as well as an individual context, it is hoped that learning can be internalised for adolescents in the same way that working with a ‘capable other’ leads to the development of skills in younger children. Unless the strategies of comprehension are internalised, students remain reliant on a superficial level of understanding and are thus limited in their cognitive development.

Rosenblatt’s Reader-Response Theory and its Link to Comprehension

Rosenblatt’s (1982) Reader-Response Theory similarly places the student at the centre of the learning. Reading is considered a negotiation between the reader and the text, in which a reader must play an active role, bringing their judgements and prior knowledge into play to interpret the meaning of a text. Rosenblatt (1982) contends that there are two types of reading: efferent reading, whereby extracting information is the goal, and aesthetic reading, whereby the purpose is to experience and perceive ideas at a personal level.

A premise of Reader-Response Theory is that interpretations and discussions around a text are connected to ways in which a text relates to the reader personally. There is both a personal and a social context associated with gaining meaning from text (Karolides, 1999) and this constructivist theory sits well alongside Vygotsky’s sociocultural theory. The importance lies in connecting the reader’s personal experiences with the text. The necessity of having background knowledge to create a deeper understanding of texts is an essential aspect of engagement with a text. Rosenblatt states that a reader draws upon life experiences, word associations, images, past events and even the mood that they are in when responding to the meaning of a text (Karolides, 1999; Rosenblatt, 2005). She believes that the act of reading is a chance to process one’s thoughts and even rethink one’s stance, change perspectives and consider alternative possibilities (Mills, Stephens, O’Keefe, & Waugh, 2004). The process of reading is an interaction with a text to effectively grasp the meaning and requires a student to be reading at a deep, rather than a surface level; this involves active thinking. Meaning is constructed as “a two-way reciprocal relation” (Mills, Stephens, O’Keefe, & Waugh, 2004, p. 48) and is not ‘in’ the text or ‘in’ the reader. Rosenblatt, when interviewed by Karolides (1999), points out that

this does not mean that every interpretation is equal; the basis of an interpretation must be able to be found in the text. Readers bringing different knowledge may have equally defensible positions, though it is not a case of “anything goes” (Karolides, 1999, p. 163). Rosenblatt states “the reader should not project ideas or attitudes that have no defensible linkage with the text” (Rosenblatt, 1994, p. 14) but highlights that meaning will be found through what the reader brings to the text and directly from the text itself. Learning is not necessarily the result of exposure to information, but a “result of transactions with the information, with texts, with ideas” (Mills, Stephens, O’Keefe, & Waugh, 2004, p. 52).

The strength of Reader-Response Theory is the move away from students having a quick answer, the right answer, or only one answer being acceptable. Here, Rosenblatt is aligned with the idea that response questions have more value than merely retrieval questions. Rosenblatt states she has been influenced by Dewey and other pragmatist philosophers in following the idea that a to-and-fro, back-and-forth relationship between a reader and a text is a transactional experience (Duke & Pearson, 2008/2009; Karolides, 1999; Mills, Stephens, O’Keefe, & Waugh, 2004). She emphasises that the meaning is being built up through this dialogical process. Rosenblatt posits that when people read about a topic, discussions arise from what the reader thinks and feels about what they have read (Duke & Pearson, 2008/2009; Karolides, 1999) and she suggests that when insights are felt personally, they become more lasting. Rosenblatt also makes it clear that the transactional view of reading is a “selecting, organising, synthesising activity” (Karolides, 1999, p. 164; Rosenblatt, 2005). Responding and reacting to reading and being engaged in a discussion about ideas, is a tool to allow students to use their thinking skills to dig deeper into a text (Keene & Zimmermann, 2013). However, it has also been found that most classroom discussions are teacher-centric and provide little opportunity for depth of thinking or knowledge building (Fisher, Frey, & Hattie, 2016; Nuthall, 2005; Rose & Martin, 2012).

This concept is reinforced by Anstey and Bull (2018) who point out that an individual’s response to a text should be considered rather than adopting an authorised interpretation. Thus, the reader interacts with the text to construct the meaning. Previous meaning-making focused on consumption, with the reader being a passive recipient. Reader-Response Theory encourages students to put their viewpoint onto a piece of reading and challenges them to think for themselves, rather

than waiting to be told what to think. When students are given a chance to respond with their thinking and can justify why they believe a certain way, active learning is promoted.

Schema Theory in Reading Comprehension.

Cognitive theories play a part in reading comprehension by focusing on the construction of mental models of the text (van den Broek & Espin, 2012). Schema Theory is one example of a cognitive theory that explains how knowledge is built and stored in frameworks known as schemata. The activation of this previously-held knowledge affects comprehension and the making of inferences (Anderson & Pearson, 1984; Ngabut, 2015). According to this theory, the background knowledge that a reader has can be drawn upon when faced with new information. Thus, Schema Theory explains how readers use their prior knowledge to make sense of a text. A reader searches his or her knowledge bases for situations consistent with a story and looks for a match between what is known and what is provided by a text (Golden & Rumelhart, 1993). The learner then elaborates on already established structures in the brain for representing concepts in memory (McVee, Dunsmore, & Gavelek, 2005; Ngabut, 2015; Rumelhart, 1980a) resulting in the essential cognitive process of inferencing (Anderson & Pearson, 1984). Schemata are held in long-term memory; whereas thinking and learning take place within the context of working memory (Derry, 1996). Rumelhart (1980b) makes it clear that comprehension is not only a top-down process but is one of interaction between top-down and bottom-up processing working together to draw upon possibilities for understanding text.

From a cognitive schema theory perspective, the goal is to seek ways in which schemata can be constructed (Derry, 1996). Thus, new concepts and ideas being read about activate the prior knowledge stored as schemata, allowing interpretation of the new ideas to take place. The issue for secondary teachers is not about providing more and more information for students, but in providing a means for students to recognise the relationships between various segments of information (McVee, Dunsmore, & Gavelek, 2005). New information can then be integrated into a logical schema, supporting the development of comprehension. It is the construction of relationships between further details and what is currently held that aids comprehension. This concept reinforces the idea that reading and understanding, as well as being a process of building schemata, is a process of connecting. Links can

be made to new ideas through culturally responsive connections, having activities that are personalised to students' strengths and interests, or having prior knowledge supports put in place. McVee et al. (2005) emphasise that in developing schemata, it is not just the words in a text that are the focus, but also social and cultural practices and opportunities for interaction. This version of Schema Theory considers that what is going on in the brain is only one aspect of what is important; the life experiences that the reader has encountered also add to the combined level of understanding. Learners build and revise their schemata each time they meet added information. Thus, Schema Theory can be viewed as more than structures of knowledge, but as a basis for social interaction and forming connections. The transactions we have with others are critical in the development of the mind (McVee, Dunsmore, & Gavelek, 2005) and are thus a building block in reading comprehension.

Van Dijk and Kintsch's Construction-Integration Model.

The Construction-Integration Model created by van Dijk and Kintsch (1983) shares a similarity with Schema Theory. Both theories show that the reader uses information from text, alongside their prior knowledge of a topic, to create a personal mental model of what the text is stating (Kintsch & Rawson, 2005; van den Broek & Espin, 2012; van Dijk & Kintsch, 1983). Van Dijk and Kintsch's (1983) Construction-Integration Model of reading comprehension describes meaning from texts developing through three levels. Firstly, word-based processes involve the reader recognising and understanding individual words. The comprehension of words and phrases is required to understand the surface level of a text. The second level consists of the reader's understanding of the text by processing chunks of the text. This constitutes constructing meaning directly from a text without links to prior knowledge. The final level of forming meaning requires the reader to process broader information about a text such as a theme, topic, and genre information. This processing enables understanding to occur by integrating information from the text with prior knowledge. It involves making inferences and monitoring what is being read, then making comparisons with what is already known (Clarke, Truelove, Hulme, & Snowling, 2014; Denton, et al., 2015; Kintsch & Mangalath, 2011; van Dijk & Kintsch, 1983).

When using textual information alongside prior knowledge, the reader constructs a base for understanding from the linguistic input available and connects

this to the reader's knowledge base (Kintsch, 1988). The integration phase is when the linguistic input and the knowledge base are combined to create understanding. The steps involved in the construction-integration process include forming the concepts which are presented linguistically in the text; connecting these concepts to what is stored in the reader's knowledge about the world and also knowledge about language; and making inferences to fill gaps and make a secure mental model (Kintsch, 1988). New knowledge connects to the nodes of previously held knowledge. Expert comprehension involves the working memory and long-term memory; it allows readers to 'juggle' all the concepts needed for understanding in the working memory (Kintsch & Rawson, 2005). Being a capable comprehender requires that the reader automatically accesses previously held structures or mental models. The reader can efficiently organise new information using their strong vocabulary knowledge and construct an adapted mental model. Inefficient readers who lack fluency have more difficulty organising detailed information (Kintsch & Rawson, 2005). Reading unfamiliar material takes considerable effort and can result in shallow comprehension if the reader does not create a mental model.

It is interesting to note that "learning from text is not to be equated with remembering text" (Kintsch, 1986, p. 106), thus constructing a mental model of the situation in a text is a necessary basis for learning from a text. If a reader can comprehend what is explicitly stated, a shallow interpretation occurs. A mental model of the situation in the text must be constructed to get to a deep understanding (Kintsch & Rawson, 2005). Creating mental models is a form of problem-solving when facing new concepts that link to currently held schemata, encouraging strategic thinking and making connections (National Reading Panel, 2000). Cognitive theory involves the reader using strategies and taking cognitive action, which helps when there is a breakdown in understanding.

This cognitive approach to reading also supports the concept of in-depth reading. It has been explained that reading leads to "thinking beyond ourselves" (Wolf, 2016, p. 3) and that if we are to find, reflect and expand on the ideas presented when we read, deep reading processes are needed (Wolf, 2016). According to Wolf (2016), there are three levels of an in-depth reading process. Firstly, the straightforward operation of bringing background knowledge, understanding another perspective and understanding the language of imagery. Secondly, in-depth reading requires deep thinking processes, which include the metacognitive skills of

observation, inference, and critical analysis. Lastly, deep reading calls for deep processing which invites the reader to provide insight, add new ideas, and contemplate over an idea they have come across (Wolf, 2016). This active process reinforces that to be a skilled comprehender of text, construction of mental models and integrating new ideas is not a passive undertaking.

Tie it all Together With Connectivism.

Connectivism (Siemens, 2004) as a theory considers technological innovations and how these change the way we learn. In the same way that social constructivism and Reader-Response Theory place the learner at the centre, Connectivism has a student-centred approach that aims to create participation in a community of learners (Guder, 2010). Technology has changed the way we access information and how we connect with others. Siemens (2004) argues that connection-making brings learning theory into the digital age and that learning can reside in a variety of sources, opinions and non-human appliances.

Earlier theories of behaviourism and cognitivism placed students as passive receivers of knowledge (Foroughi, 2015). Behaviourism focused on observable behaviour as the marker of learning, due to measuring the internal processes of thinking being difficult or even impossible. Cognitive views of learning required information to be assimilated into the memory for later use. As we have seen in Vygotsky's and Rosenblatt's theories above, constructivism had the viewpoint that through interaction, learners were able to construct knowledge actively (Foroughi, 2015). This idea challenged the view that learning is merely a transference of knowledge from an instructor to a student. A critical component of constructivist approaches is the learner being proactive in making the learning happen.

Technology has changed the way we approach learning. Cognitive information can be acquired through the support of technology, and students can interact with each other's ideas in a digital space. Connectivism is a conceptual framework whereby, with the assistance of technology, participation in conversations between teachers and learners, leads to the emergence of knowledge (Goldie, 2016; Siemens, 2006). The critical aspect of Connectivism as a theory is that humans are social beings. As a result, we interact to know and to be known, as opposed to the view that cognitivism promotes, that the internalisation of knowledge is the key to learning (Siemens, 2006). Thus, Connectivism has evolved in the digital age as the

connection between people and the relationship between ideas. Connectivism allows for a diversity of opinions and the ability to seek knowledge in a variety of places through a variety of human and non-human sources. Siemens (2004) also identifies learning as a self-organising process and emphasises the capacity to “form connections between sources of information, and thereby create useful information patterns” (Siemens, 2004, p. 4), as a requirement for learning to occur in our knowledge economy.

Connectivism advocates a collaborative epistemology (Kivunja, 2014) in which learning is constructed through collaborative activities. Digital technologies have an impact on education, allowing learning to take place through social interactions (Siemens, 2004). An area of contention in the 21st century is the explosion of technologies which have become available, creating an additional responsibility for teachers who must filter through the numerous tools and platforms available, to find those which make a difference to learning. Fullan and Langworthy (2014) highlight that among the advantages associated with new pedagogies is, if used correctly, they allow for deep learning. Using technology to connect the learning to students’ interests, using the power of peer teaching, making the learning process, the what and the why of learning, visible to students (Fullan & Langworthy, 2014) are all ways to deepen students’ understanding. For this to be successful, teachers require teaching strategies that enhance their ability to form learning partnerships with students that lead to mastering the process of learning (Fullan & Langworthy, 2014). Technology changes the way students can learn and what they can do while they are learning. Through connecting with others, this can lead to participation, sharing of ideas and interaction in a learning community (Goldie, 2016). The ability to see connections between ideas and concepts is a critical principle in Connectivism, acknowledging that learning and knowledge rest in a diversity of opinions (Bell, 2011; Dunaway, 2011). Literacy is seen as a way of bringing technology, knowledge, and skills together (Knobel & Lankshear, 2014) within a social context. This involves a focus on doing, sharing, and contributing instead of being a passive recipient.

The complexity of the theories listed above makes it clear that there is not one single solution when a learner is struggling with reading comprehension. This idea is confirmed by studies that found many struggling adolescent readers have multiple areas of difficulty, which could include decoding, vocabulary knowledge,

fluency as well as comprehension (Fogarty, et al., 2017). Interventions for reading comprehension development need to have a multi-pronged approach. It has been suggested that advances in technology may provide support in reading interventions (Fogarty, et al., 2017). Technology allows connections between students and these interactions can help create new understandings through the ability to use prior knowledge and connect this to new ideas (Fer, 2009, as cited in Gunduz & Hursen, 2015).

The Reading Apprenticeship Framework as an Overarching Structure

The Reading Apprenticeship Framework includes four overlapping dimensions that are connected by metacognitive conversations and require a context of extensive reading (Schoenbach et al., 2012). The four dimensions that support reading comprehension are Social, Personal, Cognitive, and Knowledge-Building (see Figure 2.2).

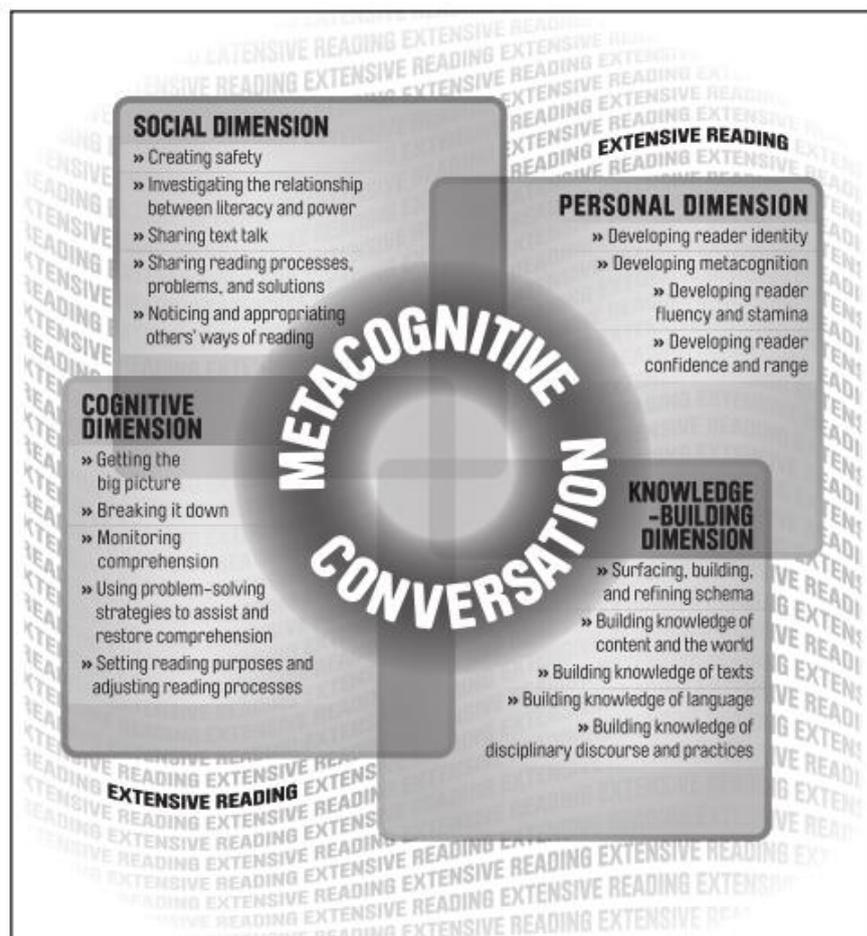


Figure 2.3. Reading Apprenticeship Framework

(Schoenbach et al., 2012) Reprinted with permission of John Wiley & Sons, Inc.

The social dimension requires interaction between teachers and students. The social aspect of the framework links to Vygotsky's (1978) Sociocultural Theory, whereby more knowledgeable others work together with students to help them purposefully engage with ideas put forward by texts. It allows students to interact with each other, putting forward their viewpoints and discussing them with others. It also allows for students to be the more knowledgeable other and use their background knowledge or experience to support others when reading about a topic in which they have expertise. This aspect allows for the resources held by students to influence the interpretation of the text and help others to gain a deeper understanding.

The personal dimension focuses on what students bring to the collective reading process. Their interpretations and responses are welcomed as part of the reading process. Students are encouraged to question and persist when reading challenging texts. This concept has a firm connection to Rosenblatt's Reader-Response Theory (1982), whereby the student's thinking and personal responses add to the understanding of a text. The personal dimension focuses on students gaining confidence and courage to interact with text and develop their thinking.

The knowledge-building dimension is the chance for reading to provide new ideas and thinking and develop students' understanding of topics. Students bring their prior knowledge to the reading event and use previously held knowledge structures, also known as schemata, to map new ideas onto currently held knowledge. Reading is an active process of modifying schemata by adding new knowledge or vocabulary and thus building comprehension of a text. Building content knowledge, vocabulary knowledge, and refining schema reflect the concepts in Schema Theory (Rumelhart, 1980a).

The cognitive dimension of the Reading Apprenticeship Framework is a chance for students to use strategies to help them persist with a difficult text. By using strategies such as re-reading a section, focusing on a chunk of reading, summarising the ideas and paraphrasing, visualising concepts, or self-questioning, they are aware of their understanding of what is happening in the text. Making inferences and using the problem-solving strategies of monitoring comprehension, and being aware of breakdowns in understanding, reflect the thinking and cognitive activity represented in the Construction-Integration Model (van Dijk & Kintsch,

1983). The strategies work with previously held ideas to make adaptations to mental models.

All four dimensions are supported through a metacognitive process, whereby students are not passively absorbing what is read but are investigating the ideas presented, asking questions, making links to what is currently known and being aware of any confusions. Under this framework, reading comprehension represents a complex process.

Having a focus on metacognitive conversations allows readers to become aware that there are mental processes that take place during text comprehension (Schoenbach et al., 2012). Although the current study uses a digital tool to investigate if there is an improvement in reading comprehension, the Reading Apprenticeship Framework provided a basis for connecting the theoretical frameworks that represent the development of comprehension. The current study uses an adapted version of the Reading Apprenticeship Framework (Schoenbach et al., 2012) as an overarching means of linking the theoretical frameworks of Sociocultural Theory, Reader-Response Theory, the Construction-Integration Model, Schema Theory and Connectivism with the pragmatic approach of using a digital tool to enhance metacognitive development in reading comprehension. The amalgamation of the theoretical frameworks that support reading comprehension and how they support the Reading Apprenticeship Framework is shown in Figure 2.3.

Actively Learn
and Reading Comprehension:
Theoretical Foundations of this Study

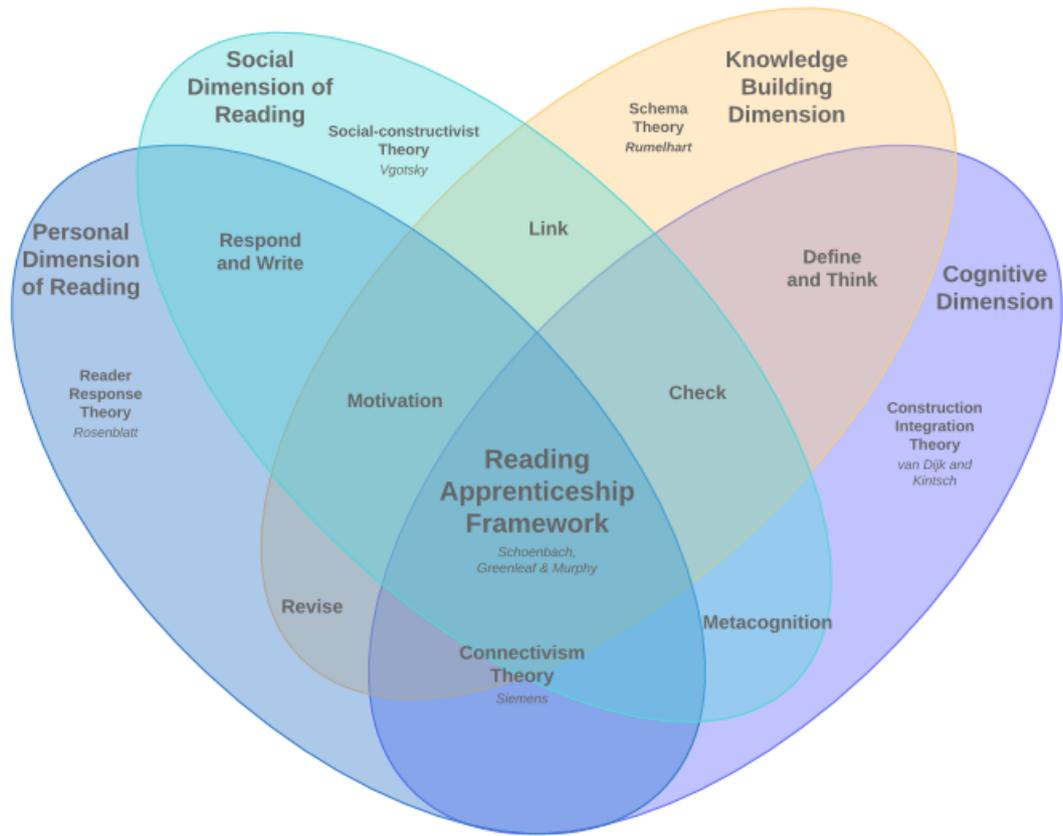


Figure 2.4. Reading comprehension theories linked to the RAF and *Actively Learn*

Learning is a social-cognitive interactive process (Schoenbach et al., 2012) involving people participating in activities with more competent others. The theories above converge to create a focus on active participation by the learner and an interactive approach to learning. It has been said that knowing means “being able to delve beneath surface-level explanations with an investigative, curious, probing frame of mind” (Roberts, 2005, p. 36). Using the Reading Apprenticeship Framework as a model that supports four theories of comprehension, enables the current theory of reading to be connected to the practical use of technology in the classroom.

Twenty-first Century Literacy, New Literacies and Multiliteracies

Twentieth-century literacy was defined as demonstrating competence in communication skills “appropriate to age” and in such a way that it enabled a person to function “independently in society” (Hillerich, 1976, p. 53). The focus was on having reading and writing skills to a level of “functional competence” (Hillerich, 1976, p. 53). Kinzer (2010) expressed the need to acknowledge the continuing transformation of literacy tools when facing the changing demands of communication, collaboration and information retrieval. Although reading and writing are critical elements of literacy, the modern-day literate person is also successful in navigating a variety of digital media. It is not a matter of traditional literacy being superseded by digital literacy; it is a matter of developing both sets of skills, thus enabling low-achieving students a chance at being able to operate effectively in modern society. Focusing on literacy which includes multiliteracies, a wide range of technology for communication, linguistic and cultural perspectives, (Cope & Kalantzis, 2000), and critical literacy, is a necessary foundation for the literate person in the 21st century.

Cope and Kalantzis (2012) emphasise the increasing integration of alternative modes of meaning-making where “the textual is also related to the visual, the audio, [and] spatial” (Cope & Kalantzis, 2000, p. 5). They assert that meaning can be represented in audio, visual, and spatial patterns, thus creating multimodal means of expressing ideas. By using digital tools for reading, access is provided to tools such as online dictionaries, text-to-speech, and hyperlinks, which provide an immediate resource to students when in the process of reading.

Literacy, when defined as the ability to communicate and to find and evaluate information critically, is more important than ever (Kinzer, 2010). Consequently, teachers of 21st-century scholars must ensure students develop the skills of reading and writing; yet they must also help students develop the skills of literacy required in the digital age as a means of functioning successfully in modern society. Both the old and the new are essential. The new literacies will not be successful without a basis in the foundational literacies. Reading and writing are still crucial in the information age, and it could be argued that they are more critical than ever before (Leu, Kinzer, Coiro, & Cammack, 2004). O’Brien and Scharber (2008) suggest the possibility of using emerging digital tools to bridge the old with the new, thus transforming how adolescents express ideas and learn in schools. It is important to note that this shift

does not seek to eliminate old literacies; instead, it proposes to synthesise new digital literacies and already established literacies (Lankshear & Knobel, 2006 as cited in O'Brien & Scharber, 2008). Digital tools allow for a collaborative and cooperative space for interaction between students and multimodal responses to texts.

A scaffolded digital reading framework, developed by Dalton and Proctor (2008), emphasises the importance of learning that is flexible and customisable. Following the principles of Universal Design for Learning (UDL) (CAST, 2018), features and supports of digital technology have the facility to scaffold reading to support struggling learners and enable students to flexibly use the tools available (Dalton & Proctor, 2008). The scaffolded digital reading framework presents the important factors of reading, such as word recognition, vocabulary development, prior knowledge, and metacognitive strategies. It compares the print reading space to the digital space. Affordances that digital technology offers over print-based reading include text-to-speech, vocabulary tools, the integration of multimedia resources and what Dalton and Proctor (2008) refer to as 'social resources'. Multiliteracies have the power to take students beyond an isolated learning experience to a place where support is available as and when needed.

The Digital Divide and the Impact This Has on Struggling Learners

The digital divide is defined as the gap in access to technology between people of different socio-economic circumstances (Warschauer, 2003). The digital divide refers not only to the availability of digital resources at school and home, but also the training of teachers to know how to use these tools in such a way that they will have an impact on learning (Garland & Wotton, 2002).

In analysing access to, and use of, modern technology, it appears that equity concerns abound. Many adolescents do not move beyond friendship-driven activities that involve 'hanging out' with friends online (Warschauer & Matuchniak, 2010). High-achieving students are more likely to move beyond their peers and use technology for interest-driven activities. These may include posting and critiquing fan fiction, watching anime series, publishing videos, researching topics, or collaborating online to create new media (Warschauer & Matuchniak, 2010). By contrast, students with lower achievement levels are more likely to use digital media for socially driven activities. These may include using social media, chatting with friends, playing online games (Warschauer & Matuchniak, 2010), or web-surfing

links about sports figures or celebrities (Biancarosa & Griffiths, 2012). Such differences led Biancarosa and Griffiths (2012) to question if the discrepancy between how students use technology not only does little to shrink knowledge gaps but in fact, may exacerbate them. They state that access to technology is not a solution alone; students need guidance in learning how to apply technology in strategic ways to develop their literacy skills. Access to technology at home does not guarantee extra opportunities for literacy activities (Biancarosa & Griffiths, 2012; Jesson, McNaughton, & Wilson, 2015; Snyder, 2008).

A further aspect that heightens the digital divide is the lack of literacy skills. Computer skills require someone to be literate; therefore, the 21st century makes it difficult to hide a lack of literacy. Limited reading skills can make computer-use a process of browsing and surface-level reading. Low literacy skills may hamstring a person's ability to perform an adequate search due to the lack of appropriate vocabulary (Cullen & Cobb, 2011) which may lead to frustration or dependence on a support person. The skills necessary to achieve high levels of reading comprehension are often acquired at home by economically advantaged students (Leu, Kinzer, Coiro, & Cammack, 2004). As such, minority groups, and those with limited internet access at home, may not be in a position to develop the skills necessary for living in a digital age.

The 2015 OECD report indicated that if current gaps in reading, writing and mathematics skills are not narrowed, inequalities in digital capabilities will persist (OECD, 2015). The OECD report (2015) highlights the importance of locating high-quality digital learning resources amongst a multitude of poor-quality ones. Without data to support practice, trial and error become the strategies used for discovering useful digital tools leading to a form of experimentation with students' learning.

Schoenbach et al. (2012) identified that "the concentration required to sustain attention on a long or challenging text, or the persistence and confidence needed to read across multiple texts on a related topic and compare ideas in each of them, is very different from the kind of browsing reading that most internet readers employ" (p. 12). If skimming through Instagram, Facebook, and internet sites are the predominant forms of reading, students may not develop the skills of deep reading (Wolf, 2018a). Such skills include finding the main ideas, making connections to other texts or society, or even asking mental questions as they read. Surface-level reading may mean that students avoid words they do not know. They may not

complete reading an article and instead be a victim of clickbait, thus avoiding reading anything that may be difficult. Browsing and skimming impede the development of strategies required for competent reading. There is evidence that online reading is not very skilled and even adolescents, whom we think of as ‘digital natives’, are not adept at critically responding to information found online (Jesson, McNaughton, & Wilson, 2015).

Engagement and Motivation Linked to Digital Technology

When teaching 21st-century students, some educators advocate not only the importance of using modern technology but also teaching 21st-century skills such as collaboration, communication, critical thinking and creativity (Kivunja, 2015; Fullan & Langworthy, 2014; Trilling & Fadel, 2009). Stansbury (2012, as cited in Bonk & Khoo, 2014) states that there is a need for a better understanding of how technology can engage students in the learning process. Greater motivation is associated with more in-depth engagement, with disengaged learners often seeing no value in learning, lacking commitment to the topic and exhibiting a lack of effort (Bonk & Khoo, 2014). Bonk and Khoo (2014) state that allowing students to make some choices in their learning is a powerful motivator.

The interesting dilemma is how we can use digital media to engage students who are struggling learners, particularly in their acquisition of literacy skills. Coiro et al. (2008) purport that digital media may be a key component of engaging marginalised youth and preparing them for future schooling and careers. Variability in reading performance can be influenced by engagement, attitude towards reading, the sense of self-efficacy a student has towards reading and their motivation (Woolley, 2011). Students who experience difficulties with reading can develop negative attitudes and avoid opportunities to read. Figure 2.4 reveals how anxiety towards reading can lead towards ineffective strategy use, low self-efficacy and can establish a cycle of reading avoidance. Castek et al. (2011) point out that digital media has the advantage of offering support tools in the moment of reading. This can assist struggling readers in vocabulary development, and the development of background knowledge and help students be effective in online communication (Castek, Zawilinski, McVerry, O’Byrne, & Leu, 2011).

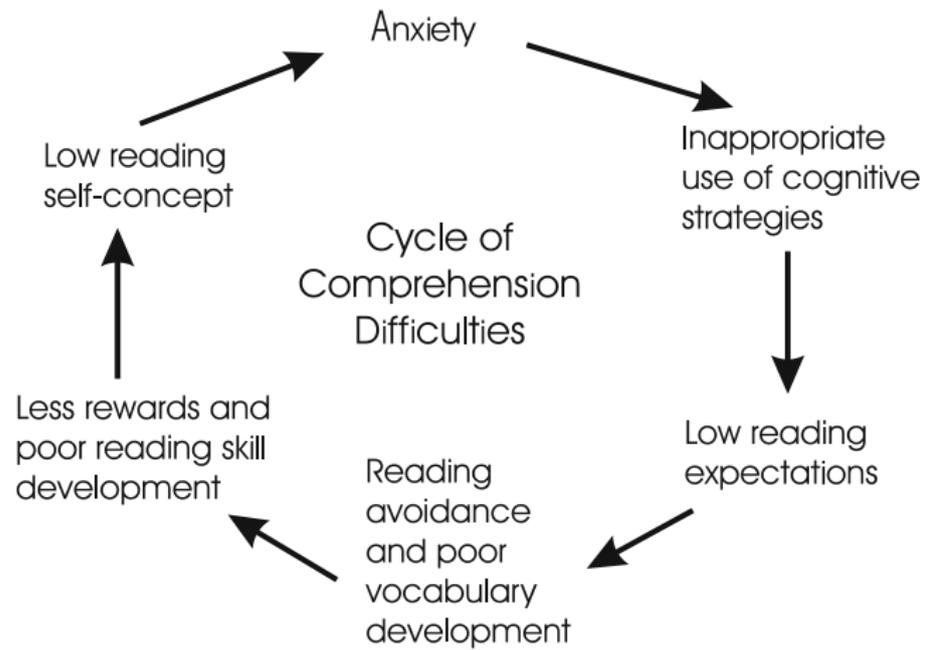


Figure 2.5. The cycle of reading comprehension difficulties
 (Woolley, 2011) Reprinted with permission of Springer Nature

A challenging aspect of electronic texts can be their non-linear nature. Despite this, there is the potential to scaffold comprehension through including definitions or providing hyperlinks to supplementary information (Snow, 2002). Links to video clips can be useful for engaging students’ interest as well as filling gaps in students’ understanding. Electronic media are an omnipresent part of students’ lives, and with these tools come connections to the world beyond their schools and families. Snyder (2008) posits that the English or literacy class is a place where we should be giving students opportunities to build critical literacy and thinking skills that are needed in life beyond school.

Digital tools must simply not be used because they are readily available; technology must make a difference to both learning and engagement. Hence, digital technology is only useful if it supports pedagogy and learning outcomes (Hutchison & Woodward, 2014; Molenda, 2014). Concerning literacy, Hutchison, Beschoner and Schmidt-Crawford (2012) suggest investigations into technology need to identify their appropriateness to foster successful reading. There is “no quick fix for reading inexperience” (Schoenbach et al., 2012, p. 8) and rather than just thinking what website to use, it is essential to be thinking, “What do I want my students to learn

and therefore how can (this tool) help me in this process?” (C, Braddock, personal communication, May 27, 2016). Despite digital education being mooted as a means of engagement for young people and possibly a way of meeting their immediate needs, the question arises, however, as to whether or not digital tools are meeting long-term needs of students and also the wider community (Bolstad & Gilbert, 2006).

The 21st century has coincided with changes in the pedagogical tools available to teachers and their students, along with new ideas about effective teaching practices concerning digital technologies (Littlejohn, Falconer, & McGill, 2008). Navigating our way through this evolving field is an essential task of educational researchers. Digital tools have value in the literacy classroom due to their ability to allow for differentiation and support skill development, along with simultaneously encouraging students’ independence in constructing new knowledge with teacher support (Hutchison & Woodward, 2014). Low literacy skills have an enormous impact on an under-achieving learner and play a negative role in the future direction of the student. Cullen and Cobb (2011) state that technology may be a means of helping students who struggle with literacy skills by providing access to age-appropriate material and support in overcoming reading challenges.

Pedagogy Surrounding Digital Tools in Education

Digital technologies need to be used in educationally meaningful ways. As technology becomes pervasive in the field of education, rather than using digital tools simply because of their availability, or because of pressure in the BYOD era for students to be frequently using the devices that they bring to school, an evaluation must be made of the strengths and limitations of the specific tools intended for use in the learning environment (Mead & Jeffries, 2018). Using technology for its own sake will make no difference to learning; “it’s about how it is used and what outcomes are achieved” (Molenda, 2014). The focus must be on ways in which using technology enhances the development of skills, rather than enables drill.

From the late 20th century and on into the early 21st century, a plethora of digital tools has become available to teachers and their students. The availability of technology must not drive instruction; technology needs to be selected to suit learning needs and the pedagogical approach (Hutchison & Woodward, 2014). Digital technology should always be considered as a tool that can be utilised to

achieve learning goals. Teachers should not be so captivated by the concept of using digital tools if a non-digital device would better support the learning. Merely adding technology to the classroom programme will not guarantee an impact or reduction in the learning gap for low-achieving students (Bain & Weston, 2012; Gallagher, 2014; Jesson, McNaughton, & Wilson, 2015; Mishra & Koehler, 2006).

Teachers who want to embrace technology as an embedded component of a 21st-century classroom need to ensure their focus is on improving engagement and learning through including students' strengths and interests and not merely using digital tools because of their ubiquitous availability (Mead & Jeffries, 2018). When using digital tools, consideration must be made as to how they support pedagogy and learning theory and how they enable thinking and connecting to take place.

The 21st century has seen an impetus for teachers to create Information and Communications Technology (ICT) rich learning environments (Bolstad & Gilbert, 2006). Although there is a desire to provide new methods of teaching and learning for this new generation of learners, Bolstad and Gilbert (2006) emphasise that there has to be an educational point in everything we do. By making the curriculum more efficient, accessible, and enjoyable for teachers and learners, ICT tools can be one way of supporting the learning of students (Bolstad & Gilbert, 2006).

Starkey (2011) points out that the link between digital technologies and student performance is complex. She posits that an important aspect of using a digital tool is the ability to connect and collaborate with others beyond a constrained environment. She also points out that what leads to meaningful learning is conversation, knowledge construction, collaboration and reflection (Starkey, 2011). It is not just the use of a digital tool that enhances learning, but the thinking and connecting that allows for deep learning to take place.

Anomalies Relating to Literacy Development Through the Use of Digital Tools

The value of digital tools as a means of developing literacy skills is by no means conclusive. A study investigating the use of an e-Learning tool to support the learning of a group of university students found the tool to be successful as it enhanced the students' ability to synthesise information (Deplaces, Blair, & Salvaggio, 2015). However, other research points to mixed reviews about the effectiveness of technology in learning. McCormick (2002) felt there needed to be more focus on the pedagogy surrounding the use of digital tools and questioned

whether digital technology led to any improvement in test scores. Despite technology now being integrated into many classrooms, Hutchison (2012) points out there needs to be a better understanding of the role technology could play in literacy development. Lawless and Pellegrino (2007) concur by stating there is not enough research-based knowledge to guide the incorporation of technology into teaching and learning. Although a gap exists in understanding the ways digital technology can enable effective literacy instruction for struggling high school students, many teachers want to incorporate technological tools into their literacy programmes.

Being literate is more than simply accessing modified print-based literacies adapted for a screen (Coiro, Knobel, Lankshear, & Leu, 2008). Digital technology changes the way readers and writers interact with texts through new skills being needed to engage with new forms of text (Coiro, Knobel, Lankshear, & Leu, 2008). Notwithstanding the evidence from studies of digital technology as learning tools over many years, there is still a lack of comprehensive understanding of the value provided by various digital tools (Beach, 2012). Digital technology can allow teachers to gain insights into reading behaviours of their students, and to support literacy development in oral language activities, authentic writing activities, and allow collaborative interaction (Colwell & Hutchison, 2015). Yet, there is also the view that digital technology “can both enhance and inhibit instruction” (Colwell & Hutchison, 2015, p. 61). The consideration at the forefront of instruction must be the literacy needs, with the usefulness of technology tools evaluated, rather than simply added to the programme (Colwell & Hutchison, 2015). Effective instructional choices can be made when we understand evidence-based ways technology can make a difference in literacy learning,

Twenty-first-century students have never known a world without Google. Many have a high level of digital gaming skill, and the ownership of smartphones is prevalent. Yet, we cannot assume all adolescents can use digital tools to enhance their learning. Despite some teachers’ enthusiasm for incorporating digital technology into classroom practices, few studies provide evidence of its effectiveness on literacy outcomes (Biancarosa & Griffiths, 2012). There is a need for further investigations into literacy development for high school students, and if e-Learning technology can have an impact. Not only is there a need for evaluating whether digital tools provide effective intervention for low-progress learners, but there is also

a need to know if digital tools can create a significant difference, in addition to traditional literacy instruction.

Snyder (1999) has identified that there is a policy push for ‘technologising’ literacy education, yet she makes it clear that this must be supported by evidence of successful learning. Kinzer (2010) states that more research is needed into how online and digital activities can be customised to students’ interests, thus leading to a more personalised learning environment.

Colwell and Hutchison (2015) point out that although research has taken place over almost two decades, more information is required to help teachers make informed decisions regarding the integration of appropriate digital tools into literacy instruction (Colwell & Hutchison, 2015). For young children, digital tools have been found to support reading comprehension, promote discussion and encourage collaborative learning (Colwell & Hutchison, 2015). Further research is required to discover if technology can be useful for the literacy learning of struggling high school students and decrease the effects of the different levels of literacy with which they arrive at high school.

According to Wolf (2018a), research cautions that “deep reading processes may be under threat” (p. 1) as a result of the increased use of digital reading tools. Deep processing characteristics such as making inferences, reasoning, perspective-taking, developing empathy, critical analysis and developing insight may be pushed aside during skim reading. Deep reading is a slower, more time-consuming process (Greenfield, as cited in Wolf, 2018a). Word spotting, grazing, or browsing a text reduces the thinking time and the ability to grasp the complexity of ideas within a text (Schoenbach, Greenleaf, & Murphy, 2012; Wolf, 2018a). This type of reading reduces opportunities for readers to develop their thinking about what is being read. Wolf also identifies a concern that reading could become more superficial, with less attention to close reading and deep reading, as a consequence of the transition to the digital culture of reading (Wolf, 2016). Paul (2013) explains that reading builds empathy in students who read for long, uninterrupted periods, creating what is like a lived experience. She points out that this form of reading (long, steady, and uninterrupted) is the opposite of online browsing.

Interestingly, with digital texts being among the typical reading habits of adolescents, many students do not regard their access to digital texts as literacy activities (Pitcher, et al., 2007). It has also been identified that struggling readers

implement comprehension strategies better online than with traditional texts (Castek, Zawilinski, McVerry, O’Byrne, & Leu, 2011); possibly because digital texts are shorter or chunked into shorter sections.

When studying the effect of reading on screen versus reading on paper, Mangen et al. (2013) found that comprehension performance was higher when reading print on paper than when reading a computer screen. They posited that the scrolling required when screen reading “might impede reading performance” (Mangen, Walgermo, & Bronnick, 2013, p. 67). It must be noted, however, that the study contained two texts – a reading text and a testing text, from which students moved from one to the other. The lack of text cohesion may have had a negative effect on reading comprehension.

Alignment of the *Actively Learn* Platform With Reading Comprehension Theory

The current research aimed to use the digital platform *Actively Learn* as a means of promoting the metacognitive processes that take place automatically in good readers. *Actively Learn* was chosen as features of this digital platform aligned clearly with the reading comprehension theories discussed earlier in this chapter. The aim was to see if using a digital tool to encourage depth of reading and active thinking can lead to improved reading comprehension. The platform works to help students slow down and connect with their understanding of a passage of text.

Actively Learn is an online platform based in Seattle, USA (Actively Learn, 2012). It was founded in 2012 and aimed to move students from skim-reading to reading with depth and understanding. The platform seeks to develop students’ depth in reading by activating their thinking during the reading process by answering embedded questions and creating notes. Teachers can choose from a catalogue of high-interest reading material that is freely available, or they can upload documents, or articles they have found on the internet (see Figure 2.6). By doing this, teachers can make the content relevant to the topic of study the class is engaged in, the learning area the teacher is working in, or directly connecting to topics of interest related to students in the class. This aligns with the personal dimension of the Reading Apprenticeship Framework (Schoenbach, Greenleaf, & Murphy, 2012). Personalising the reading and providing an opportunity to interact with the text links to the Reader Response Theory (Rosenblatt, 1982). Students cannot go further through the text until each question has been answered and they are unable to see the

complete text until the end. A teacher is also able to switch to ‘student mode’ to see the visual layout of a text they have created and assigned to their class.

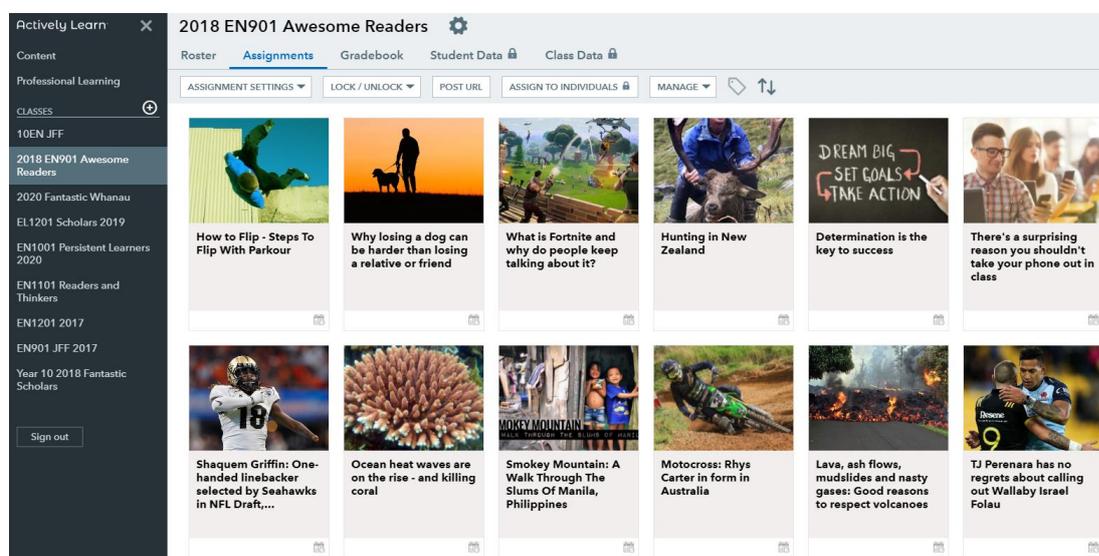


Figure 2.6: Teachers choose the content for their classes

The personal dimension of reading is also addressed through students being able to personalise their text settings such as font type and size, background colour, and spacing of words, including dyslexic settings, and they can also annotate the text. They can make use of the text-to-speech tool, with synchronised highlighting and variation in speed and voice type, or use an in-built dictionary for immediate checking of word meanings or pronunciation. If a teacher provides choices of text, students may have options of what text they choose to read. Students can reveal their thinking through their answers to questions or their comments on notes. Reluctant speakers can make contributions on notes, and in written responses, that they may not have made verbally as part of a class discussion.

Teachers can scaffold the knowledge-building dimension of the Reading Apprenticeship Framework (Schoenbach, Greenleaf, & Murphy, 2012) by chunking the text and inserting questions at appropriate junctures (see Figure 2.7). Careful placement of questions, the addition of images or video links that might provide background knowledge, or asking students to identify the meanings of unknown words are possible to achieve at any place a teacher feels would be useful. Helping students build an appropriate schema (Rumelhart, 1980a) through supporting the development of background knowledge aids the development of comprehension.

Teachers can provide immediate feedback at the time the students are working on the reading activity in the form of grades and comments. The questions that teachers embed are not for testing, but to help activate students' thinking. The entire text is not visible as a complete document would be in a paper version. Students can only see a text up until the next embedded question. This stops students from quickly skimming through a text and requires them to stop and think and respond with their thoughts before they see the next section of the document.

While some people see video games as a means of living out fantasy, the truth is who we are in the virtual world largely reflects who we are in the real one. For instance, one piece of research has found that a player's real values match their in-game decisions, suggesting that their true personality often gets reflected in a game scenario. There is also evidence that our ability to lead is strongly reflected in the way we form relationships in video games.

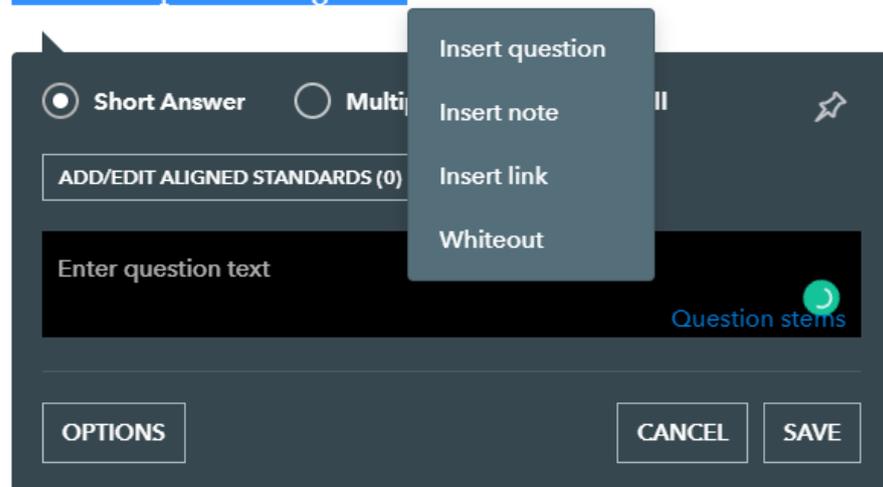


Figure 2.7: Teachers insert questions where appropriate

The platform addresses the Reading Apprenticeship Framework's social dimension (Schoenbach, Greenleaf, & Murphy, 2012) in two ways. Once students have completed an answer, they have access to their classmates' responses, thus being able to see what other students were thinking. In a similar vein to a social media platform, they have the facility to 'like' another student's answer. The platform further supports the social dimension of reading through students having the

facility to make notes that they share with the class and respond to the notes of other students (see Figure 2.8). Through students interacting on the notes, a discussion thread is developed. This aligns with both Social Constructivist Theory (Vygotsky, 1978) and Connectivism (Siemens, 2004) by providing students opportunities to interact and view the other students' responses.

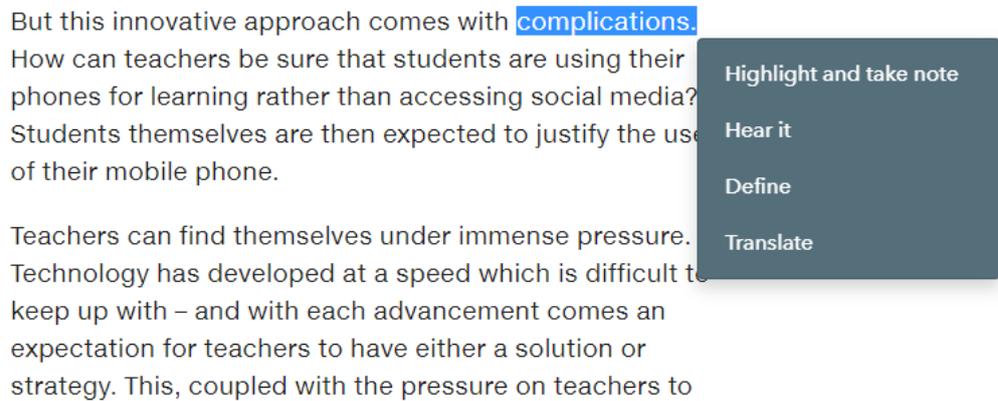


Figure 2.8: Example of students' options when reading

The Reading Apprenticeship Framework's cognitive dimension (Schoenbach, Greenleaf, & Murphy, 2012) is developed through what *Actively Learn* describes as three key interventions: Activate, Support and Reveal students' thinking (Actively Learn, 2017). Activating thinking requires the teacher to set a purpose, a learning objective for the reading, which is visible right from the beginning. The questions are embedded to support the thinking process while the reading is taking place. Teachers can grade answers (Zero, Incomplete, Basic, Proficient or Advanced) almost immediately and make comments on students' responses. Students can revise their answers if, as a result of the teacher feedback or their interaction with other students, they have adapted their thinking and want a chance to make this clear in their answers. Students can privately see the teacher's comments. The focus is to emphasise questions that use higher-order thinking and allow students to reach a greater depth of knowledge or form an opinion and support it with evidence (Actively Learn, 2012). Alignment is seen with the Construction-Integration model (van Dijk & Kintsch, 1983) whereby students build their understanding by adding to their thinking at each chunk of the text they are presented. When teachers grade or

comment on an answer, students receive a notification and can check this at any stage of the reading.

The catalogue is divided into News and Articles, Genres, and Themes (see Figure 2.9). The News and Articles section is mainly US-centric. However, during the current study, a High-Interest Articles section covered a broad range of interests and topical subjects that were not necessarily focused on the United States. For teachers in other countries to have local stories included, they need to upload their chosen texts. *Actively Learn* is a user-pays platform, yet a free version is available, which allows teachers to upload three texts per month and provides teachers access to the catalogue of texts. For issues of equity, the current research used the free version so that findings could apply to any school with computers or students who are able to bring their own device.

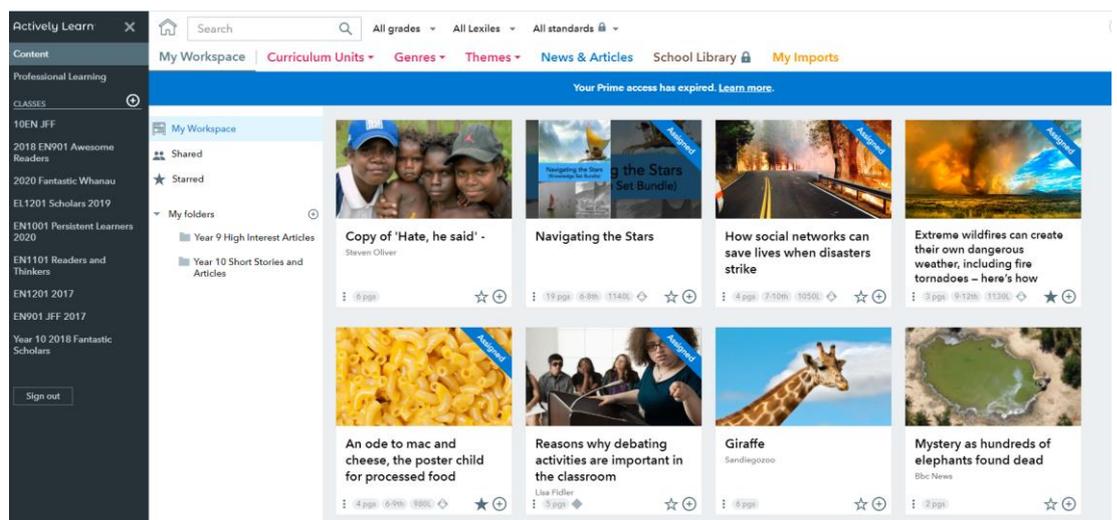


Figure 2.9: Example of the Actively Learn teacher's workspace

Stories and articles are graded according to the United States Grade 1-12 levels with the option of teachers adding Common Core Standards to the reading requirements. Using this tool in a New Zealand school meant that the Common Core Standards were not used, however, if a teacher used the catalogue, knowing an approximate grade level and translating that into a New Zealand context, could potentially be useful.

A translation tool is available, where the English text can be highlighted and translated into one of 104 other languages, including Māori, Chinese, Japanese, Spanish, Swahili, Mongolian and Ukrainian.

Teachers create a class which students connect to directly using a class code. Once students have joined the *Actively Learn* class, every new text assigned to their class is automatically in their class assignments folder. Teachers can also link directly to Google Classroom, which gives students an alert when a new text has been assigned.

An automatic grade book is included, which allows the teacher to know how many reading activities each student has completed and at what level the teacher has graded them. Further data and reporting are available on the paid premium version. The free version of *Actively Learn* does not allow open access for teachers to share or collaborate with colleagues. They may share three texts as a trial of collaboration; further sharing of texts requires a paid version of the tool.

The paid version offers a chance for differentiation for different groups of learners. The free version means that teachers can only provide extensive choices once they have created a store of resources in their workspace, or be heavily reliant on the catalogue in the early days of the usage of the tool. The resources that a teacher builds do not disappear at the end of a year but remain in the teacher's workspace catalogue and can be added to subsequently.

Summary

The current study focused on reading comprehension ability of high school students. As such, it is not focused on the early word-learning skills of beginning readers, but the effective use of text to enable further learning to happen. There is an assumption in this study that decoding skills have been developed in students by the time they reach their teenage years, except for English language learners, some dyslexic students, and students with cognitive impairment.

The breadth of literature in the research field suggests that reading is a complex activity. As a result, there is not one single theory that can account for the complexity of activities that take place during the development of reading skills, particularly learning to read with a depth of comprehension. The literature reviewed in this chapter provides a clear basis for investigating the use of a digital tool in the investigation of developing comprehension ability in adolescent learners. The Reading Apprenticeship Framework (Schoenbach et al., 2012) has been used as an overarching structure, with its focus on reading being a metacognitive conversation. The elements of the framework include four dimensions that support the

development of thinking skills when reading: the social dimension of interacting and sharing ideas with others; the personal dimension, of bringing personal thinking to the reading task; the knowledge-building dimension, of being exposed to new content and building on currently held knowledge; and the cognitive dimension where comprehension is monitored, and problem-solving strategies are used.

The theoretical frameworks that underpin this investigation are Vygotsky's Sociocultural Theory of Cognitive Development, Rosenblatt's Reader-Response Theory, van Dijk and Kintsch's Construction-Integration Model, Rumelhart's cognitive approach to Schema Theory, and Siemens' Connectivism Theory. The five theories have been melded together as a theoretical basis for this investigation. All are constructivist theories at heart. However, each has a focus on students developing cognitive and metacognitive skills through interacting with others.

1) Vygotsky's (1978) Sociocultural Theory places students at the centre of their learning and requires students to be actively involved in their knowledge-building. This theory reflects the social aspect of reading.

2) Rosenblatt's (1982) Reader-Response Theory makes room for individual responses and the cognition that creates an active reflection on what has been read. This theory corresponds to the personal dimension of reading.

3) Rumelhart's (1980a) approach to Schema Theory connects the prior knowledge held by the reader to the new information that students encounter during the reading process. This view emphasises the need for readers to build mental models of new ideas. This theory links to the knowledge-building element of reading.

4) van Dijk and Kintsch's Construction-Integration Model (1983) allows for new information from texts to be assimilated alongside prior knowledge, creating or adapting mental models. Through this integration, understanding can occur. Reading becomes a cognitive problem-solving activity where the reader uses strategies and takes cognitive action if there is a breakdown in understanding. This theory represents the cognitive dimension of reading.

5) Siemens' (2004) Connectivism Theory considers the power of digital technology, allowing people to connect through digital interaction and provide opportunities for the collaborative formation of ideas. Learners become active participants and use digital resources to enhance their learning by connecting to others in the class, or beyond the class to other support scaffolds.

The current study focused on the development of reading comprehension using digital technology. The melding of the theoretical frameworks into a streamlined approach reflects the complexity of reading comprehension. The chosen theoretical frameworks focus on having the student at the centre of the learning, the learners' responses being an important focus, and the ability for students to connect to their classmates, their teacher, or other sources of information.

After reflection on the literature that surrounds the reading of adolescents, it became clear that while beginning reading skills focus on the 'constrained' skills of decoding, many adolescents require the development of thinking skills to comprehend what they are reading. The 'unconstrained' skills of vocabulary knowledge and metacognitive skills are relevant for many teenagers who have mastered decoding yet still have difficulty understanding what they are reading. At the secondary level, reading to learn is at the heart of comprehension development.

The literature reviewed also included the pedagogy of digital technology and the impact this can have on learning. It was found that although some teachers want to add digital tools to the teaching in the 21st century, any digital tool must be chosen because of the impact it can have on learning. Research needs to be undertaken to find out what makes a digital tool useful. With the definition of literacy changing in the 21st century to include multiliteracy skills, reading and writing are still the foundational literacy skills and students are expected to be able to use these skills when using multimodal tools. Despite technology taking a role in future learning, the literature posed that the role of teachers has not been superseded. The skills of thinking and interacting, which need to be used by students for successful learning, require that explicit teaching must be involved. Cognitive skills such as reciprocal teaching strategies and discussion skills are useful supports to help students consciously develop their thinking.

The literature review points out that studies are not conclusive, nor in agreement, as to the impact that digital tools have on developing literacy skills. Contrary opinions make it clear that further research needs to be done on the impact reading on a digital platform can have on the ability to develop deep-reading skills. Digital tools are part of the current age. Rather than harking back to a simpler, less technological age, it is the role of researchers to find out ways of using technology that have an impact. As such, the review highlighted the components of the *Actively Learn* tool, which is the basis of this research.

The next chapter outlines the qualitative research design and the features of the methodology. The chapter explains the context in which the study explored the digital platform *Actively Learn*. The methods and timing of the data collection are provided. Ethical considerations are described, as are aspects required for the trustworthiness of the research.

Chapter 3 – Research Methods

Chapter Overview

The previous chapter examined the theoretical viewpoint of using a digital tool to help develop reading comprehension. The literature review elucidated existing knowledge in the field of reading comprehension and the realm of digital technology that supports literacy. There were four aims of this interpretive inquiry. The first was to find out if there were characteristics of the digital tool *Actively Learn* that effectively supported the development of students' reading comprehension. The second aim of the study considered ways reading comprehension strategies might be the focus when using this digital tool. Thirdly, the study aimed to investigate if there was any impact on engagement in reading because of using the e-Learning tool *Actively Learn*. The final aim was to find out if the digital tool *Actively Learn* was effective in improving the reading comprehension of Year 9 and 10 students. In this chapter, I focus on the methodology behind the research and explain why the research methods were chosen. This chapter describes the way the research was conducted; how the data were gathered, and the methods used for analysis. Inefficient decoding by the adolescent participants was not measured in this study. According to the studies of Biancarosa and Snow (2006), adolescents who struggle with reading are more likely to have comprehension, vocabulary and background knowledge difficulties than decoding problems.

Research Design

The core area of focus for this research was the use of digital technology combined with reading comprehension to investigate whether the two, working together, could have an impact on improving reading comprehension for secondary school students. Action research was chosen as the methodology as it particularly suits a practitioner approach, allowing the teacher to become the researcher (Stenhouse, 1975). Action research can be a 'combined design' which can employ both qualitative and quantitative data (Creswell, 2012). The action research design focuses on "procedures useful in addressing practical problems in schools and the classrooms" (Creswell, 2012, p. 22). Action research designs have an applied focus and are usually carried out by teachers to improve educational practice by studying an issue or problem (Creswell, 2012). According to Butin (2010), we need more practitioners

who can link theory and practice to ensure that daily practice and academic research are connected.

Kurt Lewin, considered to be the father of action research, and credited with coining the term in the 1940s (Ary, Jacobs, Razavieh, & Sorenson, 2006), describes this as research whereby action is taken to solve a problem and improve future practice in a field. It uses purposive sampling to address a specific area of focus and does not follow the positivist paradigm. Reflexivity and flexibility have a place in action research that may not be as easy to achieve in a solely quantitative approach. This investigation intended to determine if there was an impact of using an online reading comprehension platform on students' growth in thinking skills and by association, their reading comprehension. The naturalistic research methodology of action research offered a means of not only investigating what was currently happening in an area of educational research but provided the opportunity to make changes and take action.

This study combined both qualitative and quantitative data. The qualitative approach aimed to gain insight and understanding from the voices of students, and their teachers, as to what was happening for them as they read using a digital platform. Their views and insights are presented through 'thick description' (Geertz, 1973; Tracy, 2010) and 'in vivo' quotations from the participants, which allow the story to be shown rather than told. Qualitative data enables a rich insight into human behaviour (Guba & Lincoln, 1994), and thus, this investigation provides the voice of students and their teachers in their raw form. Doing so means there are sometimes conflicting realities due to individual subjective responses; nevertheless, the vicarious experience of the participants is reported impartially. Alongside the qualitative interview data, quantitative data were collected in this study in the form of test results and surveys to add breadth to the findings. Consent to carry out this research was granted by the principal on behalf of the Board of Trustees. With the permission of the school's principal (Appendix 2), schoolwide and classwide anonymised and aggregated data provided an alternative means of exploring the issue of reading comprehension in the study school.

Efficacy of Using Action Research for Practitioner Investigations

Action research provides a systematic process of change with action at its core that embraces reflective practice as a vital ingredient to bring about innovation (Casey, 2013; Cohen, Manion, & Morrison, 2017; Vezzosi, 2006). Fleming (2000, p. 11) refers to action research as the “systematic inquiry into a school or classroom situation with the intent of improving the quality of teaching and learning”. It is a means of achieving “both action (doing) and research (systematically collecting data)” (Fleming, 2000, p. 52). Therefore, it is a means of bringing about change while learning something new at the same time. By implication, reciprocity is an essential component of action research. It is not purely a means for an investigator to find out what is occurring in a situation. The focus is on the future and determining the progression required to create an improvement in learning for students. The change instigated in this study was the introduction of a digital platform to target reading comprehension and depth in thinking whilst reading.

This study employed practical action research to gather both qualitative and quantitative data. When carrying out research, a fundamental basis for the inquiry is the nature of reality and what can be known about the situation (Guba & Lincoln, 1994). Ontology refers to the position taken to find out what is real. The ontological position taken by a constructivist approach is based on the premise that what is real is relative to those involved in a group. This form of locally constructed reality refers to the impact social interaction can have on constructing what we know. Taking a qualitative stance enables a researcher to gain a better understanding of a phenomenon from the perspective of the participants (Bryman, 1988). This thesis uses a constructivist paradigm to allow an interpretive approach to investigate the nature of students’ responses when reading using a digital platform. The research is seeking what is real for a group of learners as they use the digital tool *Actively Learn*. There is no universal truth waiting to be discovered; thus, findings are a result of the lived experiences of the students and their interactions with the digital platform and with each other. The socially constructed process reveals more than one reality and through using an inductive approach, emergent themes are interpreted.

The epistemological position seeks to address the fundamental issues of what is legitimate knowledge and how we can discover the truth (Guba & Lincoln, 1994). The methodology of action research is consistent with the interpretivist paradigm. Unlike the positivist epistemological position that seeks objectivity, knowledge

discovered through the interpretive approach is found in social settings. The subjective input of people is sought, and knowledge is found through experience (Cohen, Manion, & Morrison, 2017; Denzin & Lincoln, 1994). Action research, in particular, seeks knowledge that occurs as a result of an action taking place; knowledge that is hoped to bring about change (Cherry, 1999). This epistemological position views knowledge as created through interaction, and it is the role of the investigator in this study to hear the voices of the students and teachers and interpret the impact. Lewin (1946) believed that knowledge should be created “from problem-solving in real-life situations” (Herr & Anderson, 2005b, p. 6). The goal of action research is the generation of knowledge “that is useful, valid, descriptive of the world” (Herr & Anderson, 2005a, p. 10) which allows both the researcher and the participants to acquire new knowledge that will bring about a positive outcome. Although test results will be considered as part of this investigation, the research seeks the voices of the participants to clarify ideas that sometimes cannot be discovered through the blunt instrument of a standardised test.

Cherry (1999) emphasises the value of action research in creating new knowledge. She states that “it is the nature of action research that new approaches are likely to be grounded in experience, to have arisen from trying to make a practical difference to something or someone” (Cherry, 1999, p. 37). Action research intends to use the knowledge created to solve problems. This approach could be useful when investigating whether a 21st-century tool could make a difference in literacy learning in the 21st century.

Mills approaches this differently by stating that action research requires three key data collection domains: experiencing, enquiring and examining (Mills, 2011). The current study uses these tools as a means of data collection. For this investigation, experiencing involves casual observations of students at work in classrooms to create a relationship with the students. Observations are not used systematically to link interview data and test results. Enquiring involves interviewing participants using open-ended questions and viewing test and survey responses. Examining entails analysing transcripts and student records that are collected. Both qualitative and quantitative data collection methods may be used in action research, and in this study, both methods were employed (see Figure 3.1).

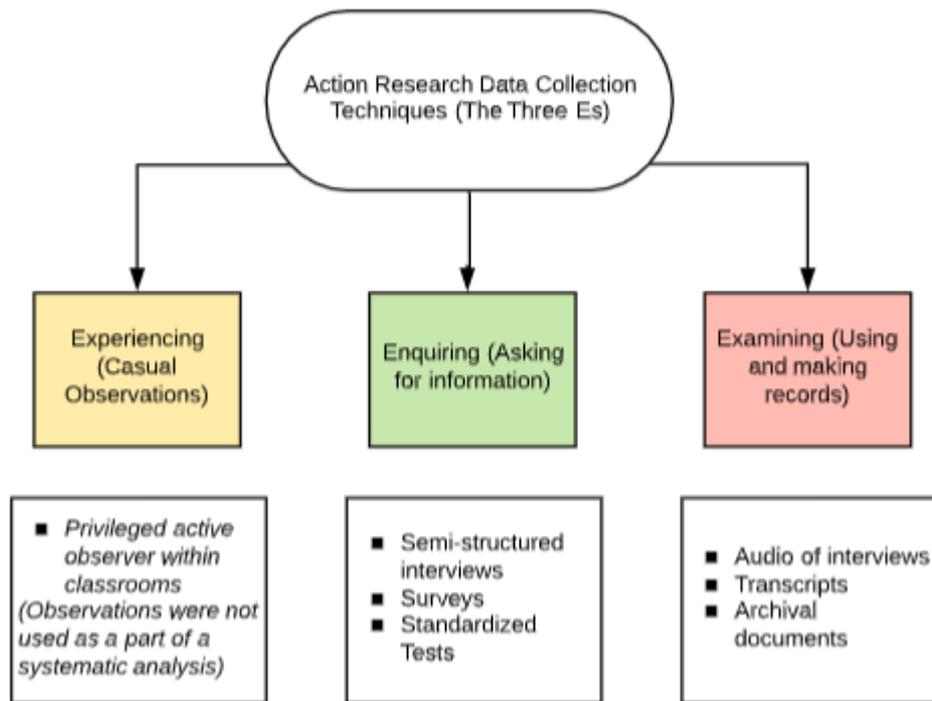


Figure 3.1. Data collection techniques for the current study

(Modified from Mills, 2011, p.89)

The key to action research is triangulating multiple sources of data to make a stronger case for what is happening (Ary, Jacobs, Razavieh, & Sorensen, 2006). Students using action research as a methodology in some academic institutions face a battle for acceptance (Herr & Anderson, 2005b). Yet, Helskog (2014) points out that Dewey (1929) himself stated that “ideas are worthless if they are not actualised in actions that restructure and reconstruct the world in which we live” (Helskog, 2014, p. 7).

For many years, teachers have been presented with research developed by academics and have been expected to adapt their practice to meet new educational fads. The relationship between teaching and research has been simple: academics do the research, and teachers get on with the teaching (Murphy & Murphy, 2018). However, action research puts the practitioners in the driving seat. The people with the ‘chalk face’ experience ask the questions that are pressing in the reality of classroom life and put in place an intervention that they test and on which they can gather data.

One common understanding is that action research takes a spiral approach. In the 1940s, Lewin (1946) described action research as a spiral of steps that take place on a cyclical basis, in which researchers: observe a practice that could be improved, plan a way to change the practice, take action to carry out the plan, and then observe and evaluate the effect of the action to reflect upon the next steps to be taken (Cohen, Manion, & Morrison, 2017; Herr & Anderson, 2005a; Kemmis & McTaggart, 1988; Lee & Wang, 2012; Lewin, 1946). The spiral process comprises ongoing improvement, development, critical thinking, and collaboration with those involved in the research setting.

Continuing the spiral metaphor, Timperley et al. (2014) developed a ‘spiral of inquiry’ model which begins with scanning what is happening, focusing on an issue and ‘developing a hunch’ (see Figure 3.2). The process then moves to a phase of professional learning before any action takes place. Timperley et al. (2014) make the point that we need to slow down and “develop a deeper understanding of what is worth spending time on before moving to hasty action” (p. 11). Action is then put into place, followed by the process of checking results before the cycle starts again. At the centre of all models of action research is an issue that creates the impetus for action to take place. The current study took place over two years, allowing data to be analysed after the first year and small changes introduced in the second cycle. These changes are explained further on in this chapter.



Figure 3.2. The Spiral of Inquiry
(Timperley, Kaser, & Halbert, 2014)

Lee and Wang (2012) assert that some quarters question the value of action research, claiming it lacks methodological rigour as it is carried out by researchers who, as practitioners, lack research training. Creswell (2012) concurs by stating that a negative aspect of action research is that it is viewed in some fields as ‘pseudo-research’. It is seen by some as an “informal process” because it is “conducted by teachers and other educators who are not formal academics” (Creswell, 2012, p. 578). Creswell also states that because it is an applied version of research, it is viewed as a “less-than-scientific approach” (Creswell, 2012, p. 579) and may lack a systematic approach. A quandary is that despite action research being used in educational settings, publication of studies that use this process is limited. Lack of publishing may be due to concern that the findings do not necessarily generalise to other population groups.

The counter-argument is that if research focuses on a particular group, the aim is to find out what works for that group. Generalisability is not the sole purpose of the investigation, as is also the case with ethnographic studies. The current study works with students and teachers in their educational setting. The beauty of action research is that it provides an authentic voice of real people working in an actual situation; in this case, the development of reading comprehension. The subjectivity of their interactions with the digital platform is embraced. Although positivists would view this as less scientific due to the lack of random allocation and a control group,

action research allows investigations into class groups as they are found. A rich, authentic picture is created that is sensitive to the input and ideas of the participants. For these reasons, action research as a methodology is useful for educators as it allows them to improve educational practice by recording and analysing data on what is currently happening, particularly problems that are being faced. The action research model also encourages change within a school through teachers reflecting on their own, and schoolwide, practices.

Practitioner researchers often want to study their contexts because they want to make a difference in their setting. Action researchers study ongoing actions that take place in an environment. This type of research is most effective when undertaken in collaboration with others who have a stake in the problem under investigation (Cohen, Manion, & Morrison, 2017; Kemmis & McTaggart, 1988).

Action research is a means whereby practitioners can investigate a ‘puzzle of practice’ in their workplace. They can execute an action and then evaluate the consequences of the action. It is a chance to identify a problem and design ways to address the issue. It is a chance for practitioners to seek practical solutions. Action research takes advantage of the professional trait of many teachers to reflect on their practice; it allows a bridge to span the divide between practice and research and puts teachers in the position of active, independent learners. The value of the action research approach is that “ideas [are] tested in the specific contexts in which they would be applied” (Henderson & Kesson, 2004, p. 33). Teacher-researchers are in the fortunate position of reflecting on their practices, analysing, and interpreting data and as a result, developing an action plan.

Participants

The participant school was a co-educational secondary school in a suburban area of New Zealand. The school was a BYOD school with a policy which strongly recommended that students brought their own devices to support their learning. The device guide suggested students use a Chromebook or a laptop, stating that a device with an 11–12-inch screen and a keyboard is preferred. The school is part of a Community Trust which enables parents to purchase digital devices on a lease-to-buy programme. This is to ensure all children in the region have access to suitable technology. At the time of this research, if a student did not have personal access to a digital device, the school had sets of Chromebooks that were loaned out on a class-

by-class basis. The *Actively Learn* platform is able to be accessed from a smartphone if another form of device is not available.

As the primary researcher, I was also a staff member at the school and part of the TLIF team which had been awarded a grant to investigate ways e-Learning tools could have an impact on personalising learning for students and could enable students' strengths and interests to be considered as part of the learning process. A purposive sampling approach was chosen for this study. For ease of management, this pragmatic approach meant the students in the classes of English teachers who were part of the TLIF inquiry were involved in the study. Convenience and pragmatism played a role in the selection of the school and the participants.

The teacher participants in Cycle One were chosen as they were all English teachers and all part of the TLIF project. All were recognised as experienced, capable and confident teachers, both in their teaching of English and their willingness to explore ways in which technology could be used to enhance learning. One participant was the head of Learning Support and provided literacy support within the school. Another had returned to secondary education after taking time out to teach Year 7 and 8 students. The researcher did not have a departmental position of responsibility. Relationships with the teacher participants were that of equals, collegially involved in an innovation project and working together to develop programmes to support their students. None of the teachers taught an 'extension' class (a streamed class for students whose grades reflected a high level of learning). All the students in the study were in either a mainstream class (mid-level academic performance); a learning support class (a group of students who required extra learning support in English basics); or a mainstream class that had a predominance of students recognised, through testing, as being students with dyslexia. Teachers were given an Information Form for Teachers (Appendix 3) about the research and a Consent Form (Appendix 4) which they signed giving written consent to be a participant. The Principal was provided with an Information Form and a Consent Form.

The first year of this study involved the three English teachers who were part of the TLIF inquiry being invited to take part in the practical action research study, with the researcher being one of the teachers. In the second cycle of the study, an extra teacher who had joined the TLIF project was added to the research (see Appendix 5). This teacher was the Assistant Head of the English Department,

overseeing junior programmes. Due to a staff change in Cycle Two, a fifth teacher, who was new to the school, joined the research investigation.

Of the classes involved, all students were offered the opportunity to be part of the research project. All students in the classes participated in the *Actively Learn* activities run by their English teacher, yet only those students who had provided written consent, and whose parents also provided consent, were involved in the interviews. Teachers distributed and collected the consent forms for their classes. Twenty-two students provided written permission to participate in Cycle One of the research; 38 students opted to be participants in Cycle Two. All teachers in the research project were experienced teachers, with between 11 and 27 years in the profession.

Cycle One included two Year 9 classes and one Year 10 class. The Year 10 class was a Learning Support class. One Year 9 class predominantly contained students with dyslexia; the other Year 9 class was a mainstream class, with students viewed as being in the middle band of learners. Cycle Two included four classes: two Year 9 mainstream classes, one Year 10 Learning Support class and one Year 10 class made up of students with dyslexia (see Table 3.1).

Table 3.1: Classes involved in this study

2017 Cycle One		2018 Cycle Two	
Year 9	Year 10	Year 9	Year 10
1x Mainstream 1x Dyslexia	1x Learning Support	2x Mainstream	1x Learning Support 1x Dyslexia

Over the two cycles of the study, 60 students permitted to be interviewed, and 149 students in total used the *Actively Learn* platform. In total, 28 boys and 32 girls across mainstream, learning support and dyslexia classes participated in interviews (see Appendix 6).

Most students were New Zealand Pākehā (European origin), with lower numbers represented by Māori, Pacific Island, or other ethnicities (see Appendix 7 for gender and ethnicity of student participants).

Actively Learn activities were integrated into the guided reading programme of each class. All the students in the participant teachers' classes took part in the *Actively Learn* activities. *Actively Learn* was the means of delivering the teaching and practice of comprehension strategies, thinking skills and a broad base of text reading relevant to each class. Access to *Actively Learn* instructions, questions, texts, and student responses was negotiated with the teachers as another data source. Classroom observation notes were made each time the observer attended a participant class, recording what both the teacher and students were doing. These observation notes included instructions given by teachers, how attentive students were, classroom noise level, and teacher-student interactions. The observation notes provided information on the beginnings of lessons as instructions were given, and as students started the reading and responding process.

The Intervention

The methodological framework for the investigation was the spiral of inquiry (Timperley, Kaser, & Halbert, 2014) as seen in Figure 3.2. The TLIF project focused on using e-Learning pedagogies to enable a puzzle or problem to be solved. After investigating several online literacy platforms, *Actively Learn* was chosen after teachers investigated the tool and found that aspects of this digital platform might be useful in the promotion of reading comprehension.

Access to the *Actively Learn* platform is through the website activelylearn.com and is also available through the Chrome Web Store as an extension to the Chrome suite of tools. Teachers made the platform available to their students using a class code or directly through creating a link on Google Classroom. Once students had joined the *Actively Learn* class, every new text assigned to their class was automatically added to their class assignments folder. The free version used for this study offered teachers the opportunity to upload three texts per month and gave unlimited access to the catalogue of texts that is part of the *Actively Learn* platform. The catalogue included the regularly updated high-interest articles. Resources that a teacher builds do not disappear at the end of a year but remain in the teacher's workspace.

Cycle One

The intention of the first cycle of the *Actively Learn* intervention was to trial an e-Learning tool to determine whether it had an impact on literacy, specifically reading comprehension. With the three Cycle One teachers being part of the TLIF project on personalising learning, the use of the *Actively Learn* tool was adapted by each teacher to meet the needs of the students in their class. The intervention took place during the middle two terms of the year (Terms 2 and 3) with each teacher using the tool once per week. During Term 3, I attended each class once a week when the *Actively Learn* tool was being used. This allowed the opportunity for observations and also allowed interviews to be undertaken during class time.

Classes did not follow a prescribed programme using identical texts. Instead, variability occurred due to the differences between students in each class. Each teacher chose articles related to either the students' interests, the topic of learning, or to current events. The teachers had the agency to select texts that were appropriate for their learners. Teachers uploaded an article from the internet by inserting a URL, or uploaded a Google Document. They could also choose from the catalogue of high-interest articles, the majority of which were non-fiction texts. Teachers selected articles congruent with the reading interests and levels of their classes. They created questions and inserted them at junctures in the reading material they felt suitable, thus resulting in chunking of the text enabling students to see only a small section of text at a time. Chunking the text and inserting questions was designed to encourage students to think while they were reading and respond to what they had read. Unlike a paper version of a reading comprehension task, students could not advance to the next chunk of text until the question had been answered; thus, they were unable to see the whole text until the end. The study began by using one article per week with the entire class, un-differentiated into reading levels but scaffolded through the insertion of questions, with the article being of interest to the class or relevant to the topic of study. The platform appeared like a social media site; however, the teacher was the site administrator, and the class site was only accessible to students in the class. Teachers gradually introduced this tool to their students, allowing students to gain confidence in using it.

Teachers ensured texts were relevant by using the three free uploads per month to target class interests, or by careful selection from the catalogue. Teachers introduced the tools available to allow students to personalise the reading experience.

Changing the text settings, the background colour, margin size, spacing between words, and changing the font style and size were ways students could adapt the platform to suit their preferences. One option available was to use dyslexic settings. Figure 3.3 shows that when ‘dyslexic settings’ was chosen, words were widely spaced, the font size was large, the Open Dyslexic style of the font was used, and a beige background was selected.

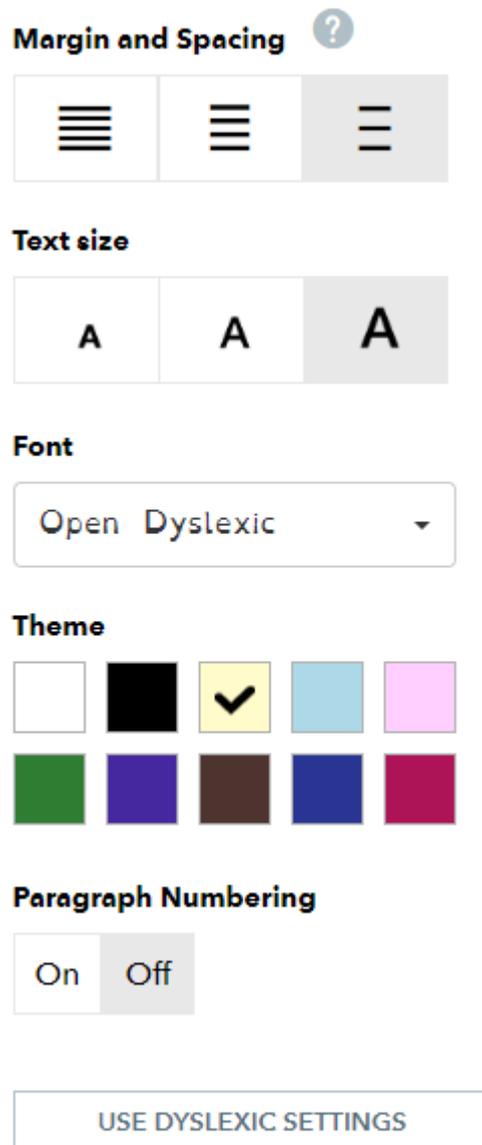


Figure 3.3. Dyslexic settings on Actively Learn

Once they had answered a question, students were able to read the answers of other students in their class. If they felt their answer was brief, or if through reading other students' responses they became clearer in their understanding of an idea, they were able to click the 'request a revision' button and modify their answer. Other

tools included being able to annotate a text, ask the teacher a question, or make a statement on a note that they could either make public to the class or private to just the teacher. Students had access to a text-to-speech tool if they chose to listen to the text while they were reading. Another tool teachers introduced was the ‘define’ tool, which allowed students to highlight a word and receive an immediate definition in student-friendly language.

Teachers were able to personalise the reading to suit the needs of their class by adding links to video clips if the further expansion of an idea was needed to provide background information about the reading. They could add notes that contained a definition or an explanation if they felt this would help students to gain a greater depth of understanding of the text they were reading.

Showing the Stretch

Towards the end of Cycle One, and as a result of professional development through the TLIF project, the study teachers added a feature to their programmes called ‘showing the stretch’ (Hipkins, 2017). Workshop facilitator, Dr Rose Hipkins, from the New Zealand Council for Educational Research (NZCER), emphasised the importance of modelling the next stage of development for students. For the *Actively Learn* team of teachers, this involved using de-identified model answers from students and discussing what steps would need to be taken to add depth to answering questions (Appendix 8). Corresponding to Vygotsky’s (1978) zone of proximal development, ‘showing the stretch’ allowed students to compare their current depth of thinking when answering questions, with the next stage of development. This use of a model allowed students to see how they could go about achieving the next step. The ipsative approach of encouraging students to go further than their past attempt is a way of fostering self-efficacy and allowing personal learning development. This approach emphasises the progress that is taking place. It also encourages students to self-assess and develop some self-reliance in being able to compare past answers to their effort in more recent responses.

Adaptations for Cycle Two

The iterative nature of action research allowed changes to be made in the second cycle of the *Actively Learn* intervention, in response to the data collected in Cycle

One. In the second phase, the three teachers from Cycle One continued using the intervention tool, and one extra teacher joined the project. As a result of interviews in Cycle One, it was discovered that students were not fully aware of many reading comprehension strategies, despite this having been a focus in each class. Explicit teaching of strategies and using them as a purpose for reading was encouraged. Posters were given to each teacher identifying six reading comprehension strategies: visualising, predicting, summarising, questioning, clarifying, and making connections (Appendix 9). Teachers were asked to focus on one or two reading comprehension strategies in each lesson.

The ‘showing the stretch’ strategy developed during Cycle One, whereby students were shown how to expand on their answers with greater detail and depth, was continued in Cycle Two. Added to this was a focus on encouraging students to provide and justify their thinking.

An under-utilised tool in Cycle One was the ‘make a note’ tool where students could write a note, with their thoughts about an aspect of the text, and share it with the class. Other students could then add a comment to the note, creating a discussion thread of ideas. When briefly used during Cycle One, it was found that students who participated in the discussion threads by using the ‘make a note’ tool also showed a depth of thinking and detail in their written answers. One way of encouraging further use of this tool was asking students to take their best answer, copy and paste it onto a note and then respond to at least one other student’s note in an educationally valuable way. Teachers were given a simplified version of Uzuner’s (2007) educationally valuable talk chart (see Appendix 10) and asked to share this with their students. Starter sentences were provided as a prompt to encourage students to engage in interaction with their peers and to focus on what Mercer (1994) called ‘exploratory talk’ rather than simply agreeing with a statement or purposely challenging an idea without any attempt to justify the argument. This was intended to encourage connectivity and interaction between students through having a constructive dialogue that could lead to improved understanding (Uzuner, 2007). Appendix 1, referred to in the previous chapter, provides the complete version of Uzuner’s online conversations and educationally valuable talk indicators.

A final modification between Cycle One and Cycle Two was based on one class where the teacher had provided choices of texts for her students. Students from that class, interviewed at the end of Cycle One, responded positively to having a

selection of texts to read. Although providing choices of texts required greater organisation for the teacher, this was encouraged as an area to attempt to develop, particularly in providing students with options that might link to their strengths and interests.

Unforeseen Complications in Cycle Two

A complication in the second cycle of this research project was that the study school made a schoolwide change whereby all subject areas for Year 9 and 10 classes took place three times a week. As a result, English classes were reduced from four lessons a week of 60 minutes each, to three 60-minute classes per week. Thus, a 25% reduction in contact time for English classes ensued. As a result, two of the teachers felt that with the reduced time available, they could not commit to using the *Actively Learn* platform weekly as had happened the previous year. Instead, during Term 2, two classes used *Actively Learn* weekly, and two classes used *Actively Learn* fortnightly. During Term 3, all classes used *Actively Learn* weekly.

A further complication in the second cycle was a change of staff. One teacher was offered a different role in the school, which meant her timetable did not include the English class involved in the study. The new teacher, however, was enthusiastic for the class to continue being part of the project. This involved one-to-one professional development to allow the new teacher to understand the tool and the way it was being used. The new teacher wanted to make some adaptations and include group work alongside the use of *Actively Learn*. For fidelity of immediate feedback to students, further training was provided as to how this study was using the tool. It took several weeks into the third term to get this one class operating with similar procedures to the other study classes.

Two teachers used the catalogue for almost all their reading activities. Using the catalogue meant questions were already inserted into each article, yet teachers had the facility to adapt any questions they wanted to change. Sometimes the answer might be a poll or a multiple-choice answer that required the students to make a selection. The other two teachers chose texts that were either connected to a topic of study or were suggested by students as topics they found. Despite the differences, the teachers' instructions at the start of each reading activity were used to help students focus on the text and create a purpose for the reading activity.

Methods of Data Collection

An important feature of action research is that the more sources of information used, and the more the evidence corroborates, it increases the ability for a problem to be understood (Creswell, 2012) and adds to the results' confirmability. This technique of 'triangulation', using multiple sources of data, "can compensate for imperfections, increase confidence in results, and raise important questions for follow up" (Fleming, 2000, p. 35). Voice-recorded interviews were conducted only with students who had signed consent to participate. The principal granted permission to use documentary evidence in a de-identified form, including historic PATC data and classwide de-identified surveys relevant to the TLIF project. Through the use of surveys, interviews, and test data, this study was able to garner different perspectives from different individuals, thus enabling a bigger picture to emerge. Using a variety of data sources allowed the results to be compared and for dominant themes to emerge.

Surveys

Two survey instruments were used in this research. Each was emailed to the school email accounts of students in the research classes, as a link to a Google Form. The first survey, 'Finding out about Year 9 & 10 students' reading behaviours' was presented to students before starting using the *Actively Learn* platform. The purpose of this survey was to glean information about students' reading habits. The survey questioned whether students read out of school time and if so, the type of reading that took place. It asked about digital versus paper versions of reading and the preference students held. The survey also asked about family members seen reading and ways of accessing information if they wanted to find out something at home (Appendix 11). The survey contained eight multiple-choice questions, with answers where students could tick all that applied. There was one question that provided space for a short answer.

The second survey took place in October, five months after the first survey. This survey was emailed to students as a link to a Google Form. The survey asked about the *Actively Learn* platform. The purpose of the survey was to find out students' responses to using the digital platform *Actively Learn*. Students were asked about their confidence in reading comprehension before using *Actively Learn*. They were also asked if any aspects of *Actively Learn* were useful, or difficult, or unhelpful. They were further questioned regarding tools on *Actively Learn* they had

used, and the topics of reading they most preferred. Finally, students were asked if they used any reading comprehension strategies and what helped them with their thinking when reading (Appendix 12). This survey contained five multiple-choice questions and six short answer questions.

Testing Materials and Procedures

The Progressive Achievement Test of Reading Comprehension (PATC) (Darr, McDowell, Ferral, Twist, & Watson, 2008) was carried out at the beginning and end of each year for all students in the Year 9 and 10 cohorts. It was used as a diagnostic test. The beginning of the year and end of year tests were administered by all English teachers in the school, as standard diagnostic, and summative assessments. All English teachers conducted these tests for their classes, following instructions given as to how to carry out the test. The PATC was undertaken in February and October of each year. PAT reading comprehension tests are available for students from Year 4 (Test 1); thus, the students in Year 9 in this study sat Test 6, and students in Year 10 sat Test 7. Each test is a booklet of texts of varying topics, genres, lengths, and difficulty.

Appendix 13 explains that each test booklet used in this study had eight texts, including narrative, explanation, poetry, recount, report, and persuasive text. There are 42 multiple-choice questions in each booklet which include three types of question: retrieval, local inference, and global inference. Retrieval (R) questions require no inference and can be retrieved directly from the text. Local inference (LI) questions require comprehension from implied information in specific sections of the text. Global inference (GI) questions require an understanding of implied information from larger parts of the text (Darr, McDowell, Ferral, Twist, & Watson, 2008). Appendix 13 further provides a break-down of the structure of the PATC by giving the age level each text is aimed at according to the noun readability count. It also makes clear that the lengths of each text vary, through listing the word count of each text. Between four and six questions are asked for each text. The range of question types associated with each text is listed, including global inference, local inference, and retrieval questions. However, not all question types are used for each text.

The reliability coefficient calculated by the ACER Quest software package is 0.91 for Test 6 and 0.90 for Test 7 (Darr, McDowell, Ferral, Twist, & Watson, 2008).

Therefore, it can be expected that 90 per cent of the variance in scale scores is due to real differences between students' reading comprehension achievement.

The Electronic Assessment Tool for Teaching and Learning (e-asTTle) (Auckland UniServices, 2007-2009) test of Reading Comprehension was administered to the research classes by the participant teachers. Teachers were provided with login information and passwords for all their students. The e-asTTle test was conducted in May and November. As this intervention was part of the classroom programme, all students in the classes took part in the activities and the testing as part of the regular learning programme. Tests were administered during morning classes as is school policy.

The e-asTTle Reading Comprehension test is generated from a bank of texts and enables teachers to devise a test according to their area of focus. It is an online test and is free to all New Zealand schools. The test created for this study addressed Levels 3, 4 and 5 of the New Zealand Curriculum with some questions at Level 3, many at Level 4 and few at Level 5. Figure 3.4 explains that levels three to five of the New Zealand Curriculum span the school years of Year 6 to Year 10, thus a variety of text levels were used within this test.

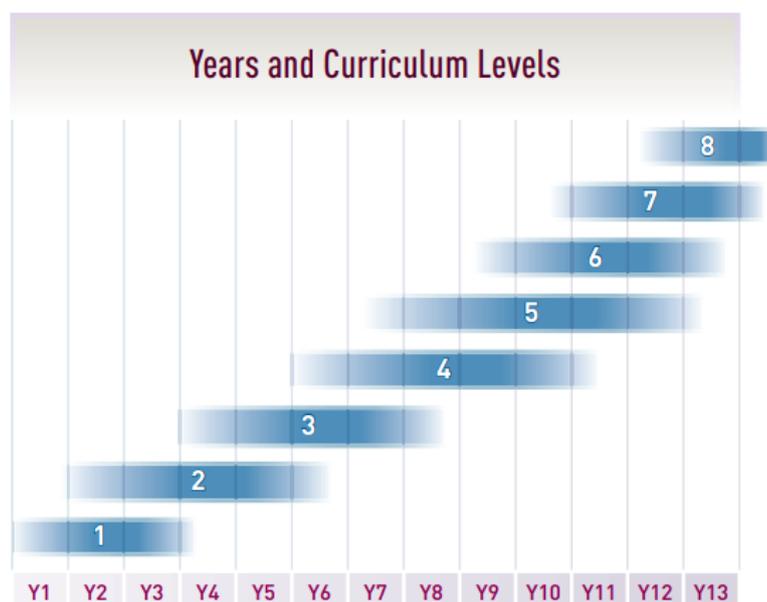


Figure 3.4. New Zealand school years and curriculum levels

The e-asTTle test differentiates the curriculum levels into three further sub-levels, depending on text reading difficulty: Basic, indicating that text is simple enough for students who require significant support in reading skills and knowledge

at this level; Proficient, meaning that the text is appropriate for students with competent skills and knowledge at this instructional level; and Advanced, indicating a student has independent reading skills and knowledge at a particular curriculum level (Meagher-Lundberg & Brown, 2002).

Year 9 and 10 students can be expected to be working at high Level 4, and Level 5 of the New Zealand Curriculum. The test focused on three strands: Processes and Strategies, Purposes and Audiences, and Ideas as these strands directly connect to aspects of reading comprehension. The post-test was created by selecting the reading comprehension test devised at the start of the year and then selecting “Create Similar Test”. Teachers can choose whether the test questions are open (written answers) or closed (multi-choice). Both tests selected ‘3’ on a scale of 1-4, with 1 being some closed questions and 4 being most closed questions. Slight differences occurred in the second test with regards to levels, and no text from Test 1 was repeated in Test 2. The tests generated a level score that connects to the New Zealand Curriculum. Numerical results identified students’ overall score, deep and surface feature scores, and scores for processes and strategies, purposes, and ideas.

Interviews with Students

Interviews with students were recorded using an MP3 Panasonic voice recorder. Interviews with students took place during class time, briefly interrupting their use of the *Actively Learn* tool when they were being interviewed. Most interviews took place in a quiet corner of the classroom; some interviews took place in an adjacent available classroom. The interviews used a semi-structured approach, broadly following an interview protocol. Through using a less formal approach, the interviewer was able to “modify the sequence of questions” (Cohen, Manion, & Morrison, 2017, p. 351) by changing the wording and clarifying or explaining the question further if needed. As a result, the order of questions was not strictly adhered to if an answer led to a different direction. The interviews used an open-ended questioning technique, thus putting no restrictions on the students’ responses. A benefit of this approach is to capture each student’s unique ideas and allow for individuality (Cohen, Manion, & Morrison, 2017). The interviewer used either probe or prompt comments to help students expand further on an issue they may have raised and to encourage a greater depth of answers. Probes also allowed for

elucidation if the interviewer did not fully understand what students were meaning (Appendix 14).

Transcripts of the interviews were typed and coded using opening coding, axial coding, and selective coding. Interviews with students were between 8 and 12 minutes long. In contrast with the teacher interviews, interviews with the students were short. One factor that may have influenced the length and depth of the student interviews could have been that the interviewer was a teacher in the school, and thus in a position of power. Although the interviewer, through friendly banter at the start of the interview, tried to make students feel assured that their honest opinions were sought, there may have been a sense of nervousness, even though they had agreed to be part of the study. This limited vocality for some students, may have been for several reasons: 1) teenagers feeling discomfort at giving their views to a teacher; 2) teenagers being direct and to-the-point when giving an opinion; 3) a desire to get back to what they were working on; 4) teenagers not being overly talkative in a formal situation.

All students in the classes were offered the chance to have their voice heard. However, many chose not to be involved in interviews and in adherence with the ethical consideration that participants cannot be coerced into being involved, there was no manipulation or cajoling to increase the number of participants. In total, 22 students agreed to be interviewed in Cycle One, and 38 students agreed to be interviewed in Cycle Two. The purpose of student interviews was to learn from the students' perspective as to how they felt about the digital tool, what they found useful and conversely what was not particularly useful. Using 'in vivo' quotes from students was an important part of this research to glean an insight into their reactions to this type of learning, and find out if they felt it made any difference to their engagement in learning and their reading ability.

A disadvantage of this approach, according to Cohen et al. (2017), is that when the wording of a question is altered, it becomes a different question. Thus, despite the systematic approach, students were not all asked the same questions in the same order with the same depth, and this could result in different responses and some gaps in the data. Another disadvantage is that interviews can be prone to subjectivity and bias on the part of the interviewer (Cohen, Manion, & Morrison, 2017).

However, an advantage of the semi-structured interview process over the survey was that it gave a chance for students to expand on their thinking. The open-ended questioning approach enabled students to provide clarifications of what they thought and to be specific as to their perspective on the tool. Interviews offer more in-depth insight than a multi-choice questionnaire through allowing freedom for participants to answer without constraints. Students were made aware that there were no wrong answers and that their honest opinions were sought.

Interviews with Teachers

At the end of each cycle, teachers were interviewed about the process (Appendix 15), with each interview recorded using an MP3 Panasonic voice recorder. They were asked for their evaluation on the practical aspects of using the tool, their opinion on students' reactions, and if the use of the platform involved extra work compared with what they might typically do in preparation for a lesson. Each interview was in a private place and voice recorded to capture teachers' answers accurately. All questions were open-ended, and probes were used to request expansion of ideas. The teachers were more willing to be expansive on their thinking than the students. This could have been because of being a colleague of the researcher and feeling comfortable with the questioning process. It may also have been because of a sense of self-efficacy and confidence in their role as teachers.

Teachers may have shown a bias for the use of the digital platform because of the positive relationships built as being part of the TLIF project and the good working relationships that had developed through working together as part of the English department. However, teachers were asked to be honest, and their professional opinion was sought, including negative as well as positive findings. Interview transcripts were later typed and coded. Interviews with teachers were between 20 and 30 minutes long. The purpose of the interviews was to investigate the experiences of the teachers. This included understanding whether the platform was intuitive to use or if there were complications in its use. They were also asked what they did to prepare a lesson using *Actively Learn* and what they noticed about student behaviour and interaction when using the tool. The use of interviews as a method of gathering data was to explore both the teachers and students' reflections on the *Actively Learn* platform.

Data Analysis

Coding Strategies for Interviews: Open, Axial and Selective Coding

Interviews were saved onto a laptop and uploaded as audio files to the qualitative data analysis software NVivo 12 (QSR International, 2018). Interviews were transcribed directly onto this software using the editing tool. The ability to change the playback speed to 70%, increase the volume of the recording and pause the audio when needed assisted this process. These features, along with the clarity of the sound on the voice recorder, made the process of transcription smooth, enabled the recordings to be transcribed verbatim, and ensured the accuracy of the transcription. The transcriptions were created by the researcher between November and February of each year of the project. This allowed the first sweep through the data to get a sense of the opinions of the participants. Some initial coding was done while creating the transcriptions. Due to the huge volume of text produced by the transcripts, the NVivo 12 software provided a frame to enable the data to be organised, sorted and interpreted.

Open coding began with developing labels to represent emerging information from the data. Anchor codes in the NVivo 12 software were added initially through their connections to the research questions. This allowed students and teachers' relevant statements to be put under their respective anchor codes (Adu, 2015). It was an opportunity to capture the important information in each transcript and collect the reoccurring responses. Data were revisited several times to get a sense of the voices in the interviews and help understand recurring ideas that were emerging. Further sub-categories of codes were added from participant comments, creating new chunks of data. An example of the open coding process can be found in Appendix 16.

As the axial coding stage was entered, patterns and relationships were found between the data and interpretations were made (Adu, 2015; Saldana, 2013). The NVivo 12 software allowed for movement, additions, and deletions of codes. Codes were redefined and merged or split into different categories. As this was an iterative process, revisiting the interviews and evaluating the existing codes was required to ensure relevant information had been captured from all the interviews. When every new interview was contained within this framework, it was concluded that data had reached 'saturation' (Saldana, 2013, p. 222), and there was no further information that would emerge.

In the final stage of coding, selective coding, emergent themes became apparent as the core variables became identified. As a result of this inductive process, the data were revisited, exploring how the interview data worked together to capture what emerged from the participants' perspectives. Inferences were made and conclusions were drawn that led to the development of the emergent themes. The data needed to speak for itself and through connecting the core categories with related categories, a narrative emerged, thus leading to an explanation of the phenomenon that occurred (Saldana, 2013). The use of NVivo 12 allowed the nodes to be pulled together, under the parent labels, which represented the emergent themes. Using the Memo function of NVivo 12, notes were made as to why data were relevant. The themes were developed based on associated content. Frequency of data occurrence at the axial coding stage, and finding a commonality amongst categories of codes, led to the selective codes being chosen. Appendix 17 provides an example of the coding process being refined from open coding to axial coding, leading to the creation of a selective code.

Surveys and Test Results

As this was a qualitative study, there were no randomised treatment or control groups through which to make statistical inferences. The study was not set up for statistical analysis due to the lack of consistency between the study group and the cohort in general. The graphs included in Chapter Four are included because they relate to the standardised testing used during this study. They show differences in percentage scale score development over one-year periods. The students' results in pre-tests and post-tests in the PATC and e-asTTle tests were compared to determine any difference in outcomes. Survey results were analysed to reveal frequency of responses for each component of the survey and these are presented as percentages in Chapter Four.

Ethical Considerations

Ethical approval for this project was gained from the Curtin University Human Research Ethics Office. The project met the requirements of the National Health and Medical Research Council's *National Statement on Ethical Conduct in Human Research* (2007). The research was regarded as low risk, however, throughout the

research project, steps were taken to ensure that the research met the high standard of ethics expected by the Australian Code for the Responsible Conduct of Research.

Because action research is open-ended and long-term, it was essential that the researcher, who was in a position of power through being a teacher, was not coercive or leading when eliciting responses from students. Ethical consideration was addressed through clearly stating to students and parents, both verbally and on the written consent form, that participation in the data collection was optional. Ethics procedures were strictly adhered to, and despite all students in the participant classes using the platform as part of the classroom programme, there was no coercion of students to be participants in the interview aspect of the study. The researcher gave all students and their parents an Information Form for Parents (Appendix 18), an Information Form for Students (Appendix 19) and a Consent Form (Appendix 20), through email and in hard copy.

Although all students' test results were recorded as cohort data for the school, only students whose consent forms were received were interviewed as part of this research and their responses to text questions used in this study. Names were anonymised to protect student and teacher' confidentiality. The name of the school and the district also remained confidential.

Bias was addressed by asking neutral questions and requesting participants to expand on their answers. It was made clear to all interviewees that it was their own opinion that was sought, and that the researcher was interested in their viewpoints. Any intervention needs to be in the best interests of the students in the class. The "do no harm" (Lichtman, 2009) ethical consideration was especially important in this project when working with students as part of classroom programmes. The beneficence of treatment of all the participants was at the core of the investigation. The study offered the use of a digital activity that the teachers in the TLIF project chose after careful consideration; it was not intended to provide a regressive outcome. The value of the study was in appraising the efficacy of the digital tool, particularly on engagement, reading comprehension progress and sense of self-efficacy within students.

Trustworthiness of the Research

As this research was part of the constructivist paradigm, the authenticity, or trustworthiness, needs to be justified through the criteria of credibility, transferability, dependability and confirmability (Guba & Lincoln, 1994). Because this was ‘backyard’ research (Glesne & Peshkin, 1992), taking place in the researcher’s workplace, it was important that the reporting of data was not biased or incomplete.

Credibility

The research took place over two years, and for each year, two school terms were devoted to using the digital platform. During the final term in each cycle of the intervention, participants were interviewed, and I attended the classes weekly. This prolonged engagement in the field added to the credibility of this naturalistic inquiry (Cohen, Manion, & Morrison, 2017) and enabled trust and rapport to be established with the participants.

Member checking allows interviewees the chance to add extra information or correct any errors of fact (Guba & Lincoln, 1994), ensuring that the interviewer has gleaned an accurate summary of the ideas the interviewee provided. In this study, interview transcripts were returned to each teacher participant. This enabled teachers to validate that what they had intended to convey was reflected. It was a chance for teachers to make changes or additions or confirm that the interview was an accurate reflection of the teacher participant's lived experience.

To alleviate a potential response bias effect (Butin, 2010), questions were simple, direct, open-ended, and leading questions were avoided (Cohen, Manion, & Morrison, 2017). Probe comments were added to secure further information. It was made clear that a ‘correct’ answer was not sought; instead, a personal insight about how students and teachers felt when using this tool, both positive and negative, was requested. The Hawthorne effect (Ary, Jacobs, Razavieh, & Sorensen, 2006) was mitigated by the interviewer attending classes regularly before interviews started, and being merely another teacher in the school. Through becoming a weekly attendee of the classes, it was intended to normalise the presence of an extra person. Therefore, the behaviour of the class would not change by the appearance of an observer.

Transferability

As this was an interpretive study, it did not seek generalisability (Guba & Lincoln, 1994). Due to the variability of the participant group, how the study was carried out, and the professional input available in other settings means that there is little likelihood this study would directly generalise to another population group. However, relevance and applicability are what is sought (Guba & Lincoln, 1994), and because of the detailed description, the replicability of the study is possible. Readers can experience what took place and decide to what extent the findings transfer to their setting (Guba & Lincoln, 1994). By providing clear, 'thick description' (Geertz, 1973) of the actions that took place, readers can make judgements as to whether this study could apply to their school setting and replicate the process within their context.

Dependability

Dependability refers to the stability of the data over time (Guba & Lincoln, 1994). In a positivist study, the unforeseen changes from Cycle One to Cycle Two would have had an impact on the reliability of results. The fact that this was a qualitative study, dealing with a real situation in which reflexivity of the methodology was expected, these changes have not been threats to the dependability of the results. Instead, they have revealed the authenticity of what can happen in educational situations, which are dynamic social settings.

Confirmability

To add to the confirmability of the process, the researcher carried out a peer audit of the methodology. Two participant teachers were asked to independently review the method to confirm the accuracy of the process as it had been reported. This allowed the auditor teachers to add any part of the process they felt may have been missed. Peer examination was involved through discussions of findings with colleagues and provided a chance to reflect on the outcomes of the study. Notes were kept in the form of a research journal and memos to record questions and concerns about the process.

Triangulation of data from various sources was used as a strategy to corroborate findings and add to the study's confirmability. Sources of data included

surveys, standardised tests, and interview responses. Interview data can be tracked to its source using anonymous coding of responses. Table 3.2 clarifies that each research question was connected to either two or three forms of evidence to help build a broad picture of the *Actively Learn* tool's impact from different perspectives. The use of two or three independent measures to address each question's issue enabled a more comprehensive account of the findings to be built than would be possible through the use of each source in isolation.

Table 3.2: Data sources used to address research questions

Research Question	Data Source 1	Data Source 2	Data Source 3
1) What characteristics of <i>Actively Learn</i> , if any, meet the reading comprehension learning needs of Year 9 and 10 students?	End of year student survey	Student participant interview responses	Teacher participant interview responses
2) In what ways, if any, can using <i>Actively Learn</i> focus on the development of reading comprehension strategies of Year 9 and 10 students?	Teacher participant interview responses	End of year student survey	
3) To what extent does <i>Actively Learn</i> have an impact on the reading engagement of Year 9 and 10 students?	End of year student survey	Student participant interview responses	
4) To what extent, if any, does <i>Actively Learn</i> improve the reading comprehension of Year 9 and 10 students?	Student participant interviews	Teacher participant interview	PAT results e-asTTle results

To aid in the trustworthiness of the research, negative or contradictory findings were not ignored. Negative case analysis was included in the results with negative responses not being excluded from the data. The different methods of data collection, and diverse perspectives of individuals, were used to enable a broad base of findings. If similar findings are found from a variety of sources, this builds confidence in the results (Pattison, 1999).

Summary

The current study investigated the use of a digital platform, *Actively Learn*, to find out its impact on Year 9 and 10 students' reading comprehension skills. The study used a qualitative constructivist design to address the research questions. However, some quantitative data were collected in the form of reading comprehension test results and survey results. The action research design enabled the research to take place over two years using a cyclic framework. Teachers used the digital platform to expose students to the reading of texts; however, supports and scaffolds were available for students in the form of tools within the platform. The intervention was designed to take place weekly during Terms 2 and 3 of the two years of the study, however, in the second year of the study a change to the schoolwide timetable meant that some teachers used the platform fortnightly for one term and weekly for the next. Data were gathered in the form of surveys, interviews, documents, and test results.

The next chapter will present the key findings of the study, structured according to the emergent themes. The findings are presented in three sections. They reveal the results of the qualitative responses from student interviews, the interview responses of teachers, and finally, the quantitative data in the form of surveys and test results.

Chapter 4 – Results

Chapter Overview

The previous chapter presented the methodology for this research and addressed how the data were gathered and analysed. It clarified that this qualitative action research inquiry aimed to investigate Year 9 and 10 student responses to the digital platform *Actively Learn*. The focus was on teachers using the digital platform in an action research study to interpret the impact that using this digital tool has on the reading comprehension of students in the early years of high school.

In the current chapter, I will present the principal findings of the research investigation. Qualitative data, generated from semi-structured interviews with 60 students and five teachers over two years, are presented to show the impact of the digital platform *Actively Learn* in supporting students' reading comprehension and engagement in reading. Responses were voice-recorded, transcribed, and coded using the NVivo qualitative data analysis tool. This chapter presents the findings of this study as they reflect the emergent themes. The qualitative results are presented alongside each of the themes, with student and teacher data being presented separately. This chapter uses the experience of the participants as reported during interviews to reveal their reactions to, and interpretations of, using the *Actively Learn* digital platform. This research aimed to develop an understanding and comment on the existing theory about reading and how to improve reading comprehension for teenagers. An interpretive approach was chosen when analysing the qualitative data to help build an understanding of ways digital technology can be used in the teaching of reading comprehension. Using a variety of data sources provides a depth to the narrative and allows the voices of the participants to be heard. Data sources included interviews, survey results and test results which will be dealt with separately within this chapter. The data presented seek to clarify students' responses to using a digital tool to support their reading and teachers' experiences of using this tool.

Although this is a qualitative action research study, in keeping with the spirit of flexibility that action research provides, quantitative data from school testing on reading comprehension have been included as part of the summary of results. The chapter ends with the presentation of the quantitative data as applicable to the research questions.

Emergent Themes

The results from the collected data are discussed in terms of three emergent themes that arose from interviews with students and teachers through intensive coding of the interview data. As explained in depth in the previous chapter, open codes were initially created that aligned with the research questions. As coding continued, more codes were created. Relationships amongst the codes were found, and codes were merged and reorganised to represent best the big picture of what the participants were saying. Three themes emerged and became the selective codes that described the core findings. However, each theme has further descriptive aspects that will be explained. Participants' comments provide empirical evidence that supports each theme. The themes that emerged through the interpretation of the findings are that:

- 1) learners require agency and autonomy when using available tools to self-help through the reading process;
- 2) making positive connections with classmates or beyond the class is a support system for developing thinking;
- 3) teachers perform a critical role in scaffolding the challenge to guide the process of reading for depth.

Figure 4.1 clarifies the connection between the research questions and the emergent themes. These themes will be explored using 'in vivo' quotes from participants in the semi-structured interviews to provide the lived experience of students and teachers and to hear their voices. To protect the anonymity of participants, and yet have data that is traceable to its source, students have been identified by the letter 'S' and a number. Teachers have been identified by the letter 'T' and a number. The aim was to glean insight from students and teachers' experiences.

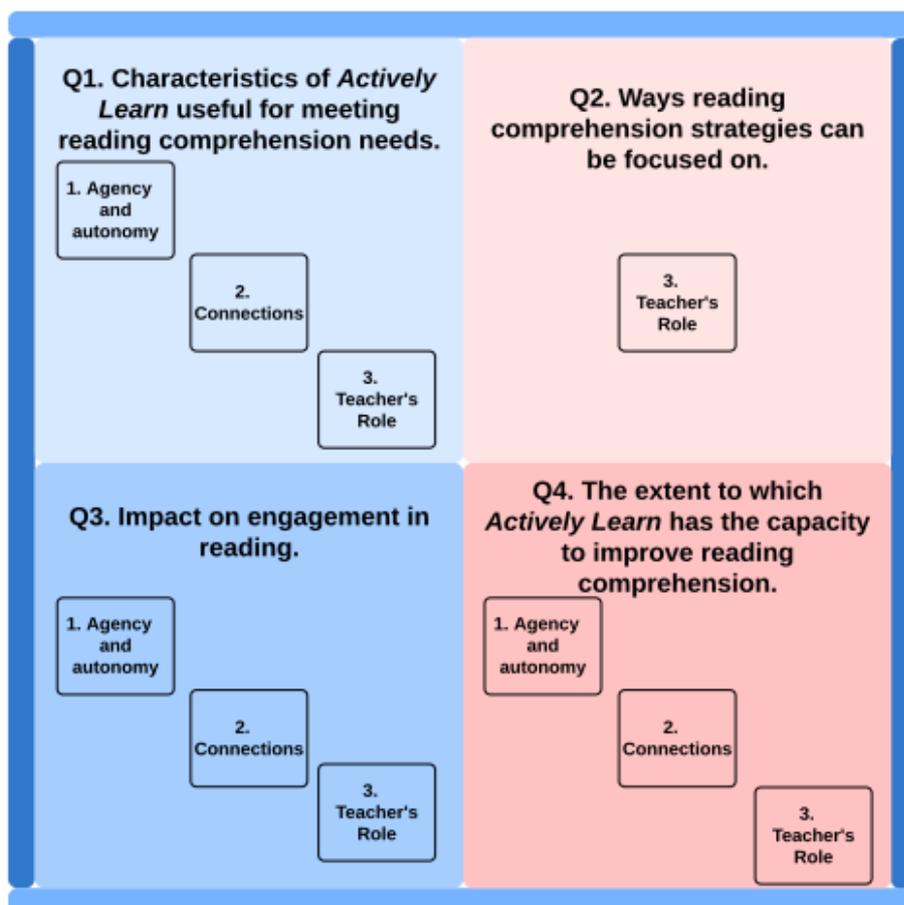


Figure 4.1. Questions addressed and associated emergent themes

Part One: Qualitative Data Student Responses

The following section reviews the data generated from individual student participant responses to open-ended interview questions. Participant students, from whom written informed consent had been provided by themselves and their caregivers, were interviewed at the end of each intervention cycle. Student interviews were approximately ten minutes long. Data in this section seek to portray the responses of this group of students and explore some of the issues that arise when using a digital platform to support reading comprehension development. Data are presented in sections according to the themes that emerged from the coding of interview responses. Examples of student responses to questions and discussion threads on the *Actively Learn* platform are included illustratively to reveal to the reader the appearance of the platform.

Learner Agency and Autonomy

Learner agency and autonomy, as terms applied to this study, mean the capacity to independently make choices (Manyukhina & Wyse, 2019) and the freedom to integrate their independent thinking and own some decision-making (Deci & Ryan, 2000) during an aspect of the learning process. Agency and autonomy for students are described in terms of four main sub-sections: independence in using the available tools, vocabulary support, aural scaffolding, and developing critical thinking through personalised responses. Through interviews with students about their perceptions of their understanding of what they read, it became apparent that the development of learner agency is supported through having autonomy when using available tools to ‘self-help’ through the reading process. Students enjoyed having a sense of choice when reading. In some cases this meant being able to choose which text they read; it also meant the opportunity to select a tool to support the reading process or to personally react to what they were reading with their own opinions and thinking. Answering questions as the text was presented to them gave immediate meaning to what they were reading. They had to think, react, and respond in the moment of reading, and many students felt this aspect of *Actively Learn* helped them develop their understanding of a text. Being required to give an opinion and explain it was something many students liked when using the platform.

Independence in Personalising the Use of Available Tools to Support Reading. Although students were taught how to use the tools available, it was their choice as to whether a tool was used, or how often it was used. Some teachers encouraged the use of support tools more often than others. For example, two teachers regularly asked the students to make a note and share it with the class. Therefore, students’ use of the *Actively Learn* support tools was influenced by what their teacher had taught about the use of the tools.

Agency and autonomy were supported through students’ choice of whether to use tools to support their reading and which ones individuals found most useful. Some students made limited use of the support systems, while others engaged with several of the available tools. From the empirical interview data, it emerged that some supports were chosen more frequently by students in this study to personalise the reading experience. Students reacted with firm views as to aspects they liked or disliked, and these were different for each student. Students commented that there

were ways of getting help when they found something challenging. The choice remained with the students as to which tools they used. From week to week, they could change how they used the support tools and personalise the reading experience to suit their needs at that time. Figure 4.2 reveals that of the 60 students who were interviewed during the two-year study, many reported using the tools available.

Defining a word was used by 80% of the students and 68% of students reported using the note tool. Use of the note tool did not necessarily mean they engaged in a discussion thread; some used the note tool at the prompting of the teacher with only 45% of students participating in a discussion thread. The use of the notes tool was dependant on promotion by the teachers and was used in some classes more than others. In one class, the note tool was rarely used due to not being introduced or focused on by the teacher. The text-to-speech tool was used by 46% ($n = 28$) of the student participants who were interviewed for this study, however, of that 46%, only 11 students (18% of the total) stated they used text-to-speech all the time. Many chose to use the tool selectively, either when tired or to hear the pronunciation of a word.

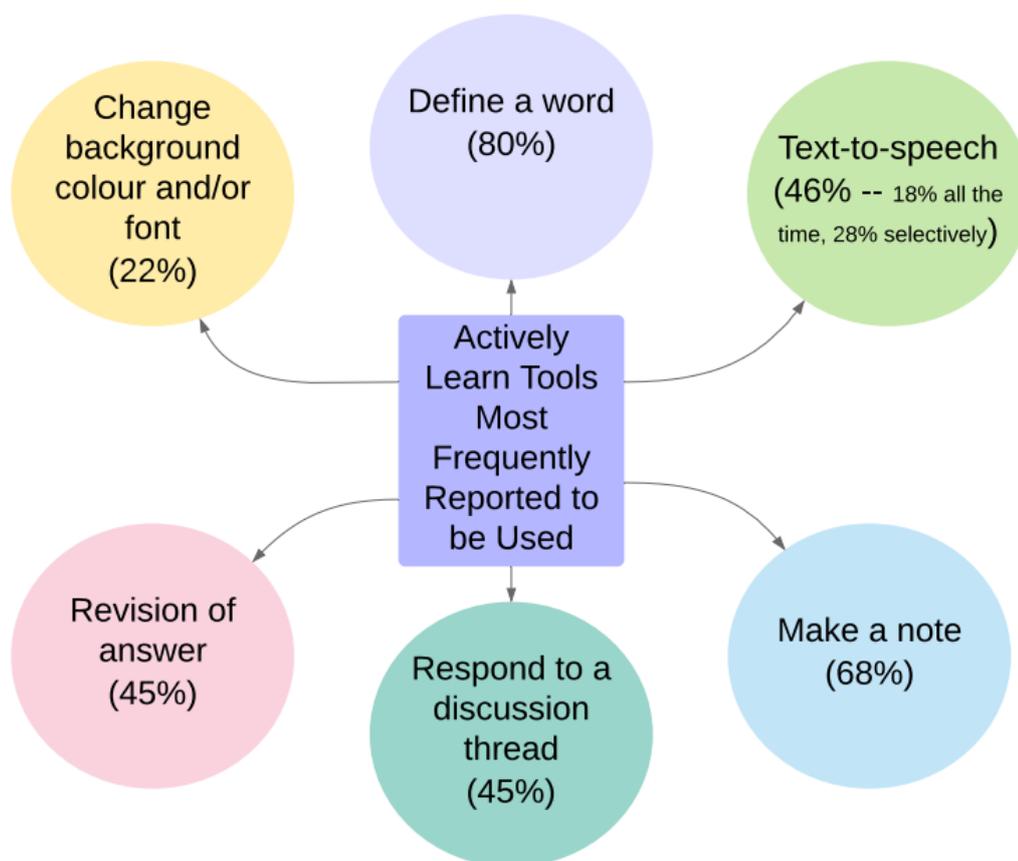


Figure 4.2. *Actively Learn* tools frequently used by the research group

Vocabulary Support. In the participant interviews, 61% of students made specific reference to the area of reading they found most challenging: encountering ‘new words’, ‘big words’, ‘hard words’, ‘words I hadn’t come across before’, was a difficulty, particularly if a text had many hard words in one paragraph. Many students found this the highest area of frustration when required to read in their school subjects. According to 16% of participants, encountering difficult words when reading in different curriculum areas had an impact on their understanding of texts. Although this was not a question explicitly asked, four students volunteered that when reading a text on paper, they would skip over an unknown word. The definition tool in *Actively Learn* allowed 80% of students to solve their lack of understanding of a word immediately in the moment of reading. For some, this involved right-clicking, highlighting, and simply reading the definition; for others, this involved also having the word spoken to them to hear how the word sounded.

I use the define tool for big, hard words cos sometimes I don't know what they mean. (S16)

If I don't know what the word is, I'll listen and define it. (S35)

Some of the words are confusing and hard to say and I don't know what they mean. (S11)

I like reading but not when there's words I don't understand. (S59)

Being able to define words in the moment of reading using *Actively Learn* was the most frequently used tool as it helped students have a better understanding when reading. Being able to solve the problem at the time of reading gave some in the study group more control over the reading outcome.

The define tool is useful cos you can figure out what the word is if you don't know what it means. I would have just left it out (in the past). (S23)

Knowing what the word means is important to understand what you are reading. Some words are hard to understand but I can define it. I right-click and I define it. Knowing what the word means and how it sounds and how it goes with the text. (S27)

I found it easier than reading a book and going, Oh, I missed that word cos I don't know what it means. (S24)

When I came across a word and could see the definition then and there I thought, "Oh, that makes a lot more sense now." It puts a sentence together if you know what a word means rather than just having a random word and thinking, I don't know what that means. (S14)

However, one student, a member of the Year 10 Learning Support class, stated that he always listened to the text and followed the words with his eyes, but did not look up the definition of a word if he did not know it.

I don't use the definition one. If there's a word I don't know I just leave it. (S57)

Although support tools are available within the *Actively Learn* platform, an agentic approach is required to make use of the supports available.

Aural Scaffolding. Almost half of the students in the study (46%) stated that they had used the listening tool at some stage. However, for 28% of students, using the text-to-speech tool was a selective and irregular occurrence, rather than listening to a text in its entirety. Most students in the dyslexia classes in this study stated they used the listening tool. Almost all students in the Learning Support class used the listening tool. Of the whole study group, 18% of students stated they used the text-to-speech tool every time they read a text on the *Actively Learn* platform. Reasons stated for using the tool selectively included hearing how to pronounce a word or if feeling ‘tired’, ‘bored’ or ‘zoned out’, text-to-speech kept them focused. Further comments included that if reading ‘becomes a little hard’ and they were not in the mood for reading, listening helped keep them involved.

It highlights each word as it reads to me so I can focus. If I lose track, I can look at the highlighting. (S43)

I use the listening tool when reading becomes a little hard and I'm not in the mood to read, so I listen to it and follow it with my eyes. It helps me cos sometimes I just read the same passage over and over again cos you get stuck somewhere so if I hear it, it forces me to listen to what I'm reading. (S18)

I'm not dyslexic, I just like to hear it. I was such a fast reader when I was young. I used to read it all and not remember anything. I've slowed down. When people read to me online, it forces me to slow down. (S12)

While most students, when using the text-to-speech tool, followed the synchronised words on the screen, two students stated that they just listened to it and did not follow the words with their eyes. In this sense, the listening tool may have been used as an escape from reading, to compensate for the difficulty these students had with decoding.

It's easier than actually reading. It reads it to you. (S43)

It's hard reading it but with the voice thing where you highlight the words and listen, it makes everything a lot easier ... I should be following it with my eyes, but I can't cos I just lose focus ... When I listen, it's easier to understand everything. It's a lot easier having the option to be able to listen to it. (S49)

While some participants found the listening tool to be helpful, in contrast, 25% of the study students categorically stated that they preferred to read for themselves and did not make use of the listening tool. Three students explained that they did not like the listening tool because it “sounded like a robot”. Others said they did not feel they needed to use it because they knew how to read or had better focus when reading themselves.

Critical Thinking Through Personalised Responses. The ownership of answering questions and providing input from their thinking onto a class forum gave the students a sense of personal responsibility in making sure they understood what they were reading. By answering questions after each segment of text, students stated that they had to think about each section while reading to be able to respond to a question. Their thinking may have been about the meaning of the text, but they could also be required to react with a personal response or transfer their thinking to the analysis of a situation beyond the text (Freebody & Luke, 1990). Thinking and engaging with the ideas within a text leads to a depth of analysis that might not occur in a situation where a student could get away with either ‘fake reading’ (Tovani, 2000) or passive listening to the opinions of other students. When discussing the types of questions that were inserted into chunks of texts, 57% of students stated they liked questions where they could use their thinking.

I like the ones that make me think about what I've read because there's no point reading if I don't know what I've read. (S01)

I like the questions where it says summarise what you just read because it gets my brain to actually think and do something. (S08)

I think about it and I make sure it makes sense and relates to the question. I make sure it answers the question. I make sure I use my thinking. (S46)

I like the more depth (questions). That get me to think. That get a picture in my head. The ones I say what I think, not the ones where you have to go back and find something. (S10)

It's sort of just revising your brain to make sure that it knows what it's just read so you can kind of process the information a little better, so you know what you're reading about. (S39)

Of the students who stated they liked the ‘thinking’ questions, 32% of that group clarified this further by stating they preferred questions where they could put forward an opinion. Students felt it was useful to connect the story to their own life and express what they were thinking after reading a segment of text. They thought it was a chance to ‘put their thoughts out there’ which required more depth of thinking and was a chance to find a part of the text to which they could ‘relate’.

I like the questions where the answer is relating to my life, rather than just finding something in the text. It's good to be able to respond how you feel. You add depth by expanding on what you already wrote. You go deeper into it. Adding more details. (S14)

I like expressing my opinion and it's good to write it down and think about what you think. (S28)

I don't like the (questions) that give you four choices because if you don't like those choices, that's too bad, that's what you're stuck with. I prefer to just type what I feel. (S36)

It helped me also opening up about how I felt about the story. (S03)

The interspersed questions had an impact on comprehension for the students by making them take control of their thinking. Continuing with the theme of learner agency and autonomy, students reported that they had to think and show their thinking; they had to own their contributions. Many students made mention that as a result, they were doing more thinking. Having to address questions within a text before they could move on, students could not ‘pretend’ to be reading; they were obliged to react and think about the text at the time they were reading it.

It's quite helpful cos I have to really read the text and understand it to answer the questions. (S46)

Sometimes I didn't know how to understand (what I read) so I used to skim through it most of the time. Now I actually read it, and I make sure I understand it. Because of the questions. (S05)

It's helping me understand more of what I am reading. So, I'm not just reading something, I'm understanding it. (S30)

When I'm reading a book or an article on paper, I zone out and look at the words, and I think I'm reading it, but I'm not. The questions (in Actively Learn) stop me zoning out when I'm reading. (S02)

The fact that we have to answer questions after each section forces us to do some thinking. It gets you thinking about what you've been reading because you have to answer the questions after it. (S17)

Students also responded as to the depth they put into answering the questions. Some varied their depth of answers according to whether they liked a text. Students reported that if they enjoyed the topic the text was about, they were more likely to try to show their thinking in an answer and write more. If the topic was not to their liking, responses were more likely to be brief. Figure 4.3 provides evidence of some answers and ways in which students inserted their reactions into a response.

It depends on the story. Like the Fortnite one, I wasn't really into that, so I got my answers done short and sweet and moved onto the next one. But if I like the story, like the cell phone one and the self-control one, ... I want to get what I think onto there, so I take my time on some of them. (S36)

When I first started *Actively Learn*, I feel I was just writing a few words, and now I'm actually writing a paragraph. (S08)

QUESTION 3 NO STANDARD

What are the main ideas in the section above and what is your reaction to these ideas?

The big main ideas are that teachers allowing students to access their mobile devices for "learning" are having a lot of pressure put on them because they don't know if the student is accessing social media instead of the school work, or playing games and not following the task the teacher has given them. Another big idea is that technology has reached a speed that is very difficult to catch up with making it even harder for the teachers trying to help their students do work by letting them access their mobile phones. I think that for these reasons phones should be banned during class and students can use spare or backup Chromebooks instead.

Zero

Incomplete

Basic

Proficient

Advanced

ALLOW REVISION

the main ideas are Technology is Changing to fast for some People to keep up with it, teachers are struggling to find new ways to help kids learn, as some Classes use kahoot which allows us Students to us our phones. another main idea was Teacher may think Students are using there phones for work but they could be using them to go on social media

Zero

Incomplete

Basic

Proficient

Advanced

ALLOW REVISION

After watching the clip and reading about what parkour is, why do you think people do this sport?

I think they do it the same reasons gymnasts do it, both sports are sort of the same they flip off things and on things, they must love the feeling of compleating a new trick they have been working on for ages and I wonder if they feel like they are a ninja sometimes.

Zero

Incomplete

Basic

Proficient

Advanced

ALLOW REVISION

I think people do this sport for the excitement and rush of doing it as well as making people's jaws drop but it can be a useful thing to know as well for example if someone wants to hurt you, you could climb a building or jump off one to get away from someone.

Zero

Incomplete

Basic

Proficient

Advanced

ALLOW REVISION

Figure 4.3. Examples of students' answers

And yet not all students liked answering questions that involved them responding with their thinking. A student who struggled with reading said he preferred questions that allowed him to go back and find an answer in the text. He did not like questions that required him to summarise information in his own words or have an opinion.

Changing Visual and Layout Aspects of Texts. A final aspect of autonomy and personalisation that was not frequently used, but is worth noting, was the ability to change the visual elements of the texts. Twenty-two per cent of students commented on the facility of the tool to change the ‘look’ of the text. Some of these students wanted to change the way the text looked for ease of reading, whereas others made changes solely for personal preference. The modifications involved changing the font, or the size of the font, changing the background colour and changing the spacing settings. The ‘dyslexic settings’ made it easier for some due to having the text more widely spaced out, while others made visual changes to make the text visually appealing and easier to read.

I changed it to the dyslexic font because I find this one easier to read. (S38)

It's easier for me to see on black, so I change the colour of the background, and the writing is white. The black on white is sometimes difficult for me to read, so I switch it around because white is much easier for me to read. (S18)

An interesting feature that had not been expected was that 12% of students in the study group changed the background colour to blue. A variety of reasons were cited for this change: one person changed to blue for ‘psychological reasons’, and others stated it made them feel calm or made it easier to see. One student noted that it was easier for her to read on a blue background due to issues with her eyes.

Making Positive Connections to Support Understanding

Another theme that emerged from the interview data was associated with the capacity of *Actively Learn* to improve understanding of reading, through making

connections. This involved not only connecting with classmates and the teacher, but also the ability to connect beyond the class at the time of reading.

Make a Note or Add to a Discussion Thread. A characteristic that 68% of students found useful in helping with their reading comprehension was the use of the note-making tool. Students could right-click, highlight text, and ‘take a note’. Through making this note public, others in the class could see it and join in as part of a discussion thread. This provided an opportunity for students to interact with each other’s comments, discuss ideas that arose from the text, and see another point of view. The note-making tool also allowed for an annotation to be made. However, it was not used in this capacity as frequently as the discussion threads. Examples of discussion threads are shown in Figures 4.4 and 4.5.

It's a good idea (writing and sharing notes) because we interact with other students in the class. We hear their ideas. We don't argue, but we debate with them. I usually say, "I see your side of the story, but this is my opinion." (S08)

Notes are cool to have other people's opinions about what you're writing and if they agree or change it a little bit. It causes everyone to have their own say. It's cool. (S18)

XXXXXXXXXX

I think that in a survival situation you NEED a good mental attitude to survive in a life-threatening situation because some people have been lost but they have all these skills that they learned and all these tools they have with them and still die but some people have been in a life-threatening situation with no skills no tools and manage to survive, it's because they had good mental attitude to surviving and probably had a good motivation to keep that fight for life going.

My Thoughts

XXXXXXXXXXXXXXXXXX

That is a very good point
 XXX You do Need very good self esteem and a good mental attitude to keep on fighting for your life

XXXXXXXXXXXX

I agree its vital to have a good mental state because without it you could very easily die according to the text we just read. But wouldn't it be useful to have all those tools and why is having a good mental state better then having all those tools?

XXXXXXXXXXXX

Some people always have these tools with them but they don't have a very good state of mind so they will just die in a survival situation.

I always wonder what is going through their mind when they jump from buildings. Are they excited or scared, are they nervous to fall or are they not even thinking about hurting themselves or falling. I never have really understood that.

XXXXXXXXXXXXXXXXXXXX

I think people who do parkour probably get very excited, they should have a go pro or something so we can see what its like from the person flipping point of view

XXXXXXXXXXXXXXXXXXXX

I feel the same way but I am scared to watch you when you do flips on the ground and you don't seem to have any fear in doing that or getting a bad injury you might be good at parkour seeing as you can already do flips on the ground!

XXXXXXXXXXXXXXXXXXXX

they probably in their head "nothing will happen im superman" then jump off a building

Figure 4.4. Discussion threads that discussed articles about 'survival' and 'parkour'

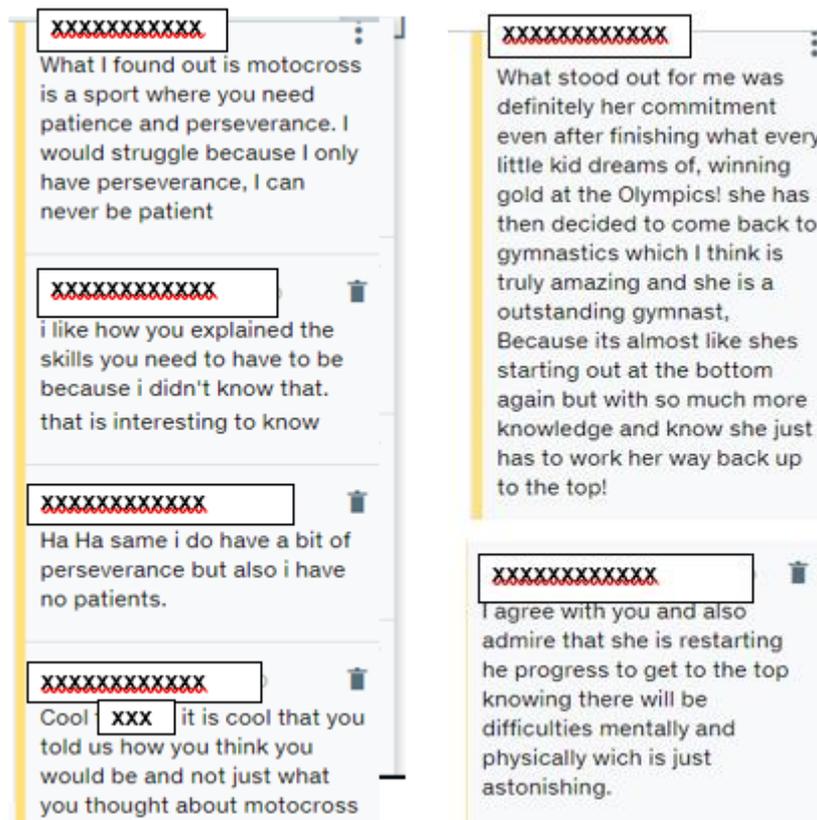


Figure 4.5. Discussion threads about 'motocross' and a 'gymnast'

Supporting this idea of connecting and interacting, Freebody and Luke (1990) remind us that if we view literacy as a social activity undertaken with others, rather than a solitary accomplishment, then encouraging students to interact is more representative of the communication skills required for everyday life. One student commented that he felt encouraged and positive when someone responded to a note he had made.

You get a good feeling if someone replies to your note and they give you a good response. (S35)

There were, however, some negative characteristics of the digital platform pointed out. Five students did not like other people seeing their answers and did not like public notes for the same reason. For students who were fearful about other people seeing their thinking, having other students able to read their work created a sense of pressure.

I do private notes cos I don't like people seeing my answers. I'm happy for the teacher to see but not other students. (S49)

It makes me double-check to make sure my spelling is 100% since the whole class can see it. It puts pressure on me to make sure everything is perfect. (S54)

This finding was important, despite only being reported by five students. The concept of a positive class climate and culture is essential for students' feelings of wellbeing. This idea will be further addressed below in the section that includes the teachers' responses.

Checking Other Students' Answers. The responses of other students are immediately accessible once a student has completed their answer. Forty-seven per cent of students commented that they checked the answers of some other students when they had completed their response. Reasons for doing this included that they got to see what someone else was thinking, they were exposed to a different perspective, and it helped to see other ways people may have interpreted the text. Another useful aspect reported was that being able to see other students' answers added a depth of understanding to their reading; it helped them understand ideas and see if they were 'on the right track'. Connecting beyond themselves to a support system, through seeing other students' answers when reading a text, was a useful means of building the understanding of ideas for almost half of the study group.

I read others' answers sometimes. It's pretty good cos then I know what they're thinking as well as what I'm thinking. I might read through a couple of them and then go on to the next part of the text. (S07)

It lets me see where other people are coming from. You get to see what other points of view people have. (S38)

This helps me if I don't get it so I can see how others get it and how they understand it. (S22)

I've looked at others' answers to help me understand and to think about it. It helps me think of other aspects of the article. (S37)

I find (checking other people's answers) quite good cos you can see if your answer is similar and if it's quite a good answer or not. And then you can see what other points of view people have. It's pretty useful. You can know more about it by seeing what other people have written. (S17)

In contrast to these opinions, however, one student stated her concern when she discovered that other people in the class would be able to see the answers she had written. At the beginning of using this platform, she felt that not knowing the others in the class well made her worried that others might judge her answers.

At the beginning, I didn't enjoy (others seeing my answers) because it was like sharing my work with other people and they could see, but I sort of like it now. I've never been keen on sharing my answers with anyone, it's like my work, and only the teacher can see it. I suppose I just got used to the people in the class and feel more comfortable with them. It was new people at the beginning, and it was like whoa, ok. I now like that you get help because you can see other people's opinions on it. It's just helpful because if you can see other people's opinions, you take in a different perspective. (S06)

Having the facility to check in on what other students were writing was a support mechanism for many students. It allowed them to privately check whether they understood the text by comparing their ideas with those of others. It also helped them expand their understanding by processing the ideas in the text through the words of a peer.

Making a Revision. Another characteristic commented upon by 45% of students was the chance to be able to revise their answer to a question. Revision entailed them clicking a 'revision request' button and teachers would receive a notification that a revision was requested. The teacher would then press 'allow revision' and the student could re-do or add to an answer. Making a revision meant students were not stuck with their first answer but could adjust their response if they felt it needed expansion. Sometimes this was as a result of seeing other students' answers, and they realised they had grasped an idea incorrectly; other times it was as a result of thinking of something else to say and wanting to add depth; at other times it was at the suggestion of the teacher. Teachers were the connection part of this process as it required a teacher to respond to the revision request before a student could make changes. The following excerpts from interviews elucidate that revising an answer was undertaken for a variety of reasons including adding detail, making a correction, or answering the question more directly.

I make a revision if I think I need to add more detail. (S42)

If it's kind of short and a bit off-topic I ask for a revision. I looked back and re-read the question, and I thought I don't like my answer, so I wanted to re-word it. (S55)

If I ended up stuffing up my answer or wanted to add more. If I thought of something more that I didn't think of before. (S58)

If you write something wrong, and then you think of something else, you think "Oh, I can write that again." (S10)

Having the facility to revise an answer meant the reading was treated as a learning experience and not a testing experience. The use of the revision tool added to the sense of personal agency whereby students were able to make changes. With 45% of students in the study group making use of this tool, it is clear that reading for understanding is an evolving process. Allowing students to connect with others, think about their response, and make changes if they chose to was useful to many students.

The Critical Role of Teachers in Guiding the Process

The final theme that emerged from the data was that despite using a digital tool, input and involvement from the teachers was an essential part of the process. From tailoring the texts through providing choices that engaged their classes, to creating appropriate chunks and interspersing these with questions, to interacting with students at the time they were working, teacher input was pivotal. There was a sense of accountability, knowing the teacher was checking the work straight away and that the teacher was able to respond to a revision request almost immediately. This emergent theme supports the findings of Fisher, Frey and Hattie (2016) that the teacher's role of creating clear learning opportunities, having clear expectations of their students, and following up with timely feedback and support is crucial for building effective learning environments.

Feedback From Teachers in the Moment of Reading. Teachers provided grade responses in the form of Basic, Proficient or Advanced, to students' answers, and made comments when appropriate. Students received a notification alert

() that allowed them to know that the teacher had responded. Students privately saw the teacher's responses to their answers; this information was not available to others in the class. Thirty-seven per cent of students made comments about the teacher being logged into the reading and having input at the time they

were reading the text and answering questions. Of the 37% of students who commented on the teacher being immediately involved in the reading activity, the majority felt positive about getting a response from the teacher while they were working. All except four of the students reacted positively, with those four all stating that they did not check any notifications from the teacher. Almost half of the positive respondents stated that they looked at the alert immediately. In contrast, the others stated they did not check it until the end of the question they were working on, or when they had finished the reading activity.

It makes me feel good like I'm actually starting to improve. When we first used this, I was only getting Basics, but now I've gone up and getting Advanced and Proficient. (S55)

It's good cos it's telling me I can see how I've done in the question I've answered. It catches my eye. If it's still there it distracts me, cos it's a bright red thing. (S01)

If you don't look at it straight away, it's always got that number beside the notification so you can always click back there and see if you have anything left to do. (S35)

It's pretty interesting cos I see what the teacher thinks of what I wrote straight away. (S10)

If it's good, I feel a bit better and feel accomplished. If it's Basic, I feel I could have done better. (S19)

I feel pretty good getting notifications. I feel happy if she gave me an Advanced grade. (S52)

Chunking and Questioning. The chunking of texts and inserting questions further reflected the theme of the critical role of teachers in guiding the process and supporting the reading development. How texts were presented in *Actively Learn* was commented upon by 67% of the students in the study. A long passage of text was broken into smaller chunks by the teacher through the insertion of questions at varying points. The junctures for the questions were decided by the teachers, as were the questions themselves. Students could not see the entire text and could not move on to the next section until they answered a question. Even if a teacher used a text from the catalogue, most teachers in the study stated they adapted the questions and would not simply use a text in its raw form. For 55% of the student participants, having the text presented in segments was a preferred way of attacking a text.

It's like a video; I have to pause. I put it on pause. I've still got it processing in my head. I have to pause to answer the question. (S52)

It's good cos it stops when you need to answer a question. It's good cos your eyes can get a rest; you get a break. (S58)

It splits up what you have read so you can think about it before you have to read more. (S17)

Of the students who commented on the chunking of texts, 25% stated that the chunking process used by *Actively Learn* helped them 'concentrate' and 'focus' and 'actually think' while reading. Being able to see one part of the text at a time, and focus on that part only, was seen by many as a positive aspect that kept them reading. A theme from this sub-group of students was that they got to think about the text 'there and then', while in the moment of reading. Because of the inserted questions, students said they had to 'really read all the text' and 'make sure they understood it' because they had to answer a question before moving on. A further comment was that if they needed to re-read a section to aid their understanding, it helped their thinking and was easier to go back and check what they had read when focusing on a part at a time.

It makes us do more thinking. I find it easier because they've sectioned it off, so you have to focus on a certain paragraph and not everything else. It lets you direct your focus more onto that paragraph. (S08)

It helps you understand what you're reading when it's cut into sections with the questions at each section. That helps us while we're reading. (S30)

An interesting comment from one student was that it was not merely the access to reading in a digital format that helped her engage, but the answering of questions as she was reading. She found that reading in a digital format was just as 'boring' as reading from paper, except when you were asked about it as you read.

I'm fine with reading, but I don't like a lot of words. It just bores me. *Actively Learn* doesn't bore me. For some reason, I find it entertaining. Social Studies is entertaining, but when you're reading off a computer all these things, it's kind of boring when you're not really asked about it. You are asked about it, but not as you read. The

questions (in *Actively Learn*) kind of help you process it better. If you're not asked about it, it's just like a thing that's stuck in your brain. You just forget about it. (S 52)

Another challenge of reading for 35% of the students who commented about the chunking of texts was the difficulty of facing lengthy documents. Reading for a long time, or being given a long text to read, held no interest for some of the students in this study. Breaking a document into smaller parts made the reading experience less overwhelming. Comments included that reading of chunked sections helped them process the text better by focusing on a small segment at a time.

I feel like you don't look down and go "oh my gosh I've got so many more questions" and you want to rush everything. You just see one question at a time, and it just slows you down to focus more. I think it's really handy and you don't get flustered like when you see you've got eight other questions to do. You just do one question at a time. You go down gradually. It's more achievable. (S28)

I like the chunks. It doesn't overload it with questions. It gives you that part; you can't just keep going. So, you have to answer that question while the knowledge is still sitting there in your head. Instead of going down, reading a whole bunch more, then it just gets pushed to the side, and you forget about it, and then you have to re-read it. But it stops you, so you have to think right there and then which is good. You're forced to answer a question before you go on, and that's a good feature. (S36)

For teachers to incorporate questions into a reading comprehension text using a paper-based format would require a lot of preparation through physical cutting and pasting of questions into documents. Texts would then need to be photocopied and distributed to students. It would not have the benefit of students only being able to see one part of the text at a time. It would also lack the benefit of students being able to reflect on the answers of other students across the class. Digital media has affordances not able to be facilitated in a paper format.

In the two years of using the intervention, over two cycles with seven classes, five participant students, all from the Learning Support class, stated in their interviews that they did not like the interruption of the questions and preferred to read the whole text at once and answer questions at the end. Reasons given were that

questions made them nervous, that answering questions was hard, or that they did not like the interruption of the questions, especially if they could not think of an answer. They wanted to be able to “have questions at the bottom and go back up and find the answer”. Two further students stated that sometimes they liked the chunks, but at other times they felt that it “stopped the pathway of thinking”. The majority of students preferred to do their thinking during the reading, rather than waiting until the end and scrolling back through a text to think about answers.

Teaching Reading Strategies. Another essential involvement of the teachers was the teaching of reading comprehension strategies. Fifty-three per cent of students made mention of using at least one reading comprehension strategy when using *Actively Learn*, with some of the students using multiple strategies. From the results, it was clear that there was a greater focus on comprehension strategies during Cycle Two with 45% of the comments about strategy-use coming from the Cycle Two interviews. Some participants stated that they had been taught about a reading strategy in class and used that when reading. Others used a personal form of strategy to help themselves through the reading process. A digital tool supports what the teacher is teaching and does not take the place of a good teacher. As such, for students to be competent in their use of reading strategies, strategies need to be taught, modelled, and used as part of the programme. While 8% of the students interviewed struggled to think of any strategy that they used to help them when reading, particularly at the end of Cycle One, other students were able to identify ways in which they worked to ensure they understood the text. Thirty per cent of the students spoke about the use of visualising as a means of helping themselves understand what they were reading.

I kinda like the ‘visualise’ type of questions that we are doing now because whenever I read something, I always get a picture in my head. (S20)

When I’m reading texts, I usually try to visualise something that’s happened in my life so I can relate to the text and know what it means. (S25)

I ask myself questions about what’s coming up next. Sometimes I question what it’s saying, what I’m reading, to help me figure it out. (S01)

Summarising ideas in a text was useful for 22% of the students. Several respondents referred to summarising a passage as helping them organise their thoughts and was a way of being sure they understood the content.

Sometimes the teacher will ask us to summarise. I like those questions. I like putting everything into a simpler form. I just try and understand and summarise the key points. (S18)

I take the ideas from the text and put them in my own words. It helps my reading to understand, and to answer in my own words and also summarise in my own words. (S50)

Clarifying their thinking, self-monitoring, or re-reading to check their understanding were strategies mentioned by 30% of the students. Students identified these strategies as making them think and connect to the texts in a conscious way. Monitoring their understanding was discussed as a strategy used by some which involved having self-control over their reading, by clarifying their understanding if meaning became lost. Some also spoke about making connections to their own lives added to their understanding of a text.

It's teaching you to stop yourself if you don't understand something. Monitoring your own reading and making sure you're understanding. Text-to-self is a good one because we make connections between our own experiences and the text. Relating it to yourself, you can remember it and process it because it's like you know something about it. (S28)

The teaching and modelling of comprehension strategies is the role of the teacher. *Actively Learn* provided an opportunity for students to practise using comprehension strategies in a format in which they could get immediate feedback from the teacher. It also enabled students to view the work of their peers as a new form of modelling of strategy use.

Part Two: Qualitative Data Teacher Responses

The following section reviews the responses of the five teacher participants, as they connect to the emergent themes. The three themes explored in the previous section on student responses will also be explored as they relate to the teachers' responses. The three themes explained in the last section were:

- 1) Agency and autonomy of the learners using the available tools to self-help through the reading process.
- 2) Making positive connections with classmates or beyond the class as a support system for developing thinking.
- 3) The critical role of teachers in scaffolding the challenge to guide the process of reading for depth.

Teachers were interviewed at the end of each cycle of this action research project in a quiet room in the participant school. Each interview was approximately 30 minutes long. The study included five teachers over two years. Three of the teachers were interviewed twice as they participated in both cycles of the project. The data in this section seek to portray the responses of this group of teachers and explore, from a teacher's perspective, some of the issues that arise when using a digital platform to support reading comprehension. Data are presented in sections according to the themes that emerged from the coding of interview data. In continuing with the format of the previous section, identities of the teachers have been anonymised using the letter (T) and a number, thus enabling the data to be traceable to its source while retaining anonymity.

Learner Agency and Autonomy

Teachers felt it was part of their job to create the conditions that supported the development of students' agency. This theme involved ways in which teachers could assist learners to develop a means of helping themselves through teaching them some tools to help solve issues that arose while reading. Teaching students the capabilities of the platform and encouraging students to use the tools as enablers to support their reading was the role of the teacher. The theme also relates to students enjoying having aspects of choice and personal input, and this section provides ways in which teachers could support the development of this sense of autonomy. The *Actively Learn* platform involved the text being presented to students in chunks and the

teachers inserting questions that addressed content in each piece of text. Students could not move on until an answer had been given, at which point, all other students' responses became visible. The tools, explained in depth in the Methodology chapter, included: a text-to-speech tool; the ability to highlight a word and have it defined; the ability to change the visual layout of a text through font size, word spacing, and background colour; the option to revise an answer; the option of adding a note and adding a discussion thread to someone else's note. Ways that teachers helped students were to scaffold the challenge and to focus on providing texts that suited the strengths and interests of their class members. It was up to the discretion of teachers to choose which texts the class were able to access. Teachers were required to exercise their professional judgement as to the suitability of a topic, ensuring that the ability level matched the students in the class. A wide range of ability levels meant that teachers had to select texts to meet the variety of needs carefully. Teachers also commented that having support tools in the platform that allowed all students to have access to texts was a way of supporting an agentic approach in their students.

Scaffolding the Challenge to Create the Conditions that Support Student Agency. One way of combatting struggling students' tendency to avoid reading is creating the conditions by which teachers can help support students develop their sense of agency and autonomy. Where students have been avoiders of reading or engaging with text, some teachers found that *Actively Learn* gave students the support systems by which they could keep up with the class and participate without feeling overwhelmed or not as 'smart' as others. By providing students with a more extensive repertoire of texts, and by putting in place scaffolds to support their reading, such as chunking the text into segments and having assistive technology available, teachers encouraged students to be more resilient readers. Using a digital platform whereby support tools were easily accessed on the screen in front of them, students could seek support in the moment of reading. The immediacy of the support was seen as a positive element by all the teacher participants who felt the assistive tools enabled students to manipulate their access to text in a way that suited everyone.

I like the fact that they don't have to go anywhere else, they don't even have to go to another page, they can just highlight the word

and click on 'define'. And the fact that they could listen to the text, that definitely helped a lot of students. (T05)

The fact that teachers chunked each text into shorter segments interspersed by questions was thought to be a positive aspect. Teachers felt this made texts accessible to all students by allowing students to think about a short piece of writing at a time and respond to what they had just read. This linked to the emergent theme of autonomy and agency, whereby students could work at their own pace and yet still be interacting as part of the class. They were able to put forward a viewpoint and were also able to support their learning by using the definition, layout and listening tools that made the reading more accessible to them.

You're making it high interest. Everyone's doing it together, and it's chunked. I think that's better. The best thing about the programme is that the questions are embedded, and they're tailored. (T03)

Although correct spelling was not a focus in this investigation, one teacher observed that a student felt a sense of achievement when he discovered another platform worked together with *Actively Learn* and helped him feel more successful.

One boy discovered that *Actively Learn* supports Grammarly and then said, "That's the first time I spelt everything right because of Grammarly." Support tools of word definition, text to speech, even Grammarly, make the text accessible for some students who might be locked out of what the class is doing because they lack some of the basic skills. (T01)

Another aspect of *Actively Learn* having support systems that helped students if the reading was potentially difficult meant that teachers did not have to 'protect' students from difficult texts (Schoenbach et al., 2012). Instead of using compensatory practices to make the text easier for students, such as reading a text aloud or turning a text into a series of bullet points to make it easier for students to process (Schoenbach et al., 2012), *Actively Learn* allows students to choose their supports. One teacher claimed that her struggling readers were able to participate and feel a part of the class.

They get carried along with the rest of the class; they are participating and not missing out. It's been a good way of keeping the reading mileage up. (T03)

By using the assistive technology tools, students could interact with texts that might be more complex than they would attack alone. With the texts being chunked into smaller segments, students were able to practise using the reciprocal teaching strategies as well as using the thinking skills of analysis and making judgements.

Engagement. Engagement in reading is included in the OECD definition of reading literacy with engagement being clarified as the motivation to read, with readers exhibiting interest, enjoyment, a sense of control and involvement in the social elements of reading (OECD, 2017). In the current study, engagement was measured through teachers anecdotal judgements of students, with factors including focus and attention to the task, interest, and optimism to participate and show persistence (Great Schools Partnership, 2016). It has been found that a supportive reading context is essential for promoting reading motivation and thus leading to engagement in reading (Ng & Graham, 2017). Keywords such as enjoyment, focus, like, and their opposites such as boredom, zoning-out, and dislike helped teachers evaluate the engagement of students in their classes. It was apparent from comments made by participant teachers that engagement had an impact on students' sense of agency and autonomy. Responses from teachers indicated that they felt students were more focused on reading when using a digital platform and that students worked in a focused way. One teacher found her students showed more persistence and concentration and were willing to read for longer when the text was presented in smaller chunks. Another teacher stated that the students exhibited a concentrated focus.

There's no way I would have had engagement like that even if I'd given them something really interesting on a piece of paper, not at all. To be able to work at your own pace, I reckon they did way more than they would have done had it been on a book or a piece of paper. (T02)

I found it was a very quiet, focused environment. If they talked to each other, it was in quiet tones and about their answers. The students seem to really like it. I even found some students who were

absent from class would jump on in, and either have done the Actively Learn activity before we got to it or be doing it from home. (T01)

During Cycle Two of the research study, *Actively Learn* introduced a ‘High Interest’ section of articles. Teachers found that this section had topical articles that were unusual, current, and included interesting events from around the world. One teacher mentioned this meant she had useful articles to draw from as a backup when she had used her three free uploads for the month.

Teachers expressed varying reasons for this engagement. One reason was the use of high-interest articles that had relevant topics for teenagers. Another engaging factor was the ability for students to use the tools and set their own pace, which provided an opportunity for everyone, regardless of ability, to participate as part of the class. A further possible engagement factor suggested, was that it was believed that using a digital platform is a familiar learning context for 21st-century students rather than seen as an innovation; through being user-friendly, it was easy for students to interact. Finally, the way the texts were presented in smaller segments with students unable to see the entire article at once, captured students who felt overwhelmed when faced with lengthy texts. All these reasons were suggested as contributors to students’ motivation to read using the *Actively Learn* platform.

Learning Dispositions. Patterns of thinking and behaviour influence learning. Several participant teachers made comments that for students to be successful in reading, and also in using *Actively Learn*, there needs to be a disposition towards having personal agency, an ability for students to have some power over their learning consciously. Teachers noted thinking dispositions such as curiosity, and being open-minded (Ritchhart & Perkins, 2008) and behavioural dispositions such as having persistence and managing self as a foundation for learning to take place. Results from student interviews indicated that 22% of the study group found reading “boring” or were “not a fan of reading” or simply stated that they did not like reading. Teachers felt that using *Actively Learn* was a means by which they could put supports in place to enable students to read more, and a greater variety of texts, than they would attempt by themselves. Data from teacher participants indicated that the use of *Actively Learn* gave more exposure to text, particularly for students who

struggled with reading. One teacher reported students in her class of struggling readers acknowledged they would not usually read as much.

We definitely read a lot more as a result of using Actively Learn. And the kids say that too. They volunteered, "I would never have read this stuff by myself." They felt I was giving them texts that were harder. I don't know if I was consciously aware of that. The stuff that I put on Actively Learn to start with was easier than what I was putting on later. Maybe subconsciously I was a better judge of what they could cope with now. (T02)

One teacher espoused that when using the digital platform, the students participated to a higher degree in the reading because they had to respond as they were reading. She stated their answers became more detailed with considerable evidence of thinking as they became confident in using the platform, (as seen in Figure 4.3 in the previous section). She also stated that in the digital space, students were more interactive than they would be in the traditional learning context where a group of students would read a text, engage in a verbal discussion, and complete written answers in a paper format. In the digital format, they checked each other's answers, responded to threads, and used the support tools to interact with the text.

I'm always amazed they gave me more detailed responses via Actively Learn than they would have in a traditional context, such as if we had read the article together and I had posed questions to them orally. I think they give me far better answers online than they would do in a discussion context. (T04)

Two teachers endorsed the use of the revision tool as a support for developing learner agency. The concept of revisiting and revising answers was noted as a way of students taking ownership over their thinking and taking steps to improve and go beyond. The revision tool was sometimes used as a result of seeing what other students had written, or through realising they could express their thinking to a greater depth. In some cases, seeing the answers of other students acted as a useful model by which students could scaffold their future responses.

I like the fact that they can re-answer a question. That was one of the highlights of Actively Learn. It was like being able to cross it out and re-write it. You can still see their first response as well as their second response. There were a lot of revision requests when they saw others' answers and thought they could do better. It was a form of peer modelling. (T05)

Teachers referred to a disposition of persistence that was required when interacting with the more complex language and lengthy texts encountered at secondary school. Facing difficult texts requires a more agentic, active approach; a way of thinking that exhibits persistence with an activity rather than a simple ‘get it done’ approach. By giving students some control, either over the choice of texts or the way they interact with a text can have an impact on a student’s sense of engagement. The New Zealand Curriculum states that the development of students’ competencies in thinking, goal setting, self-monitoring, participating and contributing all help foster the disposition of agency (Ministry of Education, 2017). The hallmarks of engagement were seen in the students who showed depth of thinking when answering the questions, and in their interaction with others. Without agency, the impact of digital technologies can be limited.

Making Positive Connections with Classmates, Teachers or Beyond the Class

Interacting and making connections emerged as a means of supporting the understanding of a text. Teachers commented that by using the digital platform, students were not isolated in their reading but were able to connect with others in the form of viewing other students answers, viewing notes made by other students, and commenting on the notes of others. Being in a digital context allowed students to move beyond their work to support their understanding. The critical element was that connections needed to be positive and teachers pointed out that creating a positive class environment in which students felt safe to participate and contribute was reinforced through using the digital platform.

Class Culture and Climate. For students to feel confident in making connections with each other, they need to feel supported in the class and know that the environment is emotionally safe. Encouraging students to have their say was a point made by three of the teachers. Teachers acknowledged a sense of discomfort from some students at the start of using the *Actively Learn* platform. Some students did not like having their thoughts or ideas viewed by others, either in their responses to questions, but more particularly in contributing their thinking to a note and building a discussion thread. Developing class relationships and a feeling of safety was acknowledged as an essential aspect when using this platform. Several

references were made to students who were nervous about others seeing their work, or who did not want to engage in conversation threads using the 'public' notes tool.

Some don't like others seeing their writing because some students have wobbly spelling. I had to let them know that when they commented on a note, it was about the ideas, not about the spelling. I had one student who said she felt really awkward at first that other students could see her answers and then she thought, that's ok, I'll get over that. (T01)

You have to teach the kids to be open. Some can be fearful that others see their work. Those kids with the real learning needs try to hide the fact that they have difficulty. (T03)

There was one girl who created a private note every time, despite me saying to make it public so that everyone can read it and you need to engage with someone else's note. Every week she would make a private note, so her response was just for me. (T04)

Although not discussed by many students, this sense of fear for some of the participants was an unanticipated consequence of using the platform. The study school had a focus on relational pedagogy, and all the study teachers were experienced educators who focused on developing relationships of care and connectedness. Indeed, this was one of the basic tenets of the school. It was an interesting finding that several students felt uncomfortable or exposed, and this was an area where teachers had to show encouragement. One teacher commented that she had the answers up on a screen as she graded or commented on students' responses, and at first, some students found this slightly awkward.

When I first started and had answers up on the screen, one boy said, "You've got it up on the screen. We can see everything that everyone's writing." I said, yeah, I know, that's fine. It might encourage you to think differently, or it might give you a different point of view. I said I don't have any issue; it's not like this is secret, or it's a test. It's ok. They were quite funny about that at first, but they got over that. (T04)

A key aspect of class culture was developing a sense of safety that what was written would be accepted by others and that different viewpoints were valued. This is a social skill that must be taught early on. For some of the participants, this was the scariest part of using *Actively Learn*, and teachers were careful to allow students to work within their comfort zone as they developed the confidence to interact with

others in the digital space, creating a supportive class culture. Developing a sense of safety for students to share ideas, view others' work, have others see their work, as well as being able to react and respond to other students was important to the teachers in this study. Maslow (1943) reports that physical and psychological safety are essential pre-requisites for motivation. Emphasising respect for others and their contributions was a focus for teachers in this study. Schoenbach et al. (2012) suggest that students bring powerful resources to a learning environment which they feel is safe, respectful and collaborative. Having a learning environment that promotes social collaboration and connections between students is a way to develop collaborative meaning-making (Schoenbach et al., 2012).

Encouraging the Use of Notes and Peer Modelling as a Means of Connecting. A tool that helped students connect and interact with each other was the note-making tool. Notes could be made as 'public' for all to see, or 'private' whereby only the teacher could see the note. Students could highlight a piece of text and make a note that would appear at the right of the screen for all students reading the text. The note tool was promoted in the second cycle of the intervention, and teachers commented on the different ways they used this tool. Some teachers used this initially to expand on word meanings to make an unusual word immediately accessible. Others used the notes to start getting the students to interact in a 'discussion' about the text.

Some students never got past the point of making their own note; they didn't comment on others' notes or build on a discussion thread. (T02)

I set a question at the end of each text: "Choose your best answer and put it onto a note. Then go in and respond to someone else's note." This gave the students a starting point, and they could pick an answer they were proud of and make it into a discussion starter. (T01)

I wanted to get them using the notes and pushing beyond the text, trying to make links to other people and the bigger ideas. If I was going to make a gross generalisation, I'd say the more able learners in the class were the ones who connected with the threads better. They quite liked the notes. It was a way of collaborating. (T04)

Four teachers commented there was a sense that for quiet students, who were less likely to engage in a group discussion or an open forum, having the relative privacy of the keyboard gave them a chance to 'have their say' without having to

speak in front of the class. Rose and Martin (2012) assert that because of the numbers of students typically in a class, only a minority of students respond to teacher questions in the classroom; in fact, they claim that most students rarely respond and many barely participate. Nuthall (2005, as cited in Rose and Martin, 2012, p139) believes that “a few students contribute the majority of ideas ... and most students are silent.” All teachers in this project found that *Actively Learn* allowed all students to participate and particularly the students who were the silent ones who did not participate in class discussions.

There are a couple of quiet, quiet kids who I'm always thrilled with what they come up with in their Actively Learn answers. It's interesting because afterwards we might do a little recap or talk about the article or the issue that's come up in the article and they'll never share. You know there's been this absolute genius that's come out of them in their answers, but verbally they don't contribute. (T04)

Allowing the quiet students to have a voice and be an active participant in answering questions about a text arose as an interesting outcome of using the platform. It was a way for quiet students to be visible to others in the class. Despite not all students using the notes tool or interacting in a discussion thread, having visible answers that everyone could see allowed all students access to viewing the text analysis process.

Connecting to Links to Build Prior Knowledge. Having a depth of prior knowledge makes a text more accessible. As well as using information from a text, bringing prior knowledge to the topic deepens the mental model that is created through reading (Kintsch & Rawson, 2005). A problem occurs when the ideas in a text are beyond the prior knowledge of a student. One way teachers used the digital platform to expand on students’ knowledge and fill gaps in prior knowledge, was to insert a link to a visual image or a video into the reading. All but one of the teachers used embedded links to support some of the reading, but only occasionally. The four who embedded links to videos or maps explained they did so to support the text or to provide some background information. If they felt there might be gaps in the students’ prior knowledge when facing a text, links were sometimes used to boost the background knowledge and thus enable students to latch onto the ideas more easily.

I only put in links if they enhanced the information, rather than helped answer a question because I decided that wasn't reading; in fact, it was a way of avoiding reading. (T02)

I inserted links when I wanted to expand on the ideas in the text or give them a visual that the text didn't contain. I don't put a link in every week though; only when it is relevant. I occasionally asked THEM to insert a link of an image that represented an idea and share it on a public note. I asked them to find a clip that represented determination when we read a text on determination. It was a good way of connecting beyond the text. (T01)

One teacher explained that using links was a way of adding depth to a text. When students did not have prior knowledge on a topic, adding a link that gave them a short video clip was a way of building some knowledge before the reading experience.

I put in links to give them some prior knowledge or context they might not have had. An example of this is we read an article about the other sports in the Winter Olympics when we were studying the film *Cool Runnings*, which is about bobsledding. The article included the sport of curling, and it assumed you had a sense of what it was. I knew most of my learners wouldn't know what curling was, so I found a clip on YouTube about curling, stuck it into *Actively Learn*, and they were able to go, "Ahh, that's what curling is." (T02)

Occasionally inserting links was a way to expand students' knowledge and therefore enable struggling students to attack a text that might otherwise leave them baffled. It stopped them from merely skipping over an unknown word and instead was an enabler for knowledge building.

Connecting Through Feedback – Grades and Comments. Teacher participants mentioned that being present in a digital space at the time students were working was also an aspect that contributed to student engagement. Some students felt more comfortable 'talking' to others and stating their opinion when using a screen, particularly students who were quiet in class and nervous about sharing their ideas. Having teachers as an interactive part of the process while students were responding to a text meant their responses were immediate, and they were able to make positive connections through the interactivity of the tool. Not only did teachers teach a strategy, but they were able to follow this up as part of the immediate marking of questions as students were working. They were able to provide feedback in the moment while students were answering questions and reading the text.

It's nice for students to know you have read their answer and are interested in what they have to say. It's also a way of helping shift their answers to another level by giving feedback and getting them to think further and add more. Most of the marking I do in class time and give immediate feedback. But I never finished in class time. I would stay after class for about 20 minutes to make sure I had graded everyone's answers. (T01)

Teachers reported that students responded positively to having the teacher involved at the time they were reading and responding to questions. Some teachers also felt that students would make more effort when they knew other students would be able to see their answers. The teachers felt there was more 'buy-in' from students reading in a digital space, and with the support of a variety of tools, it made the text accessible to everyone in the class.

I would try to read everything online at the time they were working. The kids loved that. I'd engage with the students while they were working and I'd say, "Hey, Sally, wow, your answer for number two, I hadn't thought of it that way. Great thinking." They had more accountability than writing an answer in an exercise book because others could see it. That led to greater depth of thinking and better results. (T03)

Through teachers grading answers on the *Actively Learn* platform, providing written comments in the digital space while students were working, and through vocal interactions that also took place when using the platform, teachers were three-dimensionally connected to their students. Using the digital platform enabled teachers to interact with all their students and watch their progress, commenting when necessary and supporting their next steps.

The Critical Role of Teachers in Guiding the Process

This section deals with the actions taken by teachers to guide the reading process when using the digital platform *Actively Learn*. The actions are described in terms of three key aspects: setting the focus for reading, tailoring choices to the needs and interests of students, and modelling the use of strategies. It is revealed that actions and decisions of the teacher remain critical when using digital technology because it is through teachers' understanding of learning that opportunities are opened up to which students can respond (Mead & Jeffries, 2018). This section ends with some

challenges encountered by the participant teachers and a word of caution that using a digital tool is not a panacea for the learning needs of all students.

Setting the Focus for Reading. All the teacher participants spoke of targeting a reading strategy while using *Actively Learn*. There was a consistent belief that the reading purpose needed to be set at the beginning to activate students' prior knowledge and to focus on a skill for development, such as summarising or focusing on the main ideas. Teachers could reinforce a strategy they had been focusing on and provide an opportunity in which students could practise its use. Teachers used the instructions box at the start of *Actively Learn* to write a clear focus for the reading activity of the day.

I was thinking about the reading strategy I wanted to focus on. It was building up those strategies, and I made that explicit in the early instructions at the start of a text. (T 05)

Figure 4.6 shows ways teachers used the assignment directions box at the start of each reading activity to highlight a reading comprehension strategy and to provide a focus for the reading. Participants chose the reading strategies for teaching and then reinforced these during the reading process. Teachers did not uniformly focus on the same strategy but made choices as to the needs of the students in their classes and what was appropriate for the chosen text or texts.

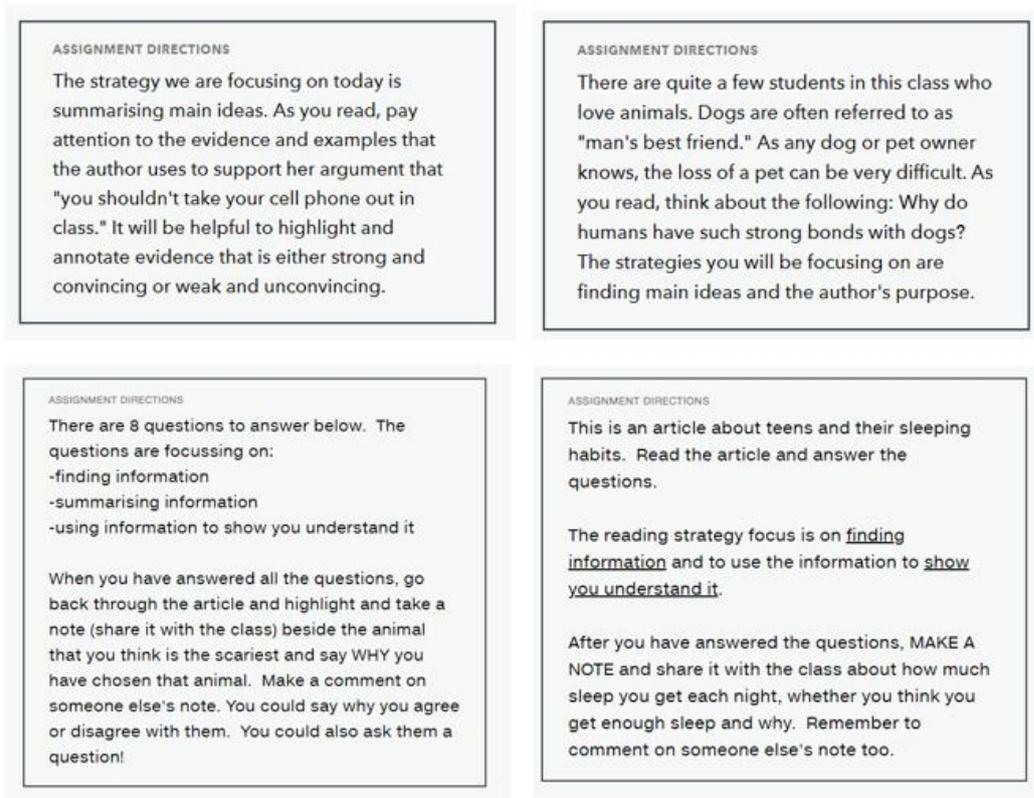


Figure 4.6. Examples of teachers' directions when using Actively Learn

Teachers used the reciprocal teaching strategies as the basis of their strategy teaching; however, they adapted the strategies to match the text and to target areas of need in the class. All teachers stated that having a focus at the start of the reading activity was a meaningful way to help students connect with the text and signpost the direction of the learning.

Tailoring the Reading by Finding Relevant Texts. Pervasive throughout the data from teachers was the need to tailor the reading to the students' interests as a means of encouraging students to have in engagement in the process. Teachers talked about having articles that linked to students' interests or the topic being studied by the class. Due to the free version of the platform only allowing three free uploads per month, in the second cycle of the study, teachers commented on the usefulness of the new 'High Interest' catalogue section. Teachers said that they found these articles to be of interest to teenagers and often topical relating to what was happening in the world at the time. One participant mentioned that if an article connected to an area of interest for a student, or an interest of one of their peers, this helped students engage

and be more interested in reading. Using high-interest materials was stated as a critical factor in hooking students into the reading experience.

I asked students what they wanted to read about and had a bank of topics that were of interest to class members. I found that when the topic was to their interest, I got more depth. I would search for articles that linked to their interests. Whenever I uploaded a student-chosen topic, I would state that it was chosen because several members of the class had an interest in this topic. One girl had a passion for gymnastics. After a Google search, I uploaded an article about Simone Biles, who I didn't know of until then. For the first time, this student went into depth in her answers. You could hear the passion in her answers. I was quite stunned. This is a girl who doesn't speak in class. (T01)

Three teachers pointed out that students liked having a choice of articles, even if only two. Teachers felt that being able to have a choice as to the topic they were reading about was an engagement factor for some of their students. However, the practicality for the teacher was not as straightforward as for the students. Having access to three free uploads per month meant that the catalogue was used to provide extra choices.

I always had more than one article, and the students liked that. It provided some extension because in the class that I had, there was a huge variety in reading comprehension levels. With the High-Interest articles that were introduced, there was more opportunity to take ready-made articles. I would go in and adapt the questions, delete, and add, but I found they were better articles to choose from. (T03)

Another critical element that teachers found engaging for the students was chunking the articles into smaller sections. There was an acknowledgement by some teacher participants that some students in their classes did not have positive feelings about reading. To make reading interesting and accessible, careful chunking and devising of questions was an essential part of the preparation when using *Actively Learn*. This involved the teachers carefully planning the types of questions, and the frequency of the questions inserted.

Writing the questions, putting thought into writing the questions took time. I have fallen into the trap of writing questions too quickly, and as the kids were working, I thought, oh my gosh, why did I write that? It's pretty surface level; I could've done something more with that. That's probably the most onerous thing. Devising good questions. (T04)

Three of the teachers stated that finding relevant articles that would suit the interests of the students and writing appropriate questions took some time; however, no one saw this an arduous task. One teacher commented that it was simply part of the usual preparation people did when being a teacher but did admit that she needed to be organised. Teachers stated they mainly focused on open-ended questions rather than retrieval questions.

Modelling the Next Steps. A further aspect to emerge from the data that exemplified the critical role of teachers in supporting the development of metacognition during reading was the explicit modelling of the depth of thinking to the students. Modelling came in the form of teaching reading comprehension strategies and in providing models for students to use as exemplars for growth. Akin to Vygotsky's (1978) zone of proximal development, the phrase that was used for this aspect of teaching was "showing the stretch" (Hipkins, 2017). Teachers did not expect students to improve on their own, so through the provision of collaborative discussion and the use of exemplars, teachers supported students to stretch beyond what they currently presented when showing their thinking, to that of adding details and depth. Two teachers commented that when teaching a comprehension strategy, such as summarising, providing anonymous models of summaries made by students, and having the students discuss what made a good summary, was a way to get students to develop their depth of thinking.

If I was teaching summarising, I would give them some model summaries and get them to choose the best one and explain why it was best. Unpacking it before they then had to make a summary for themselves about a text. I felt as time progressed and as I 'showed them the stretch' they were putting answers in their own words more; they were writing longer answers because they were starting to see they could expand their thinking. (T 02)

Two teachers said they provided a short segment of text followed by three or four answers that provided a summary of the section. This was used as a basis for helping students stretch to a deeper level of showing their understanding. This form of the ipsative process allowed students to compare possible options of answers, choose the one they thought was best, and provide an explanation as to the strengths of the answer. It also encouraged a process of comparing their new learning to their previous way of answering questions.

Showing the stretch and then socially constructing the means to develop depth was a way that teachers could help students add depth to their thinking. One teacher acknowledged that it is easier to provide models of writing than models of the process of reading.

We don't model reading particularly well. We can model writing quite easily, but to model reading is harder. It's hard to model visualising; you have to kind of talk out the strategies. (TD2)

All teachers expressed the view that discussing reading comprehension strategies and then providing opportunities for students to practise using the strategies, was an essential part of developing the metacognitive skills required for improving reading comprehension. One teacher explained that it was important to increase students' access to text by providing the support that allowed them to persist, even if a text was complex. This concept elaborates on findings that state that by allowing students to engage with complex texts, it is a way of building prior knowledge and vocabulary and develops their use of comprehension strategies (Lupo, Strong, & Smith, 2018).

I believe it's important to amplify, don't simplify. Increasing access to text rather than just simplifying, simplifying, simplifying. It was relatively text-heavy, but they had tools to make it accessible. (TD4)

This concept is supported by Rose and Martin (2012), who state that “guided repetition of high-level tasks enables learners to develop skills more effectively than simply repeating low-level tasks” (p. 307). Rather than providing easy texts, or ability-level groups that attack different texts, Rose and Martin (2012) suggest that teachers need tools to support and engage weak students, at the same time as extending already successful students.

A further means of modelling growth in critical thinking took place when using the discussion threads. The note tool was promoted in the second cycle of the study, along with sentence starters to support teachers in helping students develop more educationally valuable talk (Uzuner, 2007) when interacting in a discussion in a digital space. The reported practice of using the starter sentences and the discussion threads had some variations. Two teachers used the note tool frequently, as well as the table adapted from Uzuner's educationally valuable talk which was made into a more student-accessible document (Appendix 10). The teacher of the Learning

Support class further adapted this to be a simpler tool for her students to use (Figure 4.7).

Helpful phrases to use when “Making a Note”

“I agree that However, I also think that ...”

“I’ve noticed that I After reading this I’ve learned ...”

“I wonder if ...”

“This word/phrase/sentence makes me think ... because
What do you think?”

“This is a good example of ...”

“I want to build on your comment by saying ...”

Figure 4.7. Learning Support class starter sentences for discussion threads

Having a document with starter sentences gave students a starting point from which to engage with other students. One teacher reported that when she asked students how they went about deciding what to say when responding to another student’s note, one student went back to the Google document of starter sentences every time. A vital aspect of the teaching related to commenting on others’ notes was the importance of polite interactions.

Challenges Faced by Participant Teachers. The free version of *Actively Learn* only allowed for three text uploads per month, and teachers got around this in two ways. Firstly, during term breaks, when they had no classes, teachers would remind each other to upload three texts for the month. They did not need to insert the questions straight away, but if they knew a topic was coming up, they could upload texts ahead of time and have them stored in their workspace folder. The other way of getting around the issue of only three texts a month with the free version was to use the available catalogue. By the time the second cycle of the intervention had started, *Actively Learn* had introduced a ‘High-Interest Articles’ section of topical issues and

most teachers found this useful if they had used up their available uploads. All teachers said they would like unlimited uploads rather than three a month.

They now have a high-interest section of articles, and they are often good as a back-up when I have used up my three a month. Obviously, it would have been easier to have unlimited access to free uploads, but our department doesn't have the budget for that. (T01)

I would like the Ministry of Education to connect with Actively Learn or find a digital programme like Actively Learn. I would love to see the digital version of School Journals on a platform like Actively Learn. (T05)

In another link to the theme of the importance of teachers in guiding the process of reading support, came the issue of workload and extra work that was required. Teachers acknowledged that there was work involved in searching for suitable texts and inserting appropriate instructions and questions that addressed the strategies they were working on, yet none of the teachers found this troublesome.

It was a good challenge to prep and try and design the questions to fit where the needs were. I didn't resent doing it at all. It was quite good linking it to the topic we were working on. I liked to work thematically. (T04)

The critical role of teachers in preparation and feedback involved some areas of stress, with most teacher participants commenting that it was easier to work with one text rather than providing choices. A negative aspect of offering options of texts was moving between articles to keep connected with where students were up to, and this lost the immediacy of feedback. When teachers provided choices of text, prompt feedback and responses to students were sacrificed by the need to 'jump in and out' of different texts to 'see where the students were'. The desire to provide choice for students to enable the tool to personalise the learning and meet the students' interests was compromised by the desire to keep track of everyone and to be checking in on two or even three texts.

Chopping and changing between different articles and trying to manage those questions and who's submitted what and who's asking for a revision on that question is a little tricky. (T04)

Providing choice was good, but it got a bit hard to be immediate with the feedback, because I was trying to look at two, sometimes three, and, in some ways, life was a lot more simple when everyone did the same thing, even though I know that might not always be

appropriate. It was quite hard to keep track of everyone. I tried to make it part of the topic we were studying if I could. That way, it was relevant to everyone, and it was simpler when everyone did the same thing. (T02)

It takes some time, trawling through and trying to find relevant, appropriately-levelled articles that many in the class would like. On the times that I offered choices, that meant finding two articles. I tried three articles once, but that was a killer for marking and feedback, jumping in and out of articles. I prefer two maximum. Or just one. (T01)

A final area of challenge mentioned by two teachers was the fact that they created resources or uploaded texts, and these could not be shared with the other teachers in the department. This meant each class was working in isolation and, although teachers created a shared document of articles that they felt were good to use, by using the free version of the platform, each teacher had to create texts for their classes. One teacher found this lack of collaboration frustrating.

In terms of teacher time, it's not very effective when we're doing the same thing and can't share them with each other. You can collaborate with other teachers and share articles on the paid version. The upside was that what we chose was specific to our own class's interests or topics. I find creating resources enjoyable, but what I found frustrating was that we weren't able to share them with the other teachers. EDpuzzle, which is like a short film version of *Actively Learn* that we use in Social Studies, we were able to share. For free. I'd love the paid version of *Actively Learn* for that. To share. (T03)

When using a digital platform, there is still a need for teachers to make sure that the way they are using technology is suitable for their class. Teachers need to consider the preparation required when using a platform and how it can be tailored to meet the needs of a specific group of learners.

A Word of Caution From Participant Teachers. I end the qualitative results with a final comment from the teachers. In the current study, some teachers, although supportive of the platform, questioned its effectiveness for the very low-level learners. Teacher participants noted that for some students, existing feelings for reading were not positive. Digital tools need to be treated with thoughtful consideration as to whether they are addressing the needs of all students. Despite *Actively Learn* having tools available that supported the reading process, teachers

worried that this was not enough for students who either had deficient reading skills, including their decoding ability or had limited interest in reading and simply completed reading tasks during class time but did very little reading in their personal lives.

It's like trying to learn the violin when you just turn up to the lesson and do no practice. They're not doing a lot of reading. They aren't reading for pleasure at home. (T02)

Although improvement was noticed for some participants, others made minimal or no gain in reading comprehension tests. This was a concern for some teachers as they wondered if this tool while allowing struggling learners to participate and feel part of the class interaction, may have been limited in aiding the development of the reading skills of the very lowest-performing students. One teacher queried over-reliance on the text-to-speech tool.

I wonder if Actively Learn is too hard for some of those students. It would be without the listening tool. I wonder about the lowest readers. I wonder how much it is helping with their comprehension when they are so reliant on the text-to-speech tool. (T01)

Two other teachers queried the gains that were made by their lowest achievers. There was a consensus that despite engaging students and helping them feel involved as part of the class, a lot more is needed to develop their reading skills.

I think I didn't pick up on my bottom students as much as possible, the stanine two students. They need more one-to-one. I was really going for the Universal Design for Learning approach. I was kind of hoping that everybody, the top and the bottom would get something out of it by having really good open questions, some easier questions that would hook my slower learners in and then some really good questions that would make my high learners think, but I think at the end of the day I didn't pick up my bottom students as much as I possibly could have ... I don't think I catered for the bottom level enough. (T03)

One teacher reinforced the need for a balanced reading experience by focusing on a student who made a large amount of progress in the PATC. Although *Actively Learn* was part of the class programme, this student became involved in a reading challenge programme run by the school librarian.

You really are up against it trying to make gains. It's good exposure to text, and I think all of these kids would say "We would never read this much if it wasn't for this", which is great. But whether you're actually making massive gains??? One of the boys in my class who made a massive stanine jump, he's become a reader. He really loved the reading challenge (an activity run by the school librarian). He's kind of a reader already. So, he's made big gains. (T02)

Despite students enjoying using the platform and being exposed to more texts than they would typically read alone, all the participant teachers thought that more was needed for the lowest level of students. The next section addresses quantitative results and reflects upon gains made by some students and not by others.

Part Three: Quantitative Data

A vital aim of this research was to find out if using a digital tool as an intervention to support reading comprehension would influence the improvement of students' reading comprehension. The quantitative results presented in this section explain the findings of four instruments and address three of the research questions. The first question asked what characteristics, if any, enabled *Actively Learn* to meet the reading comprehension needs of Year 9 and 10 students. This question linked closely to question three as to the impact the digital platform had on engagement. The two survey instruments addressed these two questions.

A reading behaviour survey was conducted with the participant classes in Term 1 of each year to gain an insight into what format students were reading in and models of reading they saw around them at home. Appendix 11 contains the survey; the results are summarised in this section. The results from a post-intervention survey about the use of the e-platform *Actively Learn* presents students' views on the use of the tool. Key findings have been summarised with reference to questions one and three.

The second section of quantitative data presents the results of the Progressive Achievement Test of Reading Comprehension (PAT) (Darr, McDowell, Ferral, Twist, & Watson, 2008), a standard formative assessment tool used in New Zealand schools. This test is used annually to test reading comprehension in the study school. The purpose of the test was to find out if students were gaining meaning while reading a text. The test was taken by the whole Year 9 and 10 cohorts in February and November of each year. The final research question, which asked if *Actively Learn* was effective in terms of its capacity to improve the reading comprehension of Year 9 and 10 students, is addressed through the quantitative test results.

The final quantitative instrument used was the electronic assessment tool for teaching and learning (e-asTTle) (Auckland UniServices, 2007-2009). This test is not normally used by the study school. A decision was made to add the e-asTTle test to the evidence gathering process as a comparison. Being a test of comprehension freely available to New Zealand teachers, it was hoped that the e-asTTle test might provide information not able to be gleaned by the PATC. The data presented by this reading comprehension test will also be explained. Questions arise as to the usefulness of this test and whether the e-asTTle pre-test and post-test, despite both testing reading comprehension, are testing a similar construct. A concern is also raised as to the

comparability between e-asTTle and PAT reading comprehension tests. This study has found that reading comprehension is a complicated construct to measure and even trusted tests of reading comprehension might lack reliability. For a test to have construct validity, scores from one test of comprehension should be related to the performance on another test of the same construct, in this case, reading comprehension (Oakhill, Cain, & Elbro, 2015). Thus, a correlation between the PAT comprehension test and that of e-asTTle would show that the tests are testing a similar construct.

Similarly, for content validity, the range of skills included in a test of reading comprehension could be expected to include “vocabulary knowledge, syntactic skills and inference making” (Oakhill, Cain, & Elbro, 2015, p. 28). Therefore, a test that focused on retrieval of facts or excessively focused on one construct of reading comprehension, or an un-related construct, would not be considered to have content validity. The negative case analysis of the PAT and e-asTTle results have been included in this thesis for reliability and to show a contrast between the qualitative results and the quantitative results in this research. In hindsight, as the e-asTTle test provided an opportunity to use open questions, it may have been a better measure of comprehension had this facility been used to a greater degree.

Characteristics of Actively Learn to Meet Reading Comprehension Needs

Students were asked to identify any aspects of *Actively Learn* that they found helpful when reading. They were given the option to state that the tool was not helpful at all. They were also given a chance to choose as many of the options available or add another option. In Cycle One, the aspect of the tool that stood out as being most useful for 68% of students was the ability to answer questions while in the moment of reading. For 63% of students, having the definition tool where they could highlight a word and find out what it meant was a helpful tool to have. According to 58% of the students surveyed, the next two most useful tools were having the teacher responding or grading their work while they were doing it and being able to use the revision tool to change an answer (see Figure 4.8).

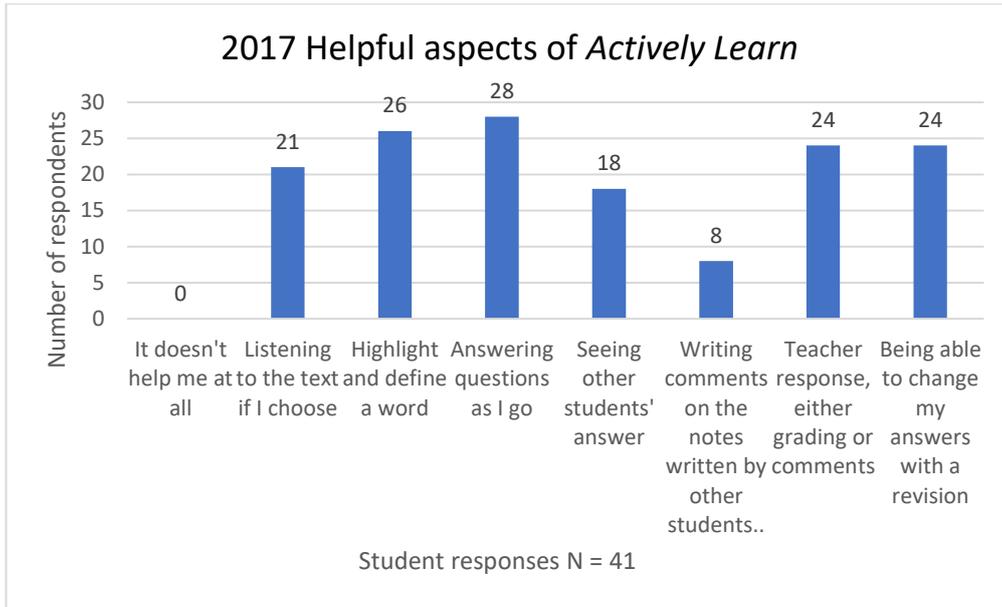


Figure 4.8. Cycle One helpful aspects of *Actively Learn*

In Cycle Two of the study, two extra options were added to the survey (Figure 4.9). One further option was the ability to change the visual aspects of the text; the other was the ability to have a choice of text. Answering questions as they carried out the reading was revealed as the most useful aspect with 67% of respondents selecting this as helpful. The next two valuable elements of the platform, noted by 54% of the students, were being able to highlight and define a word, as well as having the teacher responding and grading at the time they were using the tool. The next most useful tool, according to 48% of students in Cycle Two, was the ability to use the revision tool to change or adapt an answer.

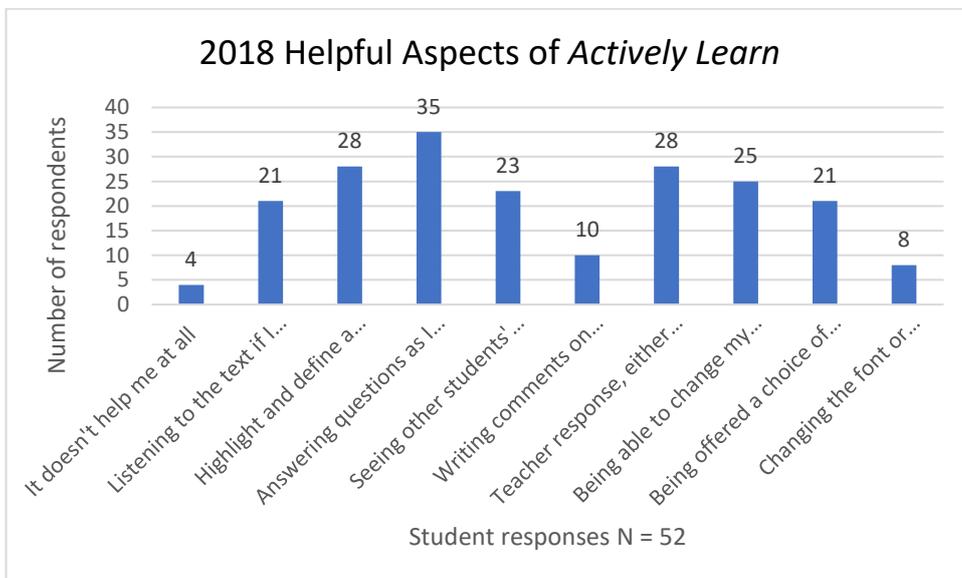


Figure 4.9. Cycle Two helpful aspects of *Actively Learn*

It is interesting to note that the top four features of the platform that students found most helpful were the same for both Cycle One and Cycle Two. Connecting to a vocabulary support tool, connecting to the teacher, having the autonomy to make changes, and using critical thinking skills at the moment that the reading takes place held the greatest usefulness for the students in both research cycles.

Impact of Actively Learn on Engagement

Reading Behaviour Survey Summary. A survey was carried out at the beginning of Term 2 for all the students in the participant teachers' classes. It was voluntary for students to participate. Eighty-five students responded in 2017, and 67 students responded in 2018. Results from both years have been combined, thus generating an overall picture of the reading that was happening outside of school from the viewpoint of students in the two-year duration of the study. Many questions gave the option for students to 'tick all that applied'; therefore, some chose more than one response, and percentages represent how many of the survey participants selected an option. Students were asked if they read outside of school time; 65% of participants across both study years stated they read out of school time. Options provided in the survey as reasons for reading were responded to with doing homework being the dominant reason (46%), followed by reading for pleasure (39%) or finding out about things of interest (35%). When asked if they preferred to read off a screen or paper, 55% of students did not mind which format they read in; almost 24% of students preferred paper to read from, and approximately 17% stated they preferred reading off a screen. The most frequent activity that involved reading outside of school time was using internet sites (62%). However, the reading of novels was reported by 47% of students with magazines (37.5%), Facebook (35%) and graphic novels (32%) being read less frequently (Figure 4.10).

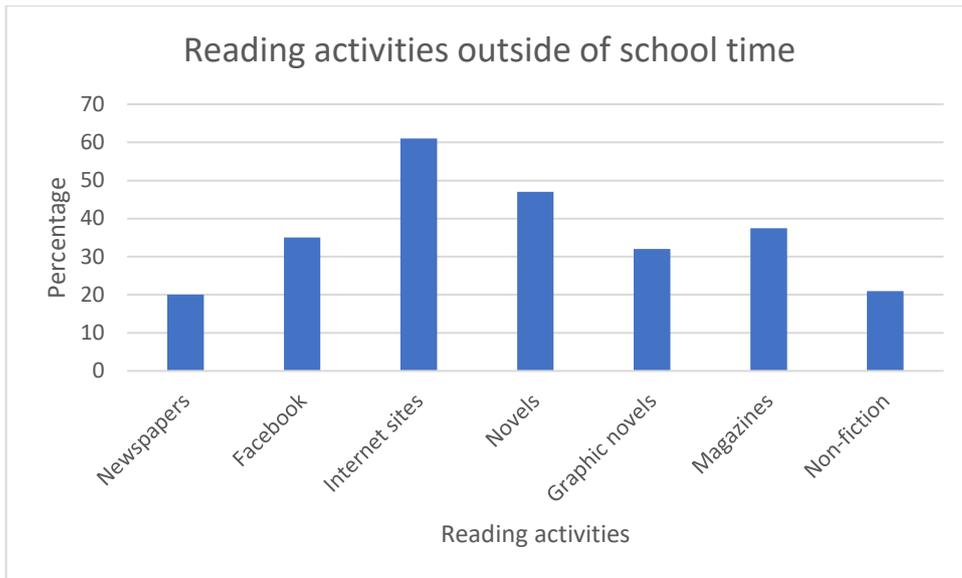


Figure 4.10. Reading activities outside of school time

Students were asked if they ever saw family members reading, and 85% of participants stated that they did see members of their family reading. Of those who did have reading role models in the home, they were more likely to be an older female such as a mother, grandmother, or auntie (76%). Seeing a sibling or cousin reading, or an older male such as father, uncle or grandfather reading, occurred for approximately 60% of the students. When asked what the other people in the home were reading, newspapers, Facebook and internet sites were most frequently reported with over 60% of participants stating that these activities occurred in their homes (Figure 4.11).

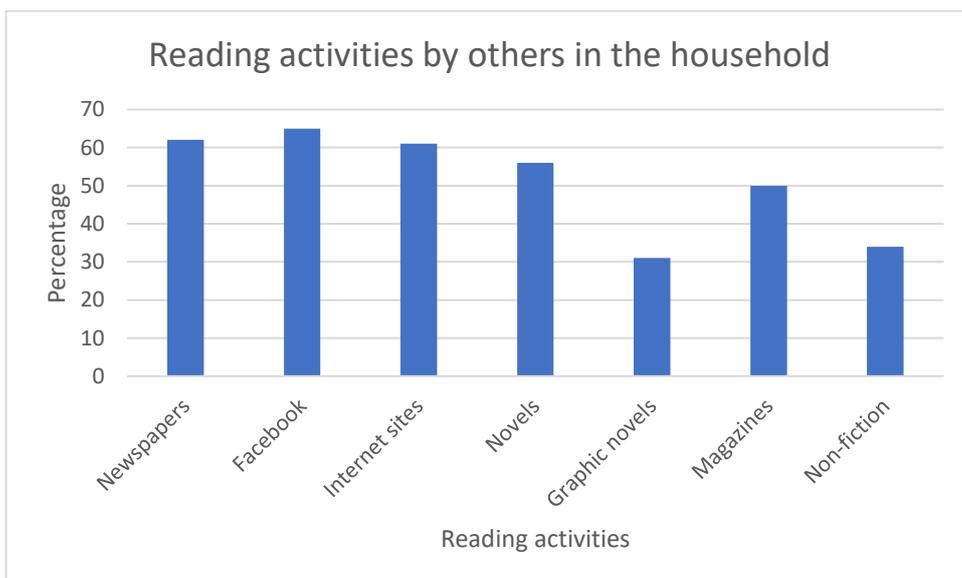


Figure 4.11. Reading activities by other household members

Post-intervention Survey Results. As a final piece of data gathering for each cycle of the intervention, students were invited to complete a survey, submitted to them via Google Forms, asking their reaction to using the digital platform *Actively Learn*. All students participating in using the *Actively Learn* platform, through being in the classes of the participant teachers, were offered a chance to submit their opinions on the survey voluntarily. This documentary evidence was for the benefit of the teachers in the TLIF project and a further chance to hear anonymous student voice.

In each year-long cycle of the study, students were asked about their feelings about reading comprehension before using *Actively Learn*. As shown in Figure 4.12, almost one-quarter of respondents felt that reading comprehension was an area of weakness and only 10% in Cycle One and 8% in Cycle Two felt this was an area of strength.

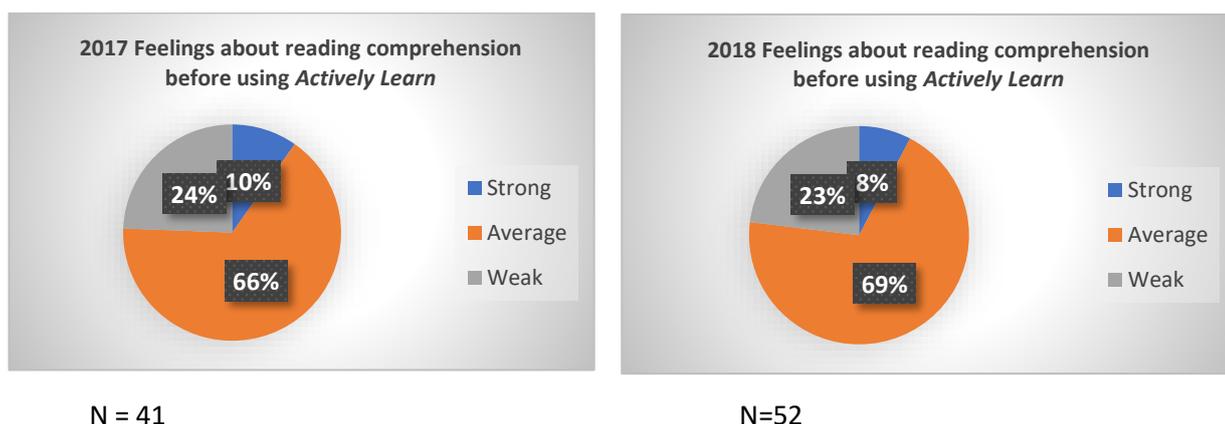
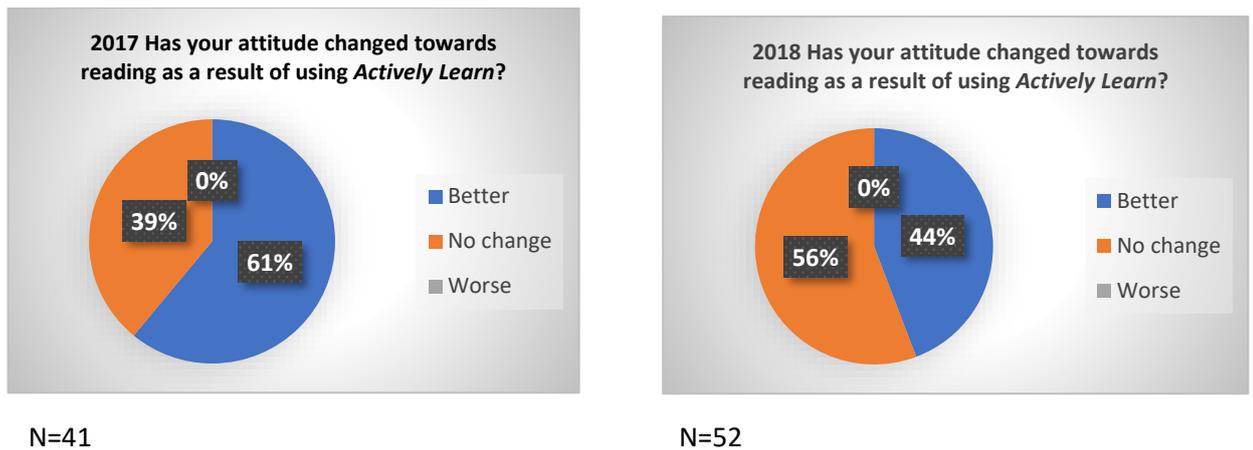


Figure 4.12. Feelings about reading comprehension before using *Actively Learn*

Students were asked if their feelings towards reading had changed because of using the *Actively Learn* platform. In Cycle One, 61% of participants stated that they felt their attitude towards reading had improved. In Cycle Two, 44% of participants felt their attitude had improved (see Figure 4.13). All other participants thought that no change had occurred in their attitude to reading as a result of using *Actively Learn*.



*Figure 4.13. Change in attitude towards reading after using **Actively Learn***

*Effectiveness of **Actively Learn** in Terms of Improving Reading Comprehension*

PATC Results Over Two Years. The Progressive Achievement Test of reading comprehension assigned in February was the same test assigned in November. It was a multiple-choice test whereby students read texts in a booklet and marked their results on a paper sheet. By being so far apart in the time that the tests were taken, it was believed that there would not be a learned response effect created from being familiar with the texts. The test results were not returned to the students, and they saw the test booklets only when completing the test in February and November.

Although PATC data is used in schools in New Zealand, it is acknowledged that this is a snapshot in time and to be considered with other factors. Students' test results may be affected because they ran out of time or finished early because other students had completed. Students are emotive readers, and the test may indicate less about their comprehension, and more about their emotional state on the day. The test may also indicate likes and dislikes, whereby a student chooses some stories to give time and attention to and shows less discipline in attempting other stories (Johnson, 2018). Understanding students and what motivates them to read is vital to success in the teaching of reading. As we do not know what they were thinking when taking the test, precision is not expected. However, a generic picture may emerge (Johnson, 2018).

Another factor in the PATC data is that tests may not match the students' abilities, and therefore provide little information. Tests that are too easy can provide

a ceiling effect, or conversely, a difficult test will give a floor effect, where few questions are answered correctly, and very little information is provided as to what a student can do (Darr, McDowell, Ferral, Twist, & Watson, 2008).

Despite students stating that they found aspects of the *Actively Learn* platform useful, the PATC results show that there is little difference between the research group and the Year 9 and 10 cohorts in the study school. The paper version of the test, rather than an online version, was used as part of the assessment regime for the study school. At a glance, Figure 4.14 shows results in Cycle One implied a marginally greater mean scale score difference for Year 9 study group students in stanines two, three, four and five, compared to those in the cohort. However, this difference was skewed by the small sample size of the study group.

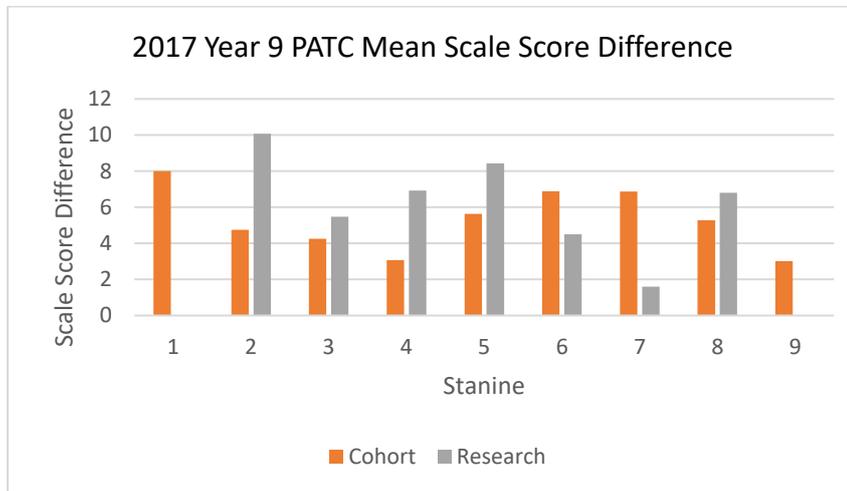


Figure 4.14. Cycle One Year 9 PATC mean scale score difference
(*n* = 41 research group, 203 cohort)

As seen by the Year 10 Cycle One results in Figure 4.15, the Learning Support class, which was the only Year 10 class in the study group in 2017, made little progress compared with the stanine 1-4 students in the cohort. Despite being compared with other students who had similar PATC results in the general cohort, the results show little difference between the study group and the cohort, except in the stanine four group, whereby the Learning Support class regressed in their results.

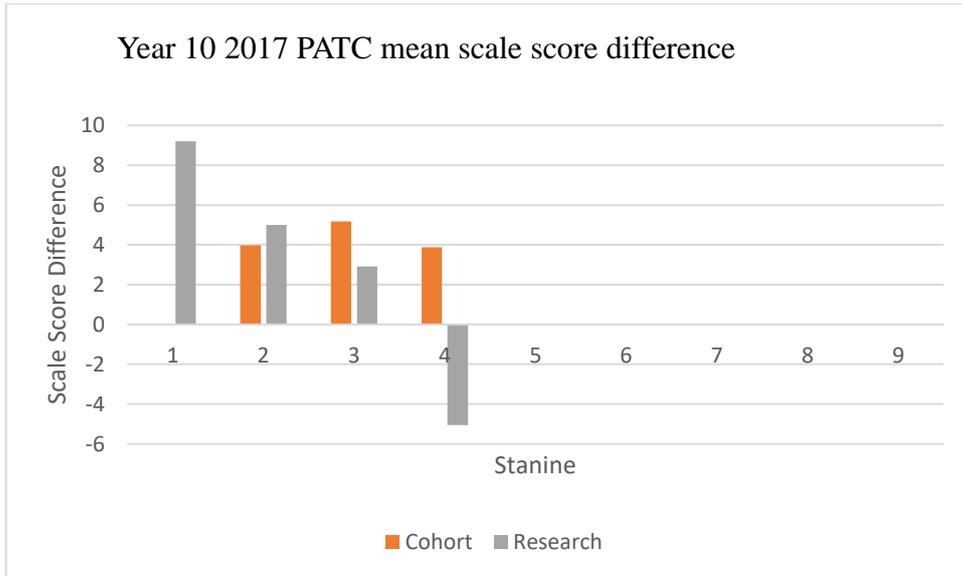


Figure 4.15. Year 10 Cycle One PATC mean scale score difference
 (n = 14 research group, 57 cohort)

The PATC results for Cycle Two represented less growth for Year 9 students than in Cycle One. The results are complicated by the change of teacher for one class and a potential impact of the timetable change, reducing English classes to three times a week. This change caused one teacher to reduce the amount of time *Actively Learn* was used. The data show that for all but stanine 2 and 7, the cohort group made higher growth in reading comprehension using the PATC measure, as seen in Figure 4.16.

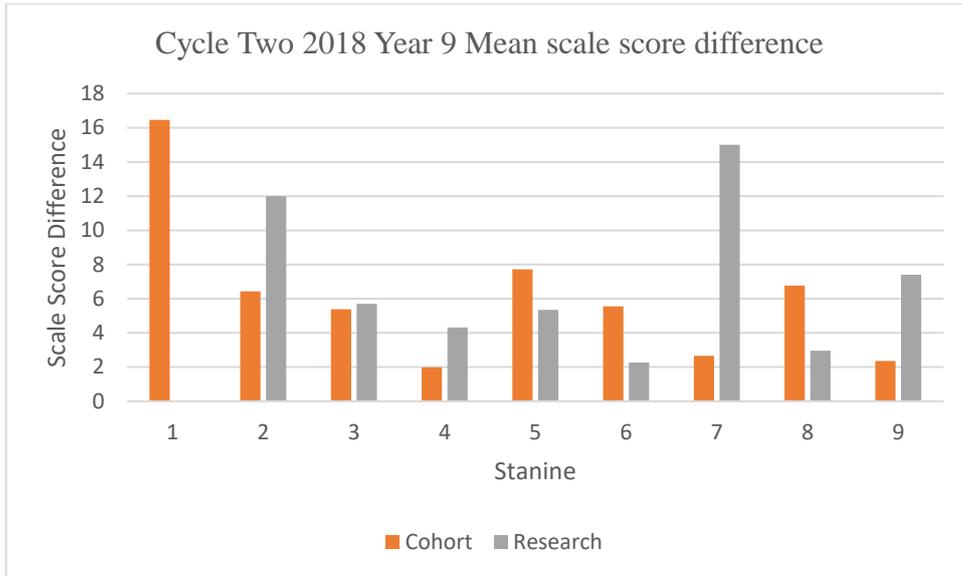


Figure 4.16. Mean PATC scale score difference Cycle Two Year 9 students
(n= 46 research group, 191 cohort)

The Year 10 study group in Cycle Two was made up of the Learning Support Class and a class of students who mostly exhibited dyslexic behaviours when reading. In comparison with the cohort’s progress in reading comprehension, using the PATC as a measure, students who did not use the digital platform performed better in the final PATC test. In Figure 4.17, the one stanine group where there is apparent growth for the study group, stanine six, is skewed by the fact that this represents one student.

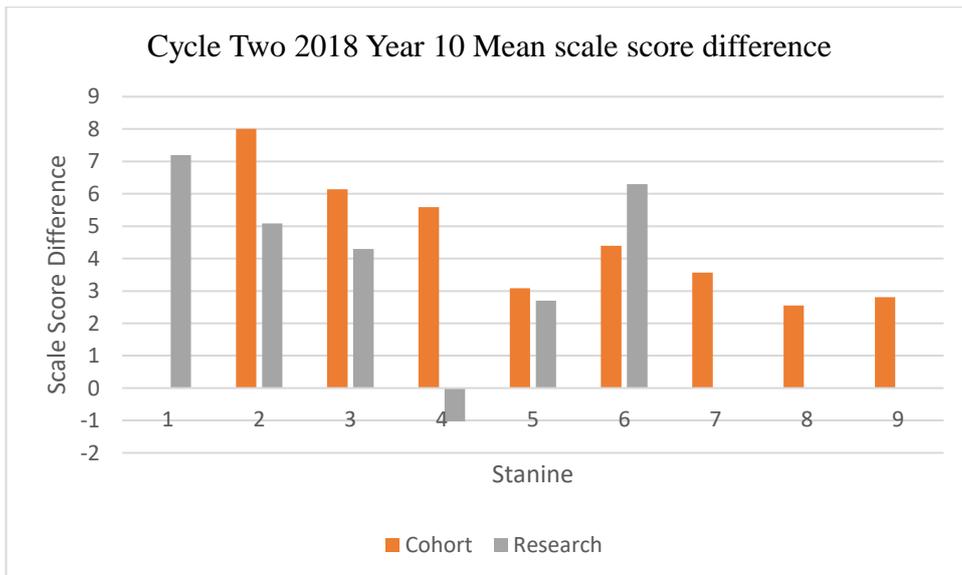


Figure 4.17. Cycle Two Year 10 mean PATC scale score difference
(n= 30 research group, 191 cohort)

Over the two years of the intervention, the PATC results show little difference between the study group and the cohort. One study group, Year 9 Cycle One, at a glance, showed more gain than the cohort group. However, the results are unreliable due to the small sample size of the study group compared to that of the cohort.

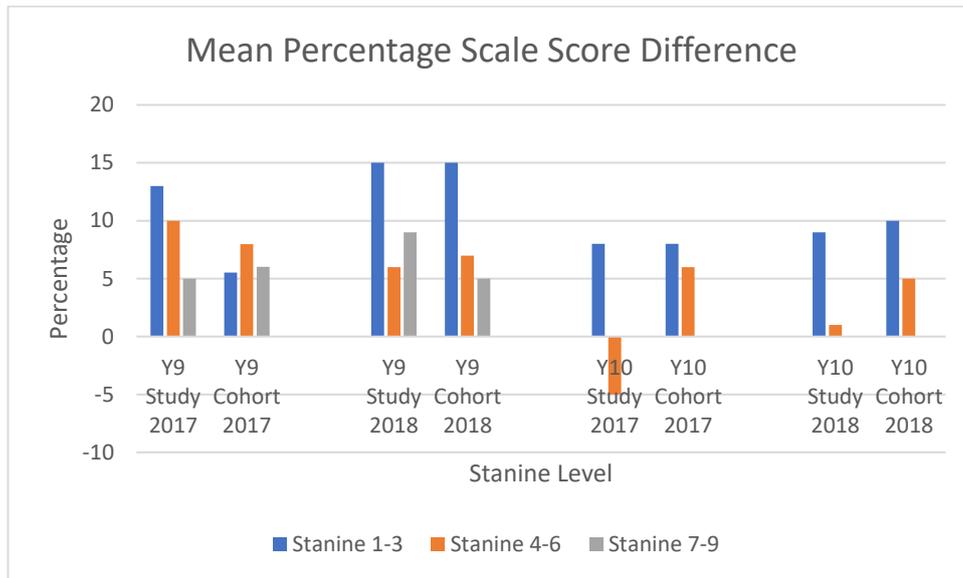


Figure 4.18. Mean percentage scale score difference over two years

Figure 4.18 shows that in Cycle Two, Year 9 students in the study group and the cohort showed similar results. However, when separating the study group results by class, there appears to be a difference between the class that used *Actively Learn* weekly for two terms and the class that used the platform fortnightly for one term and weekly for the other. Figure 4.19 indicates that the class using *Actively Learn* weekly made greater progress on the PATC assessment than the class that used the platform less frequently.

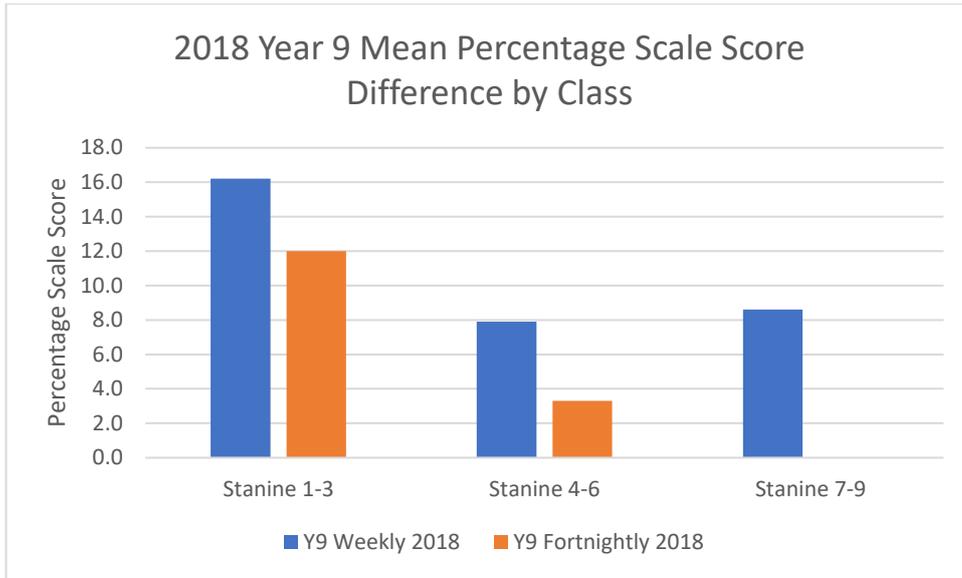


Figure 4.19. Year 9 study group by class

A further difference was observed between the two Year 10 classes in the study. Despite Figure 4.18 showing that there was little difference between the Year 10 students in the study group and cohort in stanines one to three of Cycle Two, students in stanines four to six of the study group showed markedly lower progress than the cohort. When separating the results of the study group by class, Figure 4.20 indicates that the students in the dyslexia class showed greater gains than the Learning Support students, some of whom regressed between the beginning and end of the year according to the PAT assessment.

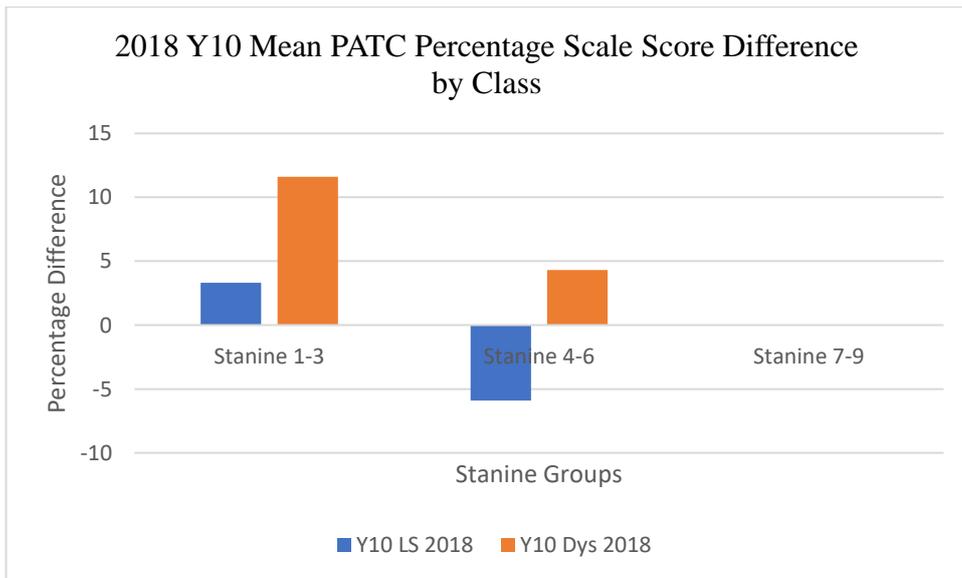


Figure 4.20. Cycle Two Year 10 study group percentage scale score difference by class

E-asTTle Results Cycle One and Two

The e-asTTle tests were performed digitally, with students reading texts and responding with answers online. The timed test had mainly closed questions with one open-ended question. The e-asTTle test given in May was not an identical test to that provided in October. The e-asTTle bank of tests allows teachers to ‘create a similar test’. This was done in case the timeframe of May to October may have caused some students to remember the text. With the facility available to create a similar test, this option was taken. The results of the e-asTTle test, when comparing score differences between Test One and Test Two were of concern. Figure 4.21 shows that Year 9 students in 2017 had a weak positive correlation between their e-asTTle scores and their PAT scores. However, this was not the case for the Year 10 class. In 2018, both year levels in the study tested using e-asTTle showed a negative correlation between the e-asTTle tests and the PAT test. Figure 4.22 represents a weak negative correlation between the PAT and e-asTTle tests for Year 9, akin to the Year 10 group in both cycles of the study.

The purpose of having two datasets was an opportunity to reveal if the two diagnostic reading comprehension tools available to New Zealand high school teachers provided similar information. Both are tests of reading comprehension. It was a chance to see if they provided an accurate picture of achievement making them valuable and reliable for teachers when analysing progress and structuring programmes.

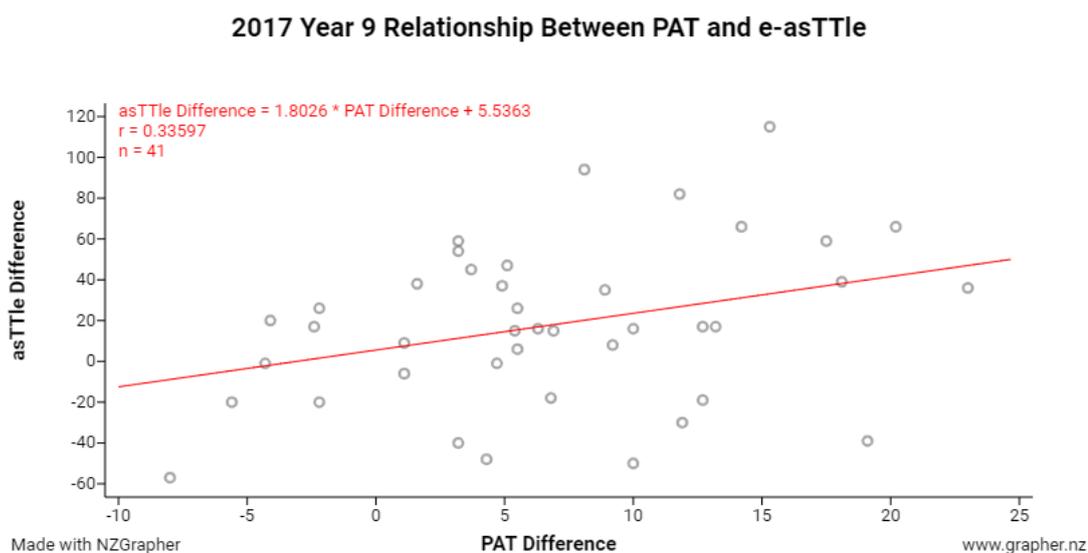


Figure 4.21. Cycle One Year 9 relationship between PAT and e-asTTle

2018 Year 9 Relationship Between PAT and e-asTTle

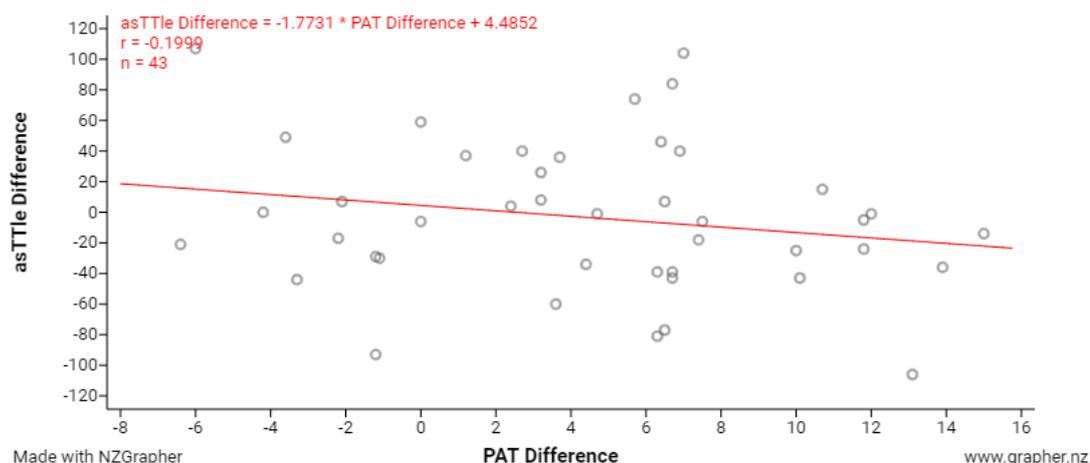


Figure 4.22. Cycle Two Year 9 relationship between PAT and e-asTTle

Concern over the seeming lack of correspondence between the PAT results and the e-asTTle assessment results led me to analyse each item of the two e-asTTle tests to compare whether the tests were measuring the same constructs. According to the validation evidence technical report (Hattie, et al., 2003), each test for e-asTTle aims to provide rich ideas in terms of “finding information, knowledge, understanding, connections, inference and surface features” (Hattie, et al., 2003). However, upon analysing the types of questions used in each e-asTTle test, it became apparent that the features of the tests included inference, retrieval, vocabulary, and structure questions. Test One contained 16 items requiring inference, a feature of in-depth reading. Fewer items required the surface reading skills of retrieval (4), vocabulary knowledge (3) and sentence structure (4).

Conversely, Test Two, required inference skills to answer 13 of the questions, but included 11 items of a sentence structure nature. A total of 16 questions in Test Two dealt with surface reading features (see Appendix 21). The focus on this surface reading skill may have had an impact on the results of Test Two. In hindsight, I should have drilled into each test item and made a comparison between the two tests before using the second test. Had this occurred, and the discovery made that the tests were not similar, using the first test as a pre and post-test may have given a more accurate measure of growth in reading comprehension.

The e-asTTle results proved to be of little help in this study due to the discovery in Cycle Two that the two e-asTTle tests were not testing the same thing,

despite the intention of them being a 'similar test'. With one test having a strong focus on inference and the other having a strong focus on vocabulary and grammar skills, it was decided that the lack of similarity in the tests created a lack of correlation between the PAT results and the e-asTTle results. The impact of the first test having 59% of questions devoted to deep reading skills and the second test only having 45% of items dedicated to deep reading skills has meant the e-asTTle test has not been a useful means of corroboration of results. However, the use of e-asTTle at the start of each cycle was to provide information about areas of strength and weakness held by students. Its usefulness was in providing teachers with data on gaps and aspects of reading that could be a focus for development.

Summary

The results presented in this chapter represent the voice of the students and the teachers in the form of qualitative results taken from interviews with participants, and the results of surveys and tests that make up the quantitative results. The qualitative results were presented according to the emergent themes of the research. Through coding the results of interviews, three key themes emerged to support the development of reading comprehension in a digital space:

- 1) Learners require agency and autonomy when using available tools to self-help through the reading process.
- 2) Making positive connections with classmates or beyond the class is a support system for developing thinking.
- 3) Teachers perform a critical role in scaffolding the challenge to guide the process of reading for depth.

The quantitative results have been presented according to three of the research questions they address. The survey instruments inquired of students what characteristics, if any, were useful in meeting their comprehension needs. The survey instruments also discussed student engagement and students' responses to using a digital platform to develop their understanding when reading. The final research question asked if *Actively Learn* was useful in terms of its capacity to improve reading comprehension. The quantitative test results addressed this question. It became clear through this research that testing reading comprehension is not a

straightforward process, and using a test that is quite different from the teaching process provides little support in finding out if students are improving.

The analysis of the qualitative and quantitative results will be discussed in the next chapter, with the difference between qualitative and quantitative findings explained. The data have caused questions to be brought forth as to how reading comprehension is taught and how it is tested.

Chapter 5 – Discussion and Conclusion

Chapter Overview

The purpose of this thesis is to explain the findings of a qualitative action research study that investigated the use of the digital platform *Actively Learn* and its capacity to improve reading comprehension. The study used an action research design to put an intervention in place and allow for adaptations to be made where necessary, over the two-year course of the investigation. This chapter will discuss the findings presented in the previous chapter and explain how the emergent themes address the research questions. A theoretical model of reading comprehension when using digital tools is proposed, allowing the multiple aspects that underpin reading comprehension to be foregrounded. An argument is made that for digital platforms to support the development of metacognitive skills that support deep reading comprehension, a combination of features is required, which include:

- The affordances of learner agency and autonomy, which allow choices to be made that suit learners' needs.
- The ability to make connections beyond an individual interaction with the text is also seen as a mechanism that supports deep engagement with reading.
- The importance of having a teacher guide the process and make decisions that allow the next learning steps to be reached.

The previous chapter was arranged according to the emergent themes of the study. This final chapter mirrors the structure of the previous chapter by making connections to the theoretical model, which emerged from the results. This chapter explicates the relationships between the emergent themes and the conceptual frameworks which underpin this study and then goes on to evaluate how the findings answer the research questions. Conclusions will be drawn from the analysis of the results. Reference is made to other studies that either question or amplify the current research, to form a coherent understanding. This chapter includes concerns, issues, and limitations that arose during the investigation.

Summary of Findings

Technology is in a perpetual state of flux, with many new digital tools becoming available and the abandonment of old platforms; thus, it is important to choose tools that support the teaching pedagogy. Although this thesis is focusing on the digital platform *Actively Learn*, key findings have arisen from the data that are important to be considered for any digital platform that aims to support and enhance reading comprehension.

As pointed out in the previous chapter, the terms learner agency and autonomy, as applied to this study, refer to the capacity to independently make choices (Manyukhina & Wyse, 2019) and having the freedom to integrate independent thinking (Deci & Ryan, 2000) during an aspect of learning. The results indicate that having the facility to manipulate a text visually is a positive aspect for some students. Font style and colour, and background colour, although not used by all students, are useful features for some, particularly for students with dyslexia or those who struggle visually. The study demonstrated that although aural support was useful to many students, particularly those with dyslexia or those who struggled with reading, text-to-speech support was found to be more useful when used strategically, rather than passively.

Vocabulary support encourages agentic behaviour through immediately having the facility to find a definition without navigating away from a tool. This study found that a useful digital platform is one that has options available and follows the principles of Universal Design for Learning (CAST, 2018), allowing students to choose the supports they require. Using a definition tool in the time of reading was useful to many of the students involved in this research. Having the agency to use their thinking and personal voice, when responding to questions at the moment of reading, rather than merely retrieving facts and information from text, is of benefit to many students. Many students stated that questions interspersed throughout the text encouraged them to be thinking while reading.

The data suggest that being able to obtain assistance through connecting with others is a support factor for students. A useful digital tool will have a component whereby students can interact with others in the class. Whether this is to discuss ideas that have arisen in the reading or view other students' responses to help consolidate understanding or privately ask a teacher a question, a platform supporting the development of reading comprehension will not consist of students

working entirely in isolation. Such a facility will enable students to get immediate help and feedback from the teacher or peers. It also allows a form of peer-mentoring to take place where students can see how other students are interacting with a text.

Finally, digital resources are ubiquitous in the 21st-century; some schools mandate their use in each lesson. However, the results in this study indicate that the role of the teacher is more important than ever to scaffold the critical thinking and metacognitive skills to operate in a world surrounded by text. Teaching and modelling of the next steps in learning, strategically tailoring texts to meet students' needs and interests, and explicitly teaching the strategies to develop students' reading comprehension are crucial roles of the teacher. Added to this is a relationship of care and connectedness that provides support and feedback. A robot will never take the place of the choices made by teachers. The current study reinforces the idea that technology without a focus on pedagogy will have little impact on learning development.

Proposed Theoretical Model to Support Reading in a Digital Space

Analysis of the key findings in this study has led to the emergence of a model that identifies the critical aspects of Agency and autonomy, Connectedness, and the Teacher's role as essential aspects required in digital tools when supporting the development of the metacognitive skills that assist deep reading comprehension. The model is hereafter referred to as the ACT Model of Supported Reading Comprehension in a Digital Space (Figure 5.1). The model emphasises that adolescent learners want agency and autonomy in their learning, yet also desire the social context of reading through making connections with peers and teachers.

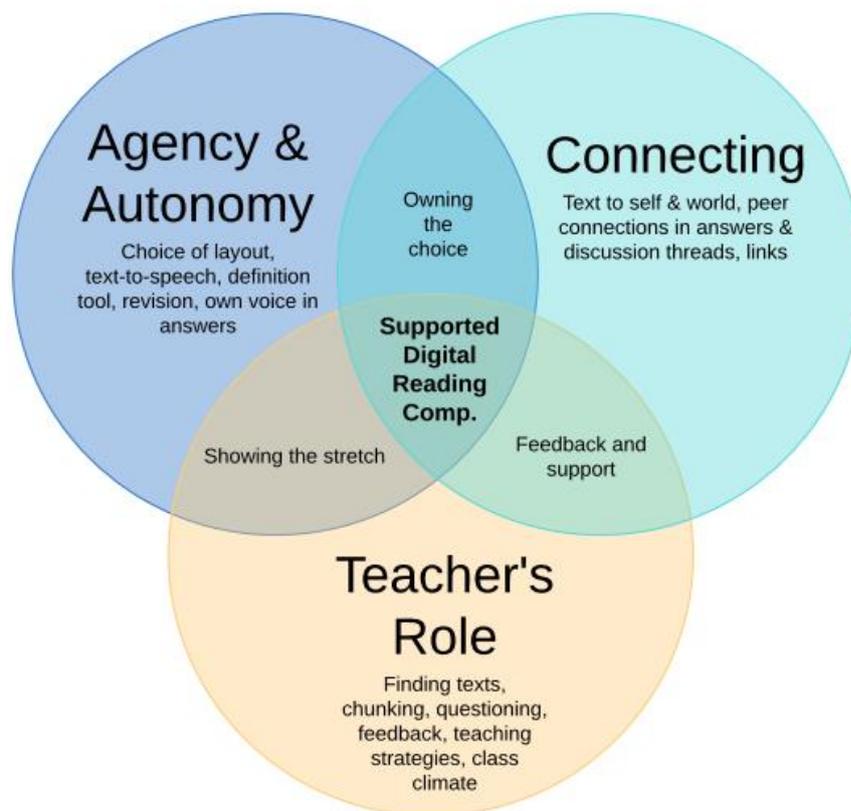


Figure 5.1. The ACT Model of Supported Reading Comprehension in a Digital Space

The discussion chapter will expand on each section of the model, but I will provide an initial summary of the importance of this model. It was clear through the findings that students had different ways in which they wanted to interact with texts. A digital tool needs to provide ‘just-in-time’ supports (Dalton & Proctor, 2008; Sweller, Ayres, & Kalyuga, 2011), that is, support that can help a reader gain further understanding and can be accessed at the moment of reading if required. Students wanted the autonomy to use supports as needed, be that vocabulary support, text format changes, text-to-speech, or having the opportunity to revise their answers. The reading experience was personalised rather than individualised. Students could be reading the same text as others in the class, yet they were able to interact with the text in a way that supported them. They also wanted ownership over their answers and their thinking. Having the agency to write responses that required thought rather than the retrieval of information was a clear finding from the results. Owning the choices that were made, rather than experiencing text identically, is an essential factor.

Another clear finding of this study was the usefulness of being connected to other students, the teacher, and the ability to go beyond the text to fill gaps in prior knowledge. Reading taking place as an isolated experience does not need to happen in the digital age. Feedback and support through seeing the answers of others, getting immediate feedback from teachers in the form of grades and comments, and connecting beyond a personal interaction with the text came through as a key factor that supports reading comprehension when using digital tools.

Furthermore, when some people think of digital learning, they may think of students sitting in front of computers and not needing the teacher. The results of the analysis illustrate the essential place of the teacher for several pivotal reasons. Firstly, the choice of text, the creation of questions that require thinking, and the teaching of strategies that support the development of metacognitive skills and in-depth reading are essential parts of reading comprehension. These elements require explicit instruction and the ability to have practice opportunities immediately after learning. The second key role of the teacher is the teaching of the next steps. Showing the stretch beyond the current ability level, providing guidance on how to use a strategy, and modelling answers that provide deep thinking are essential roles of teachers. Finally, creating a climate of trust and support where students gain confidence in putting their answers and notes into a space where others can see them is a crucial role of the teacher. Teaching is not merely about what students learn, but the way that they learn. The relationships between students, their peers and their teachers form the basis for positive support and interactions in a digital space.

There are some parallel findings between this study and that of Dalton and Proctor's (2008) scaffolded digital reading framework. However, the current research addresses important gaps. Firstly, the importance of the teacher in creating an environment that supports reading comprehension, in teaching and modelling reading strategies and in being present to give responses and feedback. The role of the teacher in the current work is that of a collaborator. The teacher connects to the students, who are not working in isolation.

The second area addressed by the current study is what Dalton and Proctor (2008) allude to as 'social resources'. The present study makes it clear that connectedness through peer interaction is a powerful scaffold for students as they stretch beyond their current reading ability. Observation of peers' answers and

interacting in comment threads help students gain other perspectives and clarify ideas within a text that they might otherwise struggle to do if working independently.

The final gap addressed by the current study is the sense of agency and autonomy that supports students' metacognitive skills. Students require flexibility and choice in the tools and supports that they use, as well as being able to use their thinking in response to questions. Having a voice and providing their reactions to the ideas they meet, provides a means of developing a deeper, more critical response to texts.

As described in Chapter Two, the theoretical lens through which we view reading comprehension cannot be narrowed down to a single framework. Instead, an amalgamation of conceptual frameworks is a more appropriate way of visualising the complexity of reading comprehension. The components of the synthesised framework were discussed in detail in Chapter Two. Yet, it is timely to revisit this integration of conceptual frameworks (Figure 5.2) considering the findings of this study. The overlapping constructs of the personal dimension and the social dimension of reading comprehension are seen in the analysis of findings that address two of the research questions: the characteristics of the platform to support reading comprehension and the impact the platform has on student engagement. The overlapping constructs of knowledge building and cognition are seen clearly when the findings address the crux of the two remaining research questions: using comprehension strategies and improving reading comprehension. Integral to, and spanning across the four dimensions of the Reading Apprenticeship Framework (Schoenbach et al., 2012) as it is presented in a digital space, is the concept of Connectivism (Siemens, 2004). This chapter will confirm that when the 'do-it-on-your-own' learning of the 20th century (Kivunja, 2014; Siemens, 2004) is superseded by connected learning, social interactions on a digital platform have the facility to empower students to develop their thinking and build their knowledge.

Actively Learn
and Reading Comprehension:
Theoretical Foundations of this Study

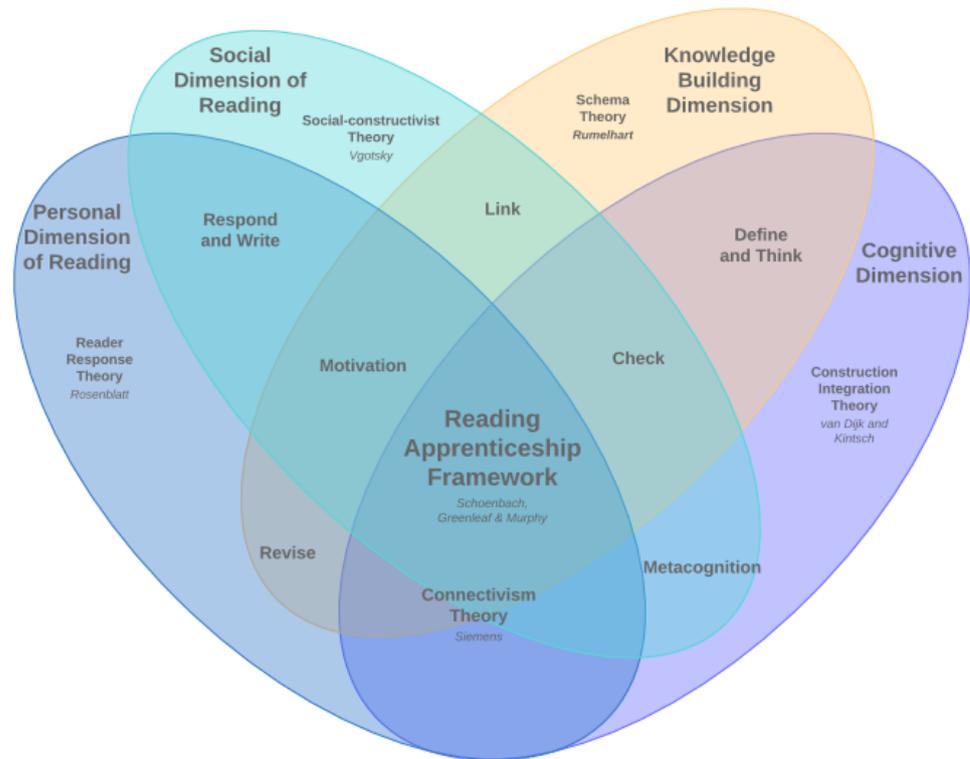


Figure 5.2. Reading comprehension – a synthesis of theories

Findings Related to Agency and Autonomy

When addressing agency and autonomy, the focus is on the personal and cognitive dimensions of reading according to the Reading Apprenticeship Framework (Schoenbach et al., 2012), as discussed in Chapter Two. Here we find Rosenblatt’s Reader Response Theory (Rosenblatt, 1982) working in tandem with van Dijk and Kintsch’s (1983) Construction-Integration theory. Through making the text personal to themselves, students have ownership of the text. This may be by including their thinking in responses as promoted by Rosenblatt (1982). Engaging cognitively in a text the reader constructs a base for understanding directly from the text and integrates this with their world knowledge, adapting mental models as they read (van Dijk & Kintsch, 1983).

The qualitative and quantitative findings indicate that the affordances of the programme suited different students in different ways. Students used various support

tools as they engaged with the platform, which allowed them to personalise the reading experience. This finding would suggest that a useful aspect of *Actively Learn* is to facilitate the metacognitive process by providing questions students can use to actively think about their understanding of what they have read, at the moment that it is happening. It also allows a time to pause, take a break from the reading, do some thinking, and even generate questions. The implication is that it requires an active thinking process. Through reflecting on the answers or comments of others, students can reflect on their understanding.

The availability of support tools, and having agency and autonomy in the selection of which tools to use, has been identified as a useful function of the platform. Adaptation of text features to suit personal needs resulted in personal ownership of answers and interactions while participating in the reading process. This enabled students to use their efforts and the available resources to problem-solve when facing difficulty. Results indicated the importance of stating an opinion and giving ‘voice’ to personal thinking, rather than retrieval from the text. Being able to “open up how I felt” was a sentiment stated by many students. The concept of autonomy and the freedom to choose which tools to use and integrate their thinking is well supported by self-determination theory (Deci & Ryan, 2000). A sense of autonomy and ownership during learning can lead to intrinsic motivation and better learning (Deci & Ryan, 2000). Van Dijk and Kintsch’s Construction-Integration Model (1983), an underpinning cognitive theory of this study, reinforces this finding. Students used their prior knowledge, in combination with making connections to the text, thus constructing a personal mental model.

The current study found that changing the background colour or the font were features of the platform not frequently used. This suggests that most students accepted the digital format of reading they faced, however, having these options available meant those students who either needed or wanted an alternative means of viewing the screen, had the affordance to do so. Such freedom to adapt the text or layout reinforces the concept that catering to the ‘average’ student does not necessarily work for everyone (Rose, 2015); having tools available to allow students to personalise the reading experience for themselves encourages ownership over their learning. The tools enabled students to work at their own pace using as many or as few of the supports as they needed.

If students have the agency to interact actively, and to problem-solve any misunderstandings, they have supports that encourage the engagement required for the reading. When students participated in *Actively Learn* with a high level of agency, they showed a greater depth of thinking in their responses. The present study raises the possibility that using *Actively Learn* gave some students access to reading activities that may have previously been too difficult.

The Impact of Vocabulary Support

The opportunity to solve a lack of understanding of a word in the moment of reading was useful for students. An interesting finding was that the most frequently used tool was the ‘define a word’ tool. This result may be explained by the fact that being able to address word-level difficulties at the moment the problem occurs has been found to help support the reading comprehension process. This finding is consistent with other studies that emphasise the crucial role vocabulary development plays in reading comprehension (Caccamise & Snyder, 2005; Castles, Rastle, & Nation, 2018; Dymock & Nicholson, 2010; Nation, 2005; Nitzkin, Katzir, & Shulkind, 2014; Tunmer & Chapman, 2012). Skipping a word and carrying on with a text can change the meaning and leave gaps in understanding. Some students identified the lack of understanding of words as a barrier to their reading. Being provided with a means of immediately accessing a useful definition was the most frequently used tool for many students. A repeatedly stated challenge that students found with reading at secondary school was the “big words, hard words”; words that they did not know.

Understanding most of the words in a text is one of the key steps towards understanding the text (Castles, Rastle, & Nation, 2018; Gala & Ziegler, 2016; Nation, 2005). Word length and the number of ‘unique’ words used have an effect on lexical complexity to such an extent that meaning can be misinterpreted (Averbeck & Miller, 2014).

Many students in the current research reported that word-level problems held them back in secondary-level reading. For some students, the definition tool having an auditory component helped them to know the correct pronunciation of the word. The results revealed the definition tool was used by 80% of the participants. This finding reveals the importance of being able to solve word-level misunderstandings as they occur. It also reinforces that by knowing what a word means helps to develop a more accurate mental model in which comprehension can be supported. The study

revealed that the use of *Actively Learn* could potentially have an impact on developing vocabulary. However, the more immediate effect was that of plugging the gaps in vocabulary knowledge. By using the definition tool, readers are exposed to the meaning of new words. Similarly, by using the text-to-speech tool to hear a word, students can gain pronunciation knowledge.

Previous studies have found that struggling readers are often exposed to less challenging, simplified or summarised material (Murphy & Murphy, 2018; Schoenbach, Greenleaf, & Murphy, 2012; Westbrook, Sutherland, Oakhill, & Sullivan, 2019). Although teachers do this as a support for students, it can have the impact of not extending the vocabulary of struggling readers. Through using the definition tool, students in the current study stated that they immediately had a way of finding out what a confusing word meant, or indeed how it sounded. Many students said that with a paper version, they would be more likely to skip past the complicated word and just carry on reading, sometimes leading to a deterioration in their understanding.

The key here was the agency of students and the motivation to find the meaning. Some students, particularly those who used the text-to-speech tool, made little effort to find the meanings of words and skipped over unknown words. A small minority of students chose to simply listen and did not follow the words with their eyes. In such situations, students may be developing their listening comprehension and may also be developing their understanding of new vocabulary. However, they may instead be in a position of ‘learned helplessness’ (Dweck, 2012) where minimal effort is made to learn new words and solve difficulties in understanding.

The use of this tool is supported by the cognitive theory of learning, particularly related to schema theory (Rumelhart, 1980a). An unknown word provides no connections for students to latch onto, and if the meaning is not gleaned from a crucial word, an abyss remains in the schema, restricting further understanding. In many cases at the secondary level, context is not enough to discover the meaning of a word. Thus, building word knowledge is aiding the building of understanding.

The Impact of Text-to-Speech Tool: Strategic Use Versus Passive Use

The evidence from this study suggests that not all students who used the text-to-speech did so for the same reasons. While the data initially indicate that almost half

of the students in the study used the text-to-speech tool, the empirical evidence reveals that less than one-fifth of the participant students used the text-to-speech tool all the time. Those who used the tool selectively stated that they used it as support – when they were tired, or while reading a more challenging or lengthy text, or when finding out how a word sounded. The reason for this is not apparent. However, one possible implication might be that those who used the tool selectively were more agentic than their peers who listened to the text every time *Actively Learn* was used. It may be that these participants benefitted from having text-to-speech available to fill in gaps in word knowledge, rather than as compensation for a general lack of phonological awareness.

Another important finding was that for students who were in the Learning Support class, or who were struggling readers, having the text read to them made it easier to understand. For some, the use of text-to-speech meant they did not lose track, due to the synchronised highlighting. This finding broadly supports other studies which found that text-to-speech tools help students with dyslexia, students with English as a second language and students with attention deficits (Harrison, Dwyer, & Castek, 2014; Wood, Moxley, Tighe, & Wagner, 2018). Use of a text-to-speech tool could be interpreted as a way of providing a model of fluent reading and be a means for struggling students to be involved in what the class is doing, thus avoiding the roadblock of slow, arduous reading that some students face. Conversely, other studies have shown that we need to be cautious of over-use of tools such as text-to-speech (Dalton & Strangman, 2006; Dalton & Proctor, 2008) due to the variance in their effectiveness for different profiles of learners. Erickson (2013) highlights this inconsistency of impact on comprehension in a study whereby text-to-speech supported students with the lowest reading comprehension ability. She found that text-to-speech interfered with the development of reading comprehension for the most capable of silent readers (Erickson, 2013). Yet, in a small-scale study by Meyer and Bouck (2014), it was found that the use of text-to-speech did not affect reading comprehension, but it influenced students' sense of independence and social validity.

For students who used the text-to-speech tool selectively, the text-to-speech option gave them the facility to become 'unstuck' if facing difficulty. One interpretation of this finding was that students who had confidence in their reading used the tool selectively either when words became difficult or when they were not in a reading mood. For students lacking reading confidence, the tool became a means

of either supporting the reading or merely avoiding the text. The students who were reliant on the text-to-speech tool were those who were struggling readers, as indicated by their PATC, or were dyslexic, and enjoyed aural support to make their reading more fluent. In this situation, Meyer and Bouck's (2014) above-mentioned 'sense of independence and social validity' may have taken effect here, with the text-to-speech tool acting as a means for students to be a participant in the class.

For students who used the text-to-speech tool every time they used the platform, there are three possible explanations as to why this tool might be preferred. Firstly, the students may have difficulty with phonological skills, and by listening, it helps them have a better understanding of the words. It may be used to fill the gaps of the 'big words' or 'tricky words' that many students said they found difficult when facing lengthy texts. Language comprehension has a strong connection with reading comprehension (Gough & Tunmer, 1986; Oakhill, Cain, & Elbro, 2015), and by listening, students are amplifying their understanding of a text. Particularly for students with dyslexia, the use of this tool allowed them to show their understanding of ideas when answering questions without labouring through the exhaustive process of decoding unfamiliar words. However, according to Oakhill et al. (2015), good language comprehension is more important in advanced reading than word recognition. They further explain that there is a high correlation between listening comprehension and reading comprehension; thus, some students with poor reading comprehension also struggle to understand ideas when they are being read to (Oakhill, Cain, & Elbro, 2015).

An interesting finding in this study was that students with dyslexia generally showed greater progress than learning support students, despite also using the text-to-speech tool frequently. This finding could be explained by them having well-developed listening comprehension skills, and with the support of a listening tool, they were able to engage and interact with the texts. Although in the standardised test at the end of the year the dyslexic students did not make greater progress than the cohort group, they made more improvement, even in a paper format with no assistive technology, than the learning support students.

A further function of the text-to-speech tool was mentioned by one student who said that the listening tool enabled her to slow down and focus. I have encountered students who arrive at high school with pride that they have been taught 'speed reading' at primary school. However, reading fast without understanding is

merely proficiently decoding the words on a page. This finding is supported by research that states that in-depth reading is a result of slow, contemplative reading, rather than speed reading that leads to skim reading (Seaboyer, 2020; Wolf, 2018b). In a similar vein, a capable adult reader who studied French at high school, but did not continue to use the language, may be able to read out the words of a French text yet have little understanding. Real fluency refers to accuracy, prosody, and flow. Using the text-to-speech tool to regulate reading speed could be a deliberate attempt to focus on the content and ensure understanding.

A third interpretation of the permanent use of the text-to-speech tool could be that it was used as a means of avoiding reading, particularly for students who did not follow the synchronised highlighting of words. The audio obviates the need to decode, and a previous study has suggested that this compensates for lack of decoding skills (Wood, Moxley, Tighe, & Wagner, 2018). This study identified that some students arrive at secondary school with severe limitations in their reading ability. As a decoding test was not included in this research, it is impossible to state explicitly that this is the reason for the delay in reading. However, some students said they struggled with reading. One student stated that his mother also found reading difficult. If we have evidence of inter-generational reading disability in New Zealand, the question arises as to how the teaching of reading is being addressed as we move into the third decade of the 21st-century. Further research is required to provide a more informed response.

Listening to the text provided struggling students with a means of participating as part of the class. It has also been found that listening to texts being read, through parents or teachers reading, or through e-books or podcasts, can help build vocabulary and have a positive effect on reading comprehension (Duursma, Augustyn, & Zuckerman, 2008; Westbrook, Sutherland, Oakhill, & Sullivan, 2019). If students were not read to often when they were children, listening to text is a further way of gaining exposure to new words. According to Wood et al. (2018), simultaneously providing students with an oral form of a written text removes the need to decode text and thus aids their comprehension of written texts. However, listening to text without being explicitly taught to decode or use comprehension strategies is unlikely to facilitate huge shifts in unassisted reading comprehension of paper texts, when assistive technology is not available.

Critical Thinking Through Personalised Responses

The results of this study indicate that students preferred answering questions where they had to respond with their thinking or opinions. All the teachers stated their questions were aimed at developing students' use of reading comprehension strategies and thinking skills, rather than merely providing 'retrieval' questions. If using the *Actively Learn* catalogue, it was important to personalise those questions to the class rather than use the mainly retrieval questions already located within the document. The lower-order thinking in Bloom's taxonomy (Anderson & Krathwohl, 2001; Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956) was used as entry questions to encourage students to explain or summarise information. Higher-order thinking skills that required students to make inferences, explain or interpret ideas, put forward an opinion, and make predictions were the primary focus of questions. An interesting association with this concept is that more than simply focusing on understanding *what* they were reading, students enjoyed the chance to state *what they thought* and offer an opinion, reinforcing the theme of agency and autonomy. The critical factor here was that by engaging in answering questions, students needed to process what they were reading, and could not just 'pretend' to be reading. This study has been able to demonstrate that an essential feature of digital technology is more than access to information, but the impact technology can have on students learning to think (Joyce & Calhoun, 2012). Working with students to connect their reading to the thinking process, is supported by other studies which have found that teaching reading and thinking together leads to gains in both reading and thinking (Coiro, 2011). Knowledge needs to be activated during the reading process (Castles, Rastle, & Nation, 2018) and *Actively Learn* can support this development of thinking and understanding through teachers interspersing higher-order questions into the text.

Interestingly, a finding that emerged from this study was that students who struggled with reading were more likely to state they preferred questions that required retrieval of facts, and literal interpretations, rather than inferential interpretations. They preferred questions where they could simply skim through the text and find an answer. These students said they would 'go back over the text and look for an answer'. They either lacked the inferencing skills and thinking skills associated with strong readers, or they lacked the perseverance to read and process information. This finding is consistent with that of Oakhill et al. (2015), who found that students who struggled with reading comprehension did not have difficulty

finding factual and literal information within a text to answer a question. The area where these students had difficulty was in integrating their knowledge or when being asked to write a summary (Oakhill, Cain, & Elbro, 2015). Posing questions during the reading process provides a means for students to monitor their comprehension while in the act of reading (Harrison, Dwyer, & Castek, 2014). This supports Castles et al. (2018) that monitoring comprehension during the reading, rather than posing questions at the end, taps into students' thinking when they are doing it and more clearly shows the understanding that is taking place.

Findings Related to Connectedness

This section focuses on the personal, social, and knowledge building dimensions of reading according to the Reading Apprenticeship Framework (Schoenbach et al., 2012), as discussed in Chapter Two. Making connections implies a social construct, the ability to go beyond oneself and seek support from others. Vygotsky's Social Constructivist Theory (1978) underpins the social concept of the value of making connections. Connections may be in the form of interacting with other class members in a digital space, gaining feedback from the teacher, or choosing to use assistive tools or embedded URL links. By making these connections, schemata are further developed. Rumelhart's Schema Theory (1980a) is reinforced through many students stating that they built their understanding through seeing other students' answers or discussing ideas with others on the discussion threads and seeing another perspective.

Technological innovations allow connections to happen in a way that would not have been possible in a non-digital format. Siemens' (2004) Connectivism Theory reinforces the notion that participation can take place between teachers and students that leads to knowledge building. The concept of Connectivism reveals that students do not need to be isolated in their learning. The social aspect of learning allows students to have a diversity of ideas and provides a platform whereby students can seek knowledge from each other or through the use of assistive tools. Results of this study indicate that the ability to connect with others, either through viewing other students' answers, connecting to a discussion thread, gaining feedback from their teacher, or connecting to a link, appears to be a positive characteristic of the platform and an opportunity to build knowledge.

An interesting finding of this study was that the assistive features of the tools available enabled students with dyslexia, or who were struggling readers, to have a sense of independence while connecting with the texts. This analysis confirms previous studies where students who struggle with reading are often dependent on their teacher or other students (Schoenbach, Greenleaf, & Murphy, 2012; Temple, 2013). However, by using a platform with assistive features, all students had access to the text by using the tools available. This social aspect of reading is often missed in cognitive models. Vygotsky's (1978) social-constructivist model underlines the importance of scaffolding learning. Having an opportunity to share their mental model, and to see the way other students had interpreted the text, provided a two-fold benefit. Not only did it provide an opportunity for personal thinking and ownership of ideas, but it also allowed for reflection to take place, as they viewed the answers of others and pondered the ways other students had responded to a question.

Social and Interactive Affordances of Actively Learn

In alignment with the present results, previous studies have demonstrated that interacting with others can provide a more in-depth insight into understanding the ideas within a text, (Fisher, Frey, & Hattie, 2016; Freebody & Luke, 1990; Harrison, Dwyer, & Castek, 2014). However, why this occurs is not clear (Fisher, Frey, & Hattie, 2016). Findings in the current study suggest that interacting with other students, whether by using the discussion thread or by looking at someone else's answer, allowed students to see another perspective or a different interpretation of an idea. Such interaction enabled students to expand on their thinking and assist with their understanding of a text. Only 45% of participants stated they took part in a discussion thread, and data were inconclusive as to whether this had an impact on achievement. However, the literature reveals that the students who benefit most from discussion and interaction are the struggling readers (Fisher, Frey, & Hattie, 2016). As such, this aspect of the digital platform is one worth explicitly developing further. This finding would suggest that by improving the confidence in students to interact in discussions, it is providing a chance for them to develop and use their thinking actively. Coined 'interthinking' by Littleton and Mercer (2013), talking together can be a way for students to think together as they interact. Although *Actively Learn* is a digital tool and the 'talk' space is a note or a discussion forum, rather than an oral conversation, a similar concept applies and represents a socio-constructivist approach

to learning. This concept is explained by Harrison et al. (2014) who describe such forums as a means of turning reading into an inquiry. A digital forum space can offer the benefit of allowing time for students to discuss ideas and work together to deepen their understanding. This moves comprehension away from being a search to retrieve a 'right' answer, to an opportunity for discussion and thinking. Comprehension is reframed as a deep-thinking process, whereby the collaborative approach to learning means students are scaffolding each other's thinking.

The current study contained more evidence of 'cumulative talk' (Mercer, 2013), whereby students agreed with a previous comment and added their ideas. However, brief evidence of students engaging in 'exploratory talk' (Mercer, 2013), that is, challenging ideas and justifying their thinking, occurred towards the end of the study. This is an area that students would benefit from being taught early in the use of the tool. Being given a chance to practise finding evidence to support their assertions, and moving beyond do-it-on-your-own learning (Kivunja, 2014) to learning that has text-focused interactions with peers, encourages more in-depth interpretations (Harrison, Dwyer, & Castek, 2014). As mentioned in Chapter Two, there is a need for the teacher to explicitly teach the skills of purposeful discussion (Anstey & Bull, 2018; Mercer, 1994; Mercer, 2013; Uzuner, 2007) to facilitate the exploration of ideas and the construction of knowledge.

Prior studies have noted the importance of discussion and interaction in the development of thinking; yet, Fisher et al. (2016) point out that whole-class discussions, mediated by the teacher, are often brief and provide little time for deepening knowledge. The real value of a discussion is where students talk to each other and have the opportunity to clarify their thinking, without the teacher being the centre point for facilitating the discussion (Alvermann, 2002; Fisher, Frey, & Hattie, 2016; Littleton & Mercer, 2013; Mercer, 2013). The note tool on *Actively Learn* was such a space for students to interact with each other in the discussion of ideas. The current study revealed that for many students, the use of a discussion thread was a valuable part of the platform, however, the use of this tool was dependent on the teacher teaching the skills of interactive discussion and encouraging its regular use.

It has been postulated by previous studies that essential skills required to be an educated person in the 21st century are reading, writing and numeracy (Kivunja, 2014; Trilling & Fadel, 2009). Expanding on from these essential skills are the learning and innovation skills of critical thinking, problem-solving, communicating

and creativity (Kivunja, 2014). The current study reinforces the importance of these past findings, which show that reading comprehension, thinking, responding and connecting are not only essential skills; they are building blocks for future learning. The use of digital technology should foster critical thinking and communication of ideas (Bolstad & Gilbert, 2006) and the further development of the notes and discussion tool is an area I see as an important focus for future classroom interactions using *Actively Learn*.

Engagement and Motivation

The proposed ACT model that emerged from this study is reinforced by earlier research on motivation. Deci and Ryan (2000) emphasise that autonomy and the sense of being connected to others lead to a higher likelihood of engagement in an activity. Data collected from teachers and students appear to indicate that this intervention may have been successful in engaging the participants in this study. The current study found that many students showed focus and persistence when using *Actively Learn*. However, there were students for whom *Actively Learn* was only another class activity, no more engaging in their life than any other task at school. Several students stated that mood or tiredness had an impact on their reading engagement. Having access to the text-to-speech kept some students engaged who would otherwise ‘switch off’ or ‘zone out’.

The results of this study indicate that many students felt a sense of self-efficacy when grades for their answers moved from Basic to Proficient and then to Advanced. One student stated that he felt good when someone commented on his discussion thread. The engagement felt by these students was linked to motivation; motivation to interact or motivation to improve. This finding is supported by Jacobs (2012) who argues that it is not the use of technology per se that is the motivating factor for learners; it is the participatory environment of digital spaces, which encourage connection and interaction, that influence motivation.

A further engagement factor indicated by the results was the ability to view other students’ responses. Other students’ ideas could be used for the clarification of concepts and represented a model for how to respond to the questions. If topic knowledge was limited, some participants read other students’ answers to check if they were on the right track. In some cases, they realised they had misunderstood the text. This finding supports studies by Caccamise and Snyder (2005), who found that

inaccurate knowledge when reading led to a misrepresented mental model when processing ideas in the text. The gap in knowledge created by a schematic misconception cannot necessarily be plugged by context, and therefore ideas become disjointed. With reference to the ACT model of reading comprehension, having the agency and autonomy to use digital tools if lacking certainty in the moment of reading, and the ability to make connections beyond the isolated reading experience, either to other students, an embedded link, or a vocabulary tool, can help rectify the gaps in knowledge immediately. This finding implies that using assistive tools, connecting to others, having the agency to answer questions with their reactions or having choices of texts, can lead to students developing engagement. It can also help build their world knowledge through access to reading materials they might not have been able to delve into without assistive technology.

Many students stated that they found reading in this digital format easier than sitting down and reading a book. Previous studies have suggested that providing online reading opportunities helps struggling students develop skills that enhance their reading capacity (Castek, Zawilinski, McVerry, O'Byrne, & Leu, 2011). A note of caution is due here, however. Although reading short chunks at a time can be a technique for engaging students and hooking them into the thinking associated with reading, it has been suggested that to develop deep, sophisticated reading skills, students need time reading printed texts, and extended texts (Seaboyer, 2020; Wolf, 2018b). A means of solving this problem could be to make the chunks longer as students become more skilled at responding to texts. It could also be done as part of the English programme whereby personal reading is encouraged in association with school libraries. Encouraging students to select a book, either paper or e-book version, and persist in reading, is a way that students can personally use the deep reading skills they have been learning. The key here is deep reading, and *Actively Learn* encourages the slowing down of reading, the thinking while reading, the attention to material covered, and the development of critical thinking and the ability to see another perspective. Using *Actively Learn* appeared to be a way of engaging students who were not keen readers and providing access to reading development opportunities.

Being able to solve their problems, such as the meaning of a word, was empowering for some students. Being able to say, "Oh, that makes more sense" after seeing or hearing a definition enabled some students not to give up. There was a

sense that using *Actively Learn* removed the frustration for some students because it provided appropriate scaffolding to students at critical moments in their reading, such as when encountering an unknown word.

Conversely, passive learners who may listen to a text without following the words on a screen and who simply want to ‘quickly get work done’, lack the quality of deep learning through shallow interaction with both the text and the other learners. Unless teachers can use tools to help struggling students change their self-beliefs, and develop a sense of self-efficacy, we will continue to observe a Matthew Effect (Stanovich, 1986) pattern of achievement at secondary schools of the rich getting richer and the poor getting poorer. A factor in combating the ‘rich getting richer’ syndrome is to provide practice and support in reading comprehension, particularly as students enter high school. Exposure to a variety of texts and topics supports the building of both knowledge and vocabulary. Thus, having content area teachers promoting reading and vocabulary development through an interactive tool such as *Actively Learn*, students with a wide range of abilities could be supported in the ‘reading to learn’ process and put their critical thinking skills to use.

Self-Monitoring, Peer-Mentoring

A key finding that emerges from the analysis connects to the social constructivist view of reading comprehension that *Actively Learn* creates. Opportunities for scaffolding across the zone of proximal development (ZPD) (Vygotsky, 1978) when using this platform, revealed that students are not working in isolation but can see someone else's work once they have written their answer. As such, they can use other students answers as a scaffold to model how to structure their future answers. The tool allowed students to deepen their understanding of a text by reading the responses of other students. A mentor can *show* other students how to complete a task, whereas *Actively Learn* allows a student a sense of agency and choice to reflect on ideas from their peers and take a richer understanding back to their work. This finding was a means of students not only monitoring their work through checking in with other students, but also making judgements about their work and choices about modifying what they had done. In an earlier study that investigated digital platforms which encourage online creations and user-generated content, it was found that students who saw each other's work and commented on it in a digital space of shared interest were able to gain deeper learning (Magnifico, Lammers, & Fields, 2018). Although

Actively Learn cannot be defined as an ‘affinity space’ (Gee, 2017; Gee, 2018) – a participatory space where people have a common interest or engage in a common activity – teachers can create affinity spaces through this platform by providing texts that meet the common interests of students in the class. Exercising agency and developing the motivation to explore what someone else has written is not only a form of monitoring their work but as one teacher put it, is a form of ‘peer-tutoring’. For some who were unsure about their answer to a question, checking the responses of other students was a process of self-affirmation that they were on the right track with their understanding.

The current study found that 68% of students used the note-making tool, yet only 45% commented on someone else’s note. The present study confirms that some students can feel intimidated putting their comments out into a social space (Magnifico, Lammers, & Fields, 2018), and it is the role of the teacher to find ways of interacting that suits their class. One teacher in this research stated that she asked students to choose their best answer and put it onto a note on which others could comment. There is no single ‘correct’ way of using the note tool, however, using a scaffold of prompts was a method two teachers in this study developed to increase the participation and interaction of their students. This form of ‘participatory culture’ can be a motivating factor for students (Jacobs, 2012). If we view literacy development as a form of self-expression (Kalantzis & Cope, 2012), and a means of thinking and responding to texts, then *Actively Learn*’s ability to have a social connection with others in the class connects strongly to Vygotsky’s social constructivist views.

This study revealed that through observations of their peers’ responses, students developed a sense of self-efficacy. Seeing classmates answering questions, and interacting with discussion threads, enabled students to learn in their ZPD with the more capable other being a fellow class member. Conforming to previous studies, the vicarious experience of seeing peers taking on a task, and observing the success of other students of similar ability, can influence a student’s belief that they too can be successful (Bandura, 1997; Schunk, 1987).

In using *Actively Learn*, students commented that seeing other students’ answers had three major effects on their work. Firstly, some students stated that they ‘realised they were on the right track’ as their understanding matched that of a peer within the class. A second affordance of the vicarious experience was to help them

develop their knowledge. If a student saw that several other students' answers were along a different vein of understanding, some students stated they realised they had not quite understood the text. Through seeing other students' work encouraged them to look back at the text again and helped them clarify their understanding. It was also a means by which students could see that there were other perspectives within the class. This approach reflected a critical literacy model (Kalantzis & Cope, 2012) whereby students could participate, have a voice and be able to respond with their thinking. Students could work at their own pace; they then had the facility to ask for a revision if they felt there was more they could add to their answer. Students were not anchored to their first answer but were able to go back and make adjustments as their thinking changed.

A final affordance of the vicarious nature of seeing other students' answers, was to see the quantity, detail and depth with which peers were answering questions. For some students, this made them realise they could be showing more thinking and adding depth to their responses. Indeed, some participants stated they asked for a revision when they wanted to add more depth to an answer. This form of self-development and self-regulating of their responses was entirely available through using a digital platform. *Actively Learn* not only allowed for connections between students, but also allowed a student not to remain 'fixed' in their response, but to make adaptations if they felt a further depth of explanation was needed.

Several teachers in the study stated that answering questions and using the note tool were ways for the quiet students to 'have a voice' and made mention that most of the students would not say as much in an oral class discussion as they state in their answers online. The traditional form of questioning in many classrooms is that of initiate-respond-evaluate (Cazden, 1988) whereby the teacher orally questions a class, a few confident students respond, and the teacher provides an evaluation of the answer. Often a 'correct' answer is sought. Conversely, in adherence to Rosenblatt's (1982) Reader Response Theory, every student using *Actively Learn* could answer each question, could have an opinion and could see how each other had responded, even if they would not usually contribute to an oral discussion. Fisher et al. (2016) posit that true discussion is where students can talk about ideas without the teacher being the centre of the discussion. Interacting using the notes tool to create a discussion thread is one such way of students guiding their own discussions. In such

a community of learners, students could co-construct their understanding of a text and build new knowledge.

Findings Related to the Importance of the Teacher's Role

One of the most important findings to emerge from the data analysis was the vital role teachers play, even in the digital age. Through providing instructional support, teachers guided students through the zone of proximal development (Vygotsky, 1978) and enabled students to read texts using thinking skills at the time of reading. Earlier studies have found that when students have the support of their teacher and classmates, they can read texts which may be more complicated than they would attempt alone (Lupo, Strong, & Smith, 2018). By providing supported opportunities to engage with texts, and encouraging the use of critical thinking skills, students are given opportunities to develop their comprehension. This key element requires the teachers to explicitly teach comprehension strategies, provide the supports that build vocabulary and prior knowledge and provide an environment of care and connectedness in which students can feel confident to participate with their thinking and develop their knowledge.

The focus of this section is on the cognitive and knowledge-building dimensions of reading, according to the Reading Apprenticeship Framework (Schoenbach, Greenleaf, & Murphy, 2012). One theoretical framework supporting the development of cognitive skills is the Construction-Integration model (van Dijk & Kintsch, 1983). This theory reinforces the idea that constructing meaning from a text is done in association with prior knowledge. Making inferences, monitoring what is being read and integrating new information with what is known is required for active reading to be taking place. This further supports Schema Theory (Rumelhart, 1980a) whereby knowledge is built and stored in memory frameworks. This section highlights the importance of the teacher's role in targeting the learning needs of the students, teaching the strategies that support cognitive development, and providing opportunities where the strategies can be immediately used as part of the learning process.

One unanticipated finding was how important it was to students having their teacher on the platform at the time that they were answering questions, providing grades or comments. The end of year survey for each cycle of the study revealed that having teacher feedback to their answers, while they were working on a reading

activity, was a helpful feature for approximately 60% of students. Obtaining a grade helped them see if they needed to put in more depth for future answers. Students commented that it made them feel “good” or “accomplished” when they thought they were starting to improve. According to students in this study, receiving a notification from a teacher that a question had been graded was one of the top four useful features. This finding implies that immediate feedback and support is helpful to students. Having feedback from the teacher is not only viewed as positive, but having the teacher interacting at the time students were doing the thinking and answering of questions meant they could get guidance at the time of learning. In non-digital situations, feedback is given orally by the teacher in small group reading activities, or in a written form when the marking of work is completed at a time remote from the reading experience.

Fostering the agency to persist and use the support tools to solve problems of understanding or use the platform to view the work of others in the class, was a role of the teachers. Through showing the tools and encouraging their self-directed use, teachers empowered students to have agency in their learning. Teacher agency and professionalism are essential aspects of the teaching and learning process (Biesta, Priestley, & Robinson, 2015). Teachers having the capacity to tailor and target texts and strategies to meet the needs, strengths and interests of students in their classes, reinforced the theme of the vital role of teachers, even when using a digital platform.

Classroom Climate and Emotional Safety

An unanticipated finding in this study was the need to develop a class climate of support and safety when interacting in a digital space on reading comprehension activities. Students who do not enjoy reading, or struggle with reading, may feel uncomfortable writing answers that are seen by others. Eight per cent of students stated that they felt nervous with the thought that other students could see their answers, and while this was a small group, it is an important finding to consider when reflecting on students’ wellbeing and confidence. This finding led to understanding the importance of teachers creating a positive class culture and a supportive environment for students to have the courage to make attempts in thinking and learning. Maslow (1943) purported that human beings need to have a sense of safety and social belonging, both of which come before, yet are closely connected to, having a sense of self-esteem. A classroom context is a microcosm of society, and

for students to feel emotionally safe to participate and contribute, there needs to be in place an environment of trust and support. This finding is in alignment with recent research by Bull and Anstey (2019). In their work on encouraging dialogic talk in the classroom, they emphasise the importance of establishing the right conditions, which include an environment in which students feel safe and know their comments are sought after and valued by teachers and fellow students (Bull & Anstey, 2019). They mention that “going public with their thoughts” (Bull & Anstey, 2019, p. 166) requires confidence and risk-taking. While *Actively Learn* does not involve face-to-face discussion, the concept of a safe classroom environment is just as applicable. Students’ answers to questions are immediately available for others in the class to view, and discussion threads ask for them to provide their thoughts and ideas. This finding is further supported by Brevik (2019), who states that if teachers want to encourage strategic development of reading comprehension, the classroom environment must be supportive.

Adolescence can be a time in life in which people feel emotionally vulnerable. Coupled with feelings of inadequacy when other students have developed skills at primary school in which some students are limited, this can provide a student with a feeling of nervousness that their shortcomings might be exposed. This loss of confidence can lead to a sense of helplessness and a desire to hide a lack of ability rather than pursue the growth mindset (Dweck, 2012). One student in the study who had low attendance and struggled with his learning said that sometimes on *Actively Learn* he would put a full stop instead of an answer, and then he could see what other people had written. He had such a lack of confidence that he did not want anyone to see his answers, yet he would write on a ‘private note’ to the teacher.

A key aspect of class culture was developing a sense of emotional safety that what students wrote in their answers and on the discussion threads, would be respectful, and respected by others. This did not mean that students would always agree or have identical points of view, but that respecting others’ perspectives and learning the skills of polite interaction was imperative when interacting on the *Actively Learn* platform. Creating a climate of emotional warmth has long been acknowledged as an essential attribute of teachers (Kleinfeld, 1975), however, being warm and demanding is a critical attribute to transfer to the students to create high expectations of polite interactions in a digital forum. Teaching this social skill early in the use of the *Actively Learn* platform is a way of supporting students' emotional

wellbeing. For some students, this was the scariest part of using *Actively Learn*, and teachers were careful to allow students to work within their comfort zone as they developed the confidence to interact with others in the digital space, creating a supportive class culture.

Teachers Targeting and Tailoring

One focus of this study was to determine ways to incorporate teaching comprehension strategies when using an online platform to develop reading comprehension. This study has been able to demonstrate that when strategies are explicitly focused on and taught, there is a higher likelihood of them being learned and understood. While this might appear obvious, it is useful to note that even though teachers believed they were incorporating comprehension strategies into their questions in Cycle One, students were not using the strategies. It was only with the explicit focus on teaching and using the reciprocal teaching strategies (Palincsar & Brown, 1984) in Cycle Two that 45% of students were able to discuss strategy-use in the final interviews. Teachers in Cycle Two stated they promoted the strategies, with all teachers commenting that they focused on a comprehension strategy in the instructions section of the reading. Reading strategies most used by students were summarising, visualising, self-questioning, monitoring their understanding and linking the text to themselves. Bull and Anstey (2019) found that when teachers analysed their classroom practice, they were surprised how little time they spent on teaching literacy skills, particularly the cognitive aspects and thinking processes.

The ACT model portrays the relatedness between the teacher's role and student agency. 'Showing the stretch', a phrase coined by Hipkins (2017) is used to represent what Vygotsky (1978) termed as the zone of proximal development. Teachers found that showing students the stretch by providing a model of how to improve was a robust way for students to add more depth. This was particularly the case when teaching summarising of main ideas and meant teachers did not simply expect students to improve on their own. With collaborative discussion and the use of exemplars, teachers supported students to stretch beyond what they currently presented when showing their thinking, to that of adding depth. Students were encouraged to have an agentic approach and identify, with the teacher's support, ways they could move to a deeper level of answering a question.

Actively Learn proved to be a versatile tool for scaffolding the thinking that takes place when good readers read. However, merely using a digital tool as a means of supporting teaching and learning, will not replace good teaching; to be effective, a skilled and knowledgeable teacher is an essential ingredient. Teachers modelling the reciprocal teaching strategies, and then reinforcing their use when students face texts on *Actively Learn*, is a powerful way of putting the teaching into practice immediately. This finding reinforces the emergent theme of the importance of the role of the teacher. The strategies that support thinking need explicit instruction to enable students to have a toolbox of strategies to use. The findings in the current study add weight to the need to explicitly teach thinking skills and comprehension strategies as they do not necessarily occur by themselves.

Having opportunities to practise using strategies, and seeing their peers' predictions, questions, and summaries, were means of reinforcing the thinking that builds successful reading comprehension. One teacher commented that providing exemplars of reading strategies is not done as commonly as providing writing exemplars. Teachers need to talk about reading strategies and model the making of summaries and predictions.

Using the modified form of Uzuner's (2007) Educationally Valuable Talk prompts was a structure some students found useful to help them interact with a depth of thinking and a courteous approach. However, this is not a simple undertaking and involves time to develop. Research has found that feedback and comments posted in online forums can often be simple and mostly motivational, providing low-level feedback (Magnifico, Lammers, & Fields, 2018). While this may seem simplistic, it is a good starting point and one from which students can develop their polite interactions and the encouraging comments. Many students may not feel comfortable contributing to online groups, however, within the safety of a closed group such as their class *Actively Learn* site, students can begin to develop their use of the language of interaction and discussion.

Although *Actively Learn* provides an opportunity for students to respond to questions with their thinking, it is not a platform intended for students to go into and interact with, in isolation. For this tool to have an impact, teachers need to set the learning goals, to teach the reading behaviours and metacognitive skills, and respond to the students in the form of comments and grades, allowing students to know how they are doing. The *Actively Learn* platform is interactive and guided by a teacher's

knowledge of pedagogy. It is not a stand-alone, self-tutoring tool. It is an opportunity for each teacher to provide contingent scaffolding, responsive to students' needs in the moment of learning (Reynolds & Daniel, 2017). If we view scaffolding as “transfer of responsibility from teacher to student, fading of support over time, and contingency on student thinking” (Reynolds & Daniel, 2017, p. 368), *Actively Learn* is a tool that may afford these opportunities, when used by an astute teacher.

Interspersed Questions and Chunks of Text

The results indicate that the chunking of text is an engagement factor for many students. It was a frequent comment that students were put off reading by being exposed to lengthy texts with long, difficult words. Having a small segment of reading, followed by a question, enabled some students to work with what was in their head and they found the reading easier; as opposed to reaching the end of an article, having a list of questions, and then having to go back and search for information. Having the relevant question next to the segment of text has an effect of reducing the cognitive load (Sweller, Ayres, & Kalyuga, 2011). Questions placed at the end of the text require split attention between the question and the information within the text. Sweller et al. (2011) found that reducing split-attention can be an aid to reading comprehension.

Fifty-five per cent of participant students mentioned that the chunking of texts helped them to focus and think about the text, rather than quickly skimming through an article. The chunking made it easier to think about the content they were reading. For both Cycle One and Two, the analysis of results indicated that the most useful factor when using the *Actively Learn* platform was being able to answer questions during the reading, rather than waiting until the end of a complete text. This finding supports earlier work by Keene and Zimmermann (2013), who state that slowing down and focusing is a crucial benefit of using reading comprehension strategies. They add that “we need to teach kids to slow down and consider the ideas they encounter in reading” (Keene & Zimmermann, 2013, p. 604). By allowing students to provide their thinking when responding to questions, connects to Rosenblatt's (1982) Reader Response Theory enabling personal reflection to aid the understanding of a text.

For 35% of students, the achievability of reading a small section of text at a time, and responding immediately with an opinion, was the most critical factor that

helped them remain focused on the reading. Other studies confirm this finding and state that breaking a text into manageable chunks, and having pre-set questions throughout the reading process which students answer as they read, reminds students to monitor their comprehension and use metacognitive practices (Fisher, Frey, & Hattie, 2016; Willingham, 2017). Students who struggle to read, through poor decoding or comprehension, may avoid reading because they find it difficult. Yet, it is through reading regularly, that they add to their bank of vocabulary and improve their fluency. For these students, it was the chunking of text that made it more achievable and kept them connected.

It could be argued that programmes such as *Actively Learn* reinforce the reading of short passages and do nothing to support the reading of extended texts (Eyre, Berg, Mazengarb, & Lawes, 2017). However, the interspersed questions elicit thinking during the reading process and steer the reader away from the tendency to skim read, which is often associated with reading on the internet (Wolf, 2018a). A balanced reading programme encourages vocabulary development skills, personal leisure reading, listening to the teacher reading and developing reading comprehension. *Actively Learn* is a tool which can be used to support a focused approach to expanding students' comprehension skills.

Relatable Texts

It was interesting that 22% of participants stated they did not like reading or were “not a big fan of reading”, or “found reading boring” and did not spend their own time reading. Some also said reading for a long time, about a topic that was not enjoyable, made them not enjoy reading. However, many of these students acknowledged the value of reading and that *Actively Learn* was keeping their reading skill going. The reading most enjoyed was when topics were “relatable”. Some students said the non-fiction texts engaged them because it helped them learn about the world. However, some commented that scientific texts could be hard to read, particularly if they did not know much about the topic. High-interest texts had an impact on engagement. Students stated they responded with more depth of thinking when the topic suited their interest. One student said that reading an article on her passion, gymnastics, was a turning point for her engagement in reading using *Actively Learn*. This finding supports research by Biancarosa and Snow (2006) that by tuning into students' lives creates more relevant reading opportunities, and is thus

more engaging for students. Reader response theory (Rosenblatt, 1982) acknowledges that personal insights are a chance for the reader to process their thoughts and even consider other perspectives.

For some students, having a choice of topics to read about was an engagement factor. The choice factor reinforces the concept of agency and ownership over the reading. Being able to choose something of interest was for them more engaging than being forced to read about something in which they were not interested. This meant it was important for teachers to ensure that reading material was of high interest. Students stated that their engagement had a firm connection to their interest. If a reading topic was of interest, students said they went into more depth and wrote longer answers, taking time to explain their ideas. If the topic was not of interest, one student stated he would “scramble back and find an answer” so he could move on.

Four teachers stated that providing choices of texts for students was challenging to manage with regards to extra preparation and the difficulty of giving feedback at the moment they were working. Transferring their focus from students engaging in one text, to those in another, added a level of complexity to the reading task through having to move between two or three texts. Most teachers stated that *Actively Learn* was more comfortable to manage when providing one text only, even if delivering a choice increased a sense of autonomy for students.

Background knowledge has an impact on reading comprehension. Thus students having topics that appeal to their interests, or which allow them to learn about an interest of someone else in the class and join in as part of a discussion thread, is a factor that affects reading comprehension as well as motivation. The finding that students engaged with greater depth and wrote longer answers when interested in the topic supports research that domain knowledge is a compensatory factor when reading difficult text (Caccamise & Snyder, 2005). Linking to schema theory (Rumelhart, 1980a), readers elaborate on previously established structures in the brain, allowing inferences and connections to be made. Poor readers may have less background knowledge to draw upon from which they can build a schema model, or add to a structure of knowledge. Through the use of assistive tools, *Actively Learn* provides another channel for supporting reading and building knowledge at the same time. Either through supported reading through the use of text-to-speech, font change, seeing other students' responses, having a chance to

interact in a discussion or simply reading the discussion thread of others, students are enabled to expand their vocabulary and knowledge.

Practice at reading text is an essential means of gaining mastery (Murphy & Murphy, 2018). When teachers provide students with regular opportunities to practise reading, they are exposed to more chances to improve. However, as one teacher pointed out, only reading in English class is like turning up to a weekly violin lesson having done no practice. Duke and Pearson (2008/2009) compellingly argue that “all the explicit instruction in the world will not make students strong readers unless it is accompanied by lots of experience applying their knowledge, skills and strategies during actual reading” (p. 108). Reading opportunities need to be created in all curriculum areas, and leisure reading encouraged. Motivation is a factor in learning, and some students have diminished motivation for learning, either by the time they get to secondary school or because of the increased difficulty of content at the secondary level. If students exhibit behaviours, such as avoiding challenges and lacking persistence, they struggle to achieve success at secondary school (Bempechat, 1998). The key here is to be active in learning. Passivity, lacking the motivation to go beyond one’s brief responses, will influence further development.

Quantitative Standardised Test Results

The results of the PAT Reading Comprehension assessment showed the students in the study group did not make a consistently greater improvement between Test One in Term One and Test Two in Term Four than the rest of the Year 9 and 10 cohort. Although the mean scale score difference results in 2017 for Year 9 students show at a glance that students in stanines 2, 3, 4, and 5 of the study group made greater gains than the cohort Year 9 students, these results are skewed by the small number in the study group. The results indicate that using the platform every week appeared to have more impact on improvement than classes that used it fortnightly. It may merely be a truism that the more a tool is used, and the more reading students do, the more they improve. However, the learning to take from this study is that a concerted effort needs to be made to expose students to reading texts and engaging in thinking while reading if any improvement is to occur.

The 2017 Year 10 study group was made up solely of students in a Learning Support class. This group made little progress when compared with students who began the year in stanines 1-4 of the cohort group. The result for the Learning

Support class may suggest that using the digital platform had little impact on developing comprehension levels of low ability students. However, there could be other explanations. Firstly, students in the Learning Support class had been identified as having ongoing literacy difficulties. The study did not include a decoding test, and it is possible that lacking the foundational reading skills of decoding could be the central issue for these students, rather than comprehension. A future study should include a decoding test to identify if this is an underlying problem for these students. Secondly, many students in the Learning Support class used the text-to-speech tool when reading texts using *Actively Learn*. The PATC assessment involved reading a paper version of texts with no assistive technology available. It also presented texts in their complete form rather than chunked into smaller sections. The discrepancy in results could be attributed to the testing format. Perhaps sitting the digital form of the PATC, whereby students have access to changing the font and background colour, with the text chunked into smaller segments, might have had an impact on the results.

Similarly, the 2018 mean PATC results for both Year 9 and Year 10 students show little impact of the intervention on the PATC results. When viewing the mean percentage scale score differences, the 2017 Year 9 study group showed greater improvement than the cohort in stanines 1-6. However, the 2018 results do not repeat this pattern. For Year 10 students, the cohort group showed greater improvement in both years. This finding could be because the Year 10 groups involved in the study had already been identified as having literacy learning difficulties, being in either a Learning Support class or a dyslexic class. An interesting finding in the 2018 Year 10 study group was that students in the dyslexic class showed considerably greater improvement than students in the Learning Support class. A possible explanation is that dyslexic students may be better able to transfer their learning to another format. It may also represent a persistence for learning found in dyslexic students that may not exist in students requiring extra learning support. As the results are not conclusive, the interpretation is speculative and further studies delving into the use of a digital reading tool for dyslexic students would be a useful extension of this study.

An anomaly with these results was that the formats of the intervention and the assessment were not congruous. Being provided with assistive tools in the intervention through using a digital platform may have supported students in their reading comprehension. However, the standardised test PATC was a paper-based

format and used multiple-choice as the means of assessing understanding. The digital intervention asked students to respond with their thinking, yet, the multiple-choice options in the assessment asked students to pick a single correct answer. The format of the test, and that it was a single snapshot in time may have had an impact on results. However, if the results of this test are reliable, then no measurable effect was made using the platform. The lack of alignment between the intervention and the assessment makes it difficult to ascertain if any gains, or lack of, can be attributed to the digital platform. Another concern may be that *Actively Learn* provided texts in chunks with questions interspersed, whereas the PATC assessment provided longer texts to read, with questions placed at the end. For struggling readers, facing lengthy texts can be difficult, therefore *Actively Learn* should be used in conjunction with being exposed to lengthy texts, to avoid exacerbating the modern trend of skim reading associated with digital reading (Wolf, 2018a).

The way *Actively Learn* was used in this study was to focus on developing the thinking skills of predicting, questioning, responding with own ideas and summarising. Yet, neither the PATC assessment nor the e-asTTle assessment presented opportunities for students to show these skills. Kalantzis and Cope (2012) explain reading as a process by which meaning is constructed rather than a mechanism for communicating facts. As such, they emphasise that reading comprehension tests which use multiple-choice answers are limited in what they can find out about a student's understanding. This study queries reading comprehension tests and the way they are used. Are they tools for ranking students, or for providing information to support reading comprehension development?

A sobering finding was that during Cycle Two, students in the Year 10 Learning Support class showed a regression in their PAT Reading Comprehension standardised test results at the end of the year. This was despite having had a teacher who used the platform weekly, with fidelity, and tailored the texts to meet the students' interests or linked texts to the topic being studied in the English class. These Learning Support students may have internalised the idea that they are poor readers. However, a further explanation for this may be more to do with the students' learning dispositions than their interaction with the digital platform; if students expect to do poorly on a reading test, they may make less effort. Knowing that they are still struggling with reading, and having to face a pen and paper test which includes a booklet of eight different texts, for which multiple-choice answers have to

be given, some students may not have the desire or effort even to attempt the readings. The feelings of efficacy for reading, particularly when in-class reading has involved support with either digital tools or teachers reading difficult passages to them, may result in a lack of effort for a test that reinforces their lack of ability.

A change that occurred in the study school, because of this research and in consultation with NZCER, was the provision of PAT Reading Comprehension tests at different levels, rather than a uniform test for a whole cohort. The PAT Manual (Darr, McDowell, Ferral, Twist, & Watson, 2008) states that not all tests are suitable for administration to a whole cohort. The manual reinforces that tests must be differentiated to match students' knowledge and skills (Darr, McDowell, Ferral, Twist, & Watson, 2008). This is supported by Oakhill et al. (2015) who state we need tests that are sensitive enough to differentiate between students of different ability levels. Despite this, many New Zealand schools test a whole year group with the same test. By providing students with a test that is too difficult, a floor effect may occur by which students answer very few questions correctly, and the test information is both unreliable and not useful.

Similarly, a test that provides an almost perfect score leads to a ceiling effect, which is equally as unreliable and unuseful (Darr, McDowell, Ferral, Twist, & Watson, 2008; Oakhill, Cain, & Elbro, 2015). The study school has since changed the standardised test protocol to allow for variation of test booklets within a cohort, particularly for dyslexic and learning support students. If a student sits a test that more accurately reflects their ability, the information gained about scale score progress is of higher value to the teacher and more accurately reflects a student's actual progress.

Implications for Assessment

The main weakness in using these results is that previous literature explains that reading comprehension is not a single construct and as such, is not easily measured (Castles, Rastle, & Nation, 2018; van den Broek & Espin, 2012). It is difficult to know what is going on in a student's mind as they sit a multiple-choice reading test and it is difficult to tell if the student is reading the passages thoroughly or scanning the text to search for answers. Another drawback is that PATC results are meant to be reported after a year, whereas for the current study, the time was less than one year. NZCER states that "the lack of precision may be exacerbated when the time

period between measurements is less than a year” (Darr, McDowell, Ferral, Twist, & Watson, 2008, p. 20). As reported by Snow and Biancarosa (2003), standardised measures of reading comprehension “are notoriously insensitive to changes wrought by intervention” (p. 16). The development of the thinking skills associated with reading comprehension is difficult to measure in a multiple-choice test. Previous studies have found a variance between short-answer tests of reading comprehension and multiple-choice tests (Graesser, 2007; Zawoyski & Ardoin, 2019). Short-answer questions that require students to think about cause or consequence (Graesser, 2007), or allow for higher-level thinking rather than recall (Zawoyski & Ardoin, 2019), are said to be a better measure of the thinking that is associated with reading comprehension. Rather than encouraging deep thinking about the text, multiple-choice questions encourage students to search the text for answers rather than read passages for thorough understanding (Zawoyski & Ardoin, 2019).

An investigation into the equivalence between the PAT online reading comprehension assessment and the paper version found that on average, online tests scored lower than tests taken in the paper version (Eyre, Berg, Mazengarb, & Lawes, 2017). One suggestion made for the lower performance in the online mode was the mismatch between classroom and assessment experience (Eyre, Berg, Mazengarb, & Lawes, 2017), with most reading comprehension in classes taking place in a paper format. An opposite problem has arisen in the current study; students had digital exposure to short segments of text but were tested on paper with extended texts.

The report also referred to a United States study, comparing paper-based assessment with online assessment, that highlighted high-performing students did better on digital assessments and lower ability students did not benefit from having the test presented in a digital format (Eyre, Berg, Mazengarb, & Lawes, 2017). However, with the explosion of digital tools being a pervasive part of education, and indeed life, over the latter part of the decade, it would be interesting to know if this finding is still applicable. The report has suggested that the online PATC could be improved by using short blocks of text, with interspersed questions (Eyre, Berg, Mazengarb, & Lawes, 2017). Such a test may have been more beneficial for the students in the current study. The PATC online platform is more closely aligned to the *Actively Learn* platform as it allows for the change of font style, size, colour, background colour and students are also able to revise their answers.

An alternative type of reading comprehension test that might be more appropriate in the digital age would be something akin to the PISA reading comprehension tests (OECD, 2018). These tests provide many short-answer questions for students to present their reasoning, rather than merely clicking a multiple-choice answer. Some multiple-choice questions are included; however, for many, there is the facility for students to explain their choice, with reference to the text. Providing their explanation relates to their choice, more than one answer can be correct.

This type of questioning that requires an explanation of the thinking is more like the National Certificate of Educational Achievement (NCEA) Unfamiliar Texts achievement standard than it is to a multiple-choice PAT reading comprehension test. Promoting thinking while reading is crucial in the internet age if we are to create learners who think critically, who analyse texts they face, and who can provide reasons that support their thinking. The articles in the PISA test offer reading activities that are relevant today, such as a blog post or an online question forum in which students read and respond to questions about people's online responses. This type of test expects students to be thinking about what they are reading and not merely a 'multi-guess' form-filling process. The PISA test exposes students to short excerpts at a time linked to a relevant question, yet they can move between the texts to refresh their memory of the article.

As the testing regime in the current study differed from the teaching regime, it is difficult to have confidence in the PATC results. Stated succinctly, "existing tools simply do not provide the refined level of information that researchers and teachers alike need to target instruction most effectively" (Snow & Biancarosa, 2003, p. 16). If better assessments were developed that made use of the critical cognitive processes of reading comprehension, a more precise understanding would develop as to what students are thinking while reading and how teachers can target future learning.

Addressing the Research Questions

The preceding sections of this chapter have discussed the findings of this research in detail concerning the three emergent themes. The following section summarises the findings as they address the four research questions that have guided this study.

Research Question 1 – What characteristics of *Actively Learn*, if any, meet the reading comprehension learning needs of Year 9 and 10 students?

This question was addressed qualitatively through interview results and quantitatively through survey results. Results suggest that the use of some of the assistive technology available on the *Actively Learn* platform helps students understand texts and provide ways for them to get support if they struggle with an aspect of reading. Vocabulary support in the form of a definition tool enabled confusing words to be explained at the time they occurred in the text. The facility to answer questions at the time of reading, rather than waiting until the end, was useful in activating students' thinking skills. Rather than retrieving an answer from the text, deep thinking is best supported by open-ended questions which require a personal response or reaction. A further facility of being able to request a revision of an answer was a useful way to reflect that learning is fluid. Students did not have to be fixed to their first response if their thinking changed during the reading. This characteristic enabled students to develop their answers further as their ideas changed or their thinking became more refined. Another useful characteristic of this platform was that teachers could be engaging in the text as a collaborator at the time students were responding to questions. Having teacher support in terms of feedback at the time of reading was found to be a feature noted by students as being useful to their understanding of texts.

Research Question 2 – In what ways, if any, can using *Actively Learn* focus on development of reading comprehension strategies of Year 9 and 10 students?

Qualitative interview results from the teachers involved in the study reveal that the teaching and modelling of reciprocal teaching strategies of predicting, questioning, summarising main ideas and clarifying was a focus each time they used the platform. Explicit teaching of the reciprocal teaching strategies, as well as the strategies of making connections and visualising, are viewed as useful skills to teach students to support reading comprehension and help them monitor their comprehension. The teachers used the instructions section at the start of each text to reinforce the strategy of focus for each reading session and reinforced the strategies as part of the tailored questions embedded within the texts.

The current study has found that for reading comprehension strategy-learning to be effective, it is a role of the teacher to ensure this happens. In-depth thinking while reading does not occur naturally for all students. More particularly, in the digital era where skim reading has become the ‘new normal’ (Wolf, 2018a), strategy training is a way of helping develop in students metacognitive skills they can use during the reading process. Teaching the strategies and providing opportunities to have targeted practice is a way of developing both knowledge and cognition. After teaching a strategy, *Actively Learn* provides an opportunity for teachers to give immediate practice to students. Having a focusing comment which targets the procedure, and inserting questions which also focus on the strategy, teachers can build layers of learning by providing real practice for all students. Quiet students who might not have a voice in group discussions can benefit from using their ‘keyboard voice’ in a digital space. Providing a text that enables students to both read and respond to questions in the moment of reading can be a way of providing a pathway into the thinking that is required to make reading an in-depth learning experience.

Research Question 3 – To what extent does *Actively Learn* have an impact the reading engagement of Year 9 and 10 students?

This question has been addressed qualitatively through interview results and quantitatively through survey results. Many students responded positively about the use of the platform in engaging their interest. Evidence suggests that through the chunking of texts, and responding to questions immediately, the platform helps some students persist with their reading and respond using their thinking skills.

Engagement was also promoted through the availability of assistive tools. The findings regarding engagement parallel the ideas that emerged in the theme of agency and autonomy. For some students, being able to view a text in the format that they chose, or having help available immediately were factors that kept them reading. This help may have also been through connecting to others by seeing other student’s answers or having choices of texts, or students having the agency to answer questions with their reactions. A sense of engagement was generated by text accessibility and ownership over the choices that were made.

Research Question 4 – To what extent, if any, does *Actively Learn* improve the reading comprehension of Year 9 and 10 students?

This final question was addressed through quantitative standardised test results and interview responses from students. The results of the PATC testing regime showed little difference between the intervention group and the cohort group. Issues arose as to the way reading comprehension was tested (multiple-choice questions in paper format with no support tools) and taught within this study (digital interaction with text and support tools available). This study has reinforced that as reading comprehension is not a single construct, it is not easily measured by a standardised test.

The qualitative results from interviews with students, however, provide a different picture. Students stated that through answering questions while they were reading, they did more thinking than they would typically if reading a lengthy text for a content area subject at high school. The focus became thinking and responding, rather than searching a text to find answers. The possibility of inserting their thinking was a way of developing reading comprehension.

Limitations of the Findings

While the results of this study are intriguing, it is important to identify some limitations. The findings may have been affected by the lack of consistency across the two cycles of the intervention. A confounding factor that occurred in the second cycle of the study was the change in the timetable at the study school. The new timetable structure for Year 9 and 10 students allowed only three classes of English per week, instead of the previous four, thus reducing English teachers' contact with their classes by 25%. The purpose of the change was to introduce equity amongst all subject areas and provide students with more access to option subjects. While a noble goal, this meant that due to limited class time in Cycle Two, two of the teachers chose to use the *Actively Learn* platform once a fortnight for one term, and weekly in the next term. This reduced usage of the *Actively Learn* may have had an impact on the quantitative results.

Another confounding factor was the change of teacher halfway through Cycle Two for one of the study classes. This necessitated providing professional learning for the new teacher in the way the tool was being used for this study. This

professional learning involved several weeks of observing and supporting the new teacher to have the class running in the manner of the other classes, with focus on the text, a quiet learning environment and questions that were open and encouraged depth of thinking. The lack of consistency of implementation across the two years in which this study took place is a limitation of the study. The modifications that occurred due to staff or timetable changes reveal the nature of education, and in this study, teachers exhibited the flexibility to adapt to the changes. Although the changes may have had an impact on results, the study reflects the reality of life in the classroom.

In hindsight, this study may have benefitted from the inclusion of a decoding measure, particularly for the dyslexic and Learning Support classes. A decoding test would have provided a broader understanding of where literacy difficulties may lie. It would have allowed teachers to know if the literacy issue needing addressing for some secondary school students was indeed reading comprehension or if there were other factors at play.

A further limitation of this study included using the free version of the *Actively Learn* digital platform due to equity of access issues amongst schools in New Zealand. The paid version offered more collaboration for teachers and access to more frequent uploading of texts. The generalisation of the results of this study will depend on the similarity of the conditions. Furthermore, teachers cannot only use this tool as a sporadic accompaniment to their programme and expect it to be effective. The fidelity of delivery, including concerted effort and planning by teachers, coupled with teacher interaction and support, is required to meet the interests and learning needs of students in any class. A cookie-cutter replication is neither possible nor appropriate. Users of *Actively Learn* need to use the platform as appropriate to their context. However, the emergent themes discovered through this study will be relevant for future use by other teachers, and for the future development of digital tools that support comprehension development.

Due to the lack of correlation between the before and after tests, the e-asTTle assessment tool had limited usefulness. The e-asTTle tool was useful as a diagnostic measure of aspects of reading comprehension that might need addressing for the classes involved. If a future study were to use the e-asTTle tool to identify shifts in reading comprehension, it is recommended that the same test be used twice. The many months between a year-start and year-end test would combat any learned effect

there might be in the assessment, as would the fact that texts and answers are not returned to the students. Providing an Individual Learning Pathway Report in ‘student speak’ that indicates strengths and areas for development, and referring to this when teaching reading comprehension strategies, would be the most effective use of this tool.

Decoding: The Elephant in the Room?

Qualitative data from teachers in the study suggested a concern from most teachers about whether *Actively Learn* had an impact on the lowest ability students. These findings raise intriguing questions regarding the teaching of reading. Participant teachers felt they were making very little difference for the most struggling readers; thus, a more extensive intervention may be needed for those students in the lowest stanine groups. The current study acknowledges that although the *Actively Learn* digital platform appeared engaging for students, the most considerable shift was for the middle ability students. Many studies state that when secondary students have literacy difficulties, they are mainly in the area of reading comprehension (Biancarosa & Snow, 2006; Clarke, Truelove, Hulme, & Snowling, 2014; Frankel, 2016). However, this is contested by Hougen (2015), who asserts that the lack of mastery of basic skills in reading is the underlying contributing factor to the lack of reading comprehension of secondary school students. She purports that for struggling adolescent readers, development in decoding multi-syllabic words, developing vocabulary knowledge, fluency, and prosody are all a basis for increasing reading comprehension (Hougen, 2015). It may be that these studies are addressing two different groups of readers. One group being adolescent readers who can decode and perform basic retrieval tasks, yet lack the inferential skills to make deductions. The second group could be adolescents with low development in the constrained skills and therefore lack ability in decoding, phonemic awareness and alphabetic knowledge

The current study also questions whether the group of students who were the lowest performers in reading have other difficulties, such as decoding or fluency, which require specialised support and intervention. If shallow processes such as decoding and letter-sound associations are not fluent, the working memory is taxed, and comprehension processes are compromised (van den Broek & Espin, 2012). A single digital tool does not provide enough support to ameliorate all of these

problems. The idea that there may be multiple areas of difficulty and that reading comprehension development can only be established after listening comprehension and decoding is purported by many studies (Cullen & Cobb, 2011; Fogarty, et al., 2017; Tunmer & Chapman, 2012). Nicholson (2009) points out that teaching poor readers requires specialist skills. Regular classroom teachers at secondary schools have neither the time nor the expertise to focus on early reading skills. If the whole language teaching of early reading skills depends on literate cultural capital (Nicholson, 2009), we will continue to be a nation whose education allows the rich to get richer and the poor to get poorer. For students who lack literate preparedness for school, more explicit teaching of the early reading skills of phonemic awareness and alphabetic coding may be a way of creating equity for young children from low socio-economic backgrounds, or children with specific reading disabilities (Chapman, Arrow, Braid, Greaney, & Tunmer, 2018). New Zealand young adults have been found to exhibit declining levels of literacy (Chapman & Tunmer, 2014), despite having remedial support available in their early years of education. The thinking skills that support reading comprehension ability must be built on a foundation of phonological knowledge.

Morphology is the study of meaning-bearing units within words that can be used to make up a whole word (Castles, Rastle, & Nation, 2018; Schoenbach, Greenleaf, & Murphy, 2012). For example, knowing the meanings of prefixes, suffixes, and words with a common root can help students identify word meanings and how they can change according to the morphological units they contain. It has been found that morphological awareness provides students with a large advantage when helping students develop vocabulary and comprehension skills (Castles, Rastle, & Nation, 2018; Schoenbach, Greenleaf, & Murphy, 2012). This aspect of decoding may be useful for secondary school students to recognise that even unfamiliar words have meaningful chunks that can add together to create meaning. Schoenbach et al. (2012) posit that investigations into word patterns that focus on morphology are “second only to repeated incidental exposure (as in extensive reading) for adding to students’ word knowledge” (p. 265).

Reading instruction is rarely continued at the secondary level (Limbrick & Aikman, 2005; Shanahan & Shanahan, 2008) with many teachers expecting that fundamental literacy skills are in place. With the study school reducing Year 9 and 10 classes to three times a week, there is little time for in-class remediation if

students are below their expected level of reading ability. Where students are identified as having a low reading ability, there may be intensive reading programmes available in high schools. However, these usually involve students being removed from their current class and missing a lesson taking place. While this may be done in the student's best interest, it may have an unintended consequence of causing disadvantage by offering them a restricted curriculum.

If students have not reached a sufficient level of reading by the time they reach secondary level, they have diminished chances of using their reading skills as a tool towards further learning. This would suggest that for the lowest ability students, attempting to remediate literacy problems at the high school level may be leaving it too late. Previous research has found that difficulties with comprehension become obvious at approximately eight years old (Clarke, Truelove, Hulme, & Snowling, 2014; Wanzek, et al., 2013). If comprehension problems are not dealt with at a young age, these students are unlikely to catch up with their peers. Moats (2011) suggests that intensive instruction in the early years of primary school which includes systematic phonics teaching including the speech sound system (phonology), learning the meaningful parts of words (morphology), the writing system (orthography) along with structure (syntax) and meaning (semantics) can ameliorate most reading disabilities. The results of the current research indicate that using *Actively Learn* had little impact on the most struggling learners.

Pasi Sahlberg (2015), when discussing the Finnish education system, states that prevention is a common strategy and education needs in literacy are identified and addressed as early as possible. He reinforces that “the common strategy internationally is to repair problems in primary and secondary education as they occur rather than prevent them from happening” (Itkonen & Jahnukainen, 2007, in Sahlberg, 2015, p. 65). New Zealand has a long tail of underachievement in literacy (Tunmer, Chapman, Greaney, Prochnow, & Arrow, 2013). It is a country that supported the whole language, context-based approach to reading throughout the late 20th and early 21st centuries (Murphy & Murphy, 2018). The most adept students are successful in comparison with the rest of the world. Nevertheless, the gap between the most capable readers and the lowest-performing gives cause for concern. Prior studies have found that structured, phonics-based interventions significantly improve children’s ability to read (Snowling & Hulme, 2011; Verhoeven, Perfetti, & Pugh,

2019; Wood, Moxley, Tighe, & Wagner, 2018). Yet, this has not been the focus for many years of teaching reading in New Zealand.

There is an expectation that everyone learns to read early, and adolescent students who do not read well can feel they have to hide this failure. Learning is limited by the constraints of literacy (Fisher, Frey, & Hattie, 2016) and for deep learning to take place, the surface-level elements need to be in place first. Although reading comprehension requires quite a different skill to the phonemic awareness and decoding required when first learning to read, without decoding, comprehension (and thus reading) cannot take place (Gough & Tunmer, 1986). Mastering the constrained skills of letter-sound associations provides students with the foundation skills that they can use to develop the unconstrained skills of vocabulary development, background knowledge acquisition, and metacognitive skills, which lead to reading comprehension. The development of these latter skills will continue for the rest of their lives.

Contribution of This Research to the Field of e-Learning and Reading Comprehension

This study contributes to the research on e-Learning in the field of adolescent reading comprehension in four ways. Firstly, it provides a rare, systematic, and impartial investigation into the use of a specific digital platform and analyses the strengths and weaknesses of using such a tool to develop students thinking skills. It raises the need for teachers to provide opportunities for students to use independent thinking and contribute ideas autonomously using their voice. Not all students need to use identical support tools, and some will use none. However, having assistive tools available provides a route into reading high school texts that some students may otherwise find too difficult if reading alone. Chunking a text and thinking during the reading process was a facility referred to by many students as being a supportive feature in the digital reading platform used in this research. Having the agency to solve reading problems in the moment of reading is a useful offering of digital reading that is less easy to access in paper-based reading. The opportunity this provides for building self-efficacy in students is something that cannot be achieved in a paper-based format.

A further contribution to the field of e-Learning and its power to support adolescent learners is the ability to make connections. Although paper-based reading allows students to make connections to self, to other texts, or beyond the text to world events, digital reading enables students to make connections to other students while reading. In the current study, this took the form of writing answers that other students could see, writing notes that others connected to on a discussion thread, using a definition tool to explain a word in the time of reading, or immediate connection with their teacher. Peer-to-peer modelling became an unintended consequence of the connection process. Students had the facility to reflect on the responses of other students, and use this as a model for their writing. An e-Learning tool is a means of integrating technology into classroom teaching in a way that is relevant and adaptable. If it does not meet these requirements, teachers need to question their reason for using the tool.

The third contribution of this study is that it expands the evidence of the importance of teachers supporting metacognitive development. Because students are in high school, there is an expectation that they can read fluently and deeply; yet many high school students lack the thinking skills that enable depth of comprehension to be achieved. Teaching students to use thinking strategies while reading in a digital space and being directly involved in the process as students are reading means teachers can give immediate feedback and support. This would not be possible in paper-based reading whereby teachers may mark answers to questions, and students would receive them back several days later. It is not the assessment of the reading that has power, but the interaction. Having the ability to request a revision was for many students a strength of the platform. They were not tied to their first answer but were able to revise their answers as their thinking developed. They were also able to reflect and revise, rather than simply get the reading done. An essential component of the use of technology is a competent teacher. The TPACK model (Mishra & Koehler, 2006) recognises the need for technological, pedagogical and content knowledge and emphasises that when all three concepts work together, technology can enhance students' learning. Thus, it reinforces the importance of pedagogical knowledge; without it, a technology tool is another gimmick for students to use. Pedagogical knowledge is crucial to skill development. Palincsar and Brown (1984) highlight that providing a model of what expert readers do, through strategy-modelling by a teacher, and providing a context that enables direct use of the

strategies, enhances a student's ability to develop their mental processes during reading activities.

Finally, while the *Actively Learn* platform appears to have the potential to support the development of thinking skills during reading, questions remain regarding the impact this has on the students who arrive at secondary school with insufficient reading ability. For the lowest ability readers, either a more intensive intervention in the foundational skills of reading is needed at the secondary level, or we need to ensure that as a country we do not wait until these students have had eight or nine years of failure. Although gains can still be made at secondary school, prevention is better than repair, and for these students to catch up with their peers and use reading as a tool for learning, we must not accept that 20% of students will struggle with reading. We must find ways to change our teaching to ensure all students can function in a society that is surrounded by text.

In alignment with the above contributions, this study has proposed a practical model of teaching reading comprehension using e-Learning tools. Merely using a digital tool will have little impact; the tool must allow for the development of agency and autonomy, making connections with other learners, and make use of the valuable skills the teacher brings in the form of pedagogical knowledge.

Suggestions for Future Research

This study has highlighted some aspects of literacy development that are beyond the scope of this inquiry and would benefit from further research. The current study focused on English classes. However, it is the new content in other faculties that some students struggle with when arriving at high school. A future study that uses the same digital platform in content area teaching such as science, health, economics, and social sciences might be a way of spreading literacy skills into content areas and simultaneously develop the thinking skills required for these subjects. Encouraging reading and thinking in these fields would move students beyond from the surface skill of memorising facts and towards the thinking required for the application of ideas. This would be one way of genuinely integrating literacy across the curriculum. In the words of Fisher, Frey and Hattie (2016), if we believe “that teaching is about impacting learning, rather than stuffing heads with facts” (p. 74) we need to equip students with the tools to become deep learners.

Another area for future research would be the assessment of reading comprehension through the means of close reading using a modified version of the Year 11 Achievement Standard, Unfamiliar Texts, which requires students to read an excerpt of text and respond in written form with their thinking. Such an assessment would more accurately reflect the learning that has taken place. It would be interesting to find the impact on the Unfamiliar Texts Achievement Standard results if a class used a digital platform such as *Actively Learn* regularly, alongside the teaching of reciprocal teaching strategies and having the ability to connect with their peers and teacher. It would also be interesting to find out if the metacognitive skills that are developed when reading chunked excerpts of texts can transfer to be applied when students read longer texts. The fact that this external assessment at Year 11 in New Zealand can be done in a digital format may also reflect a more reliable connection between the way students are taught and the way they are tested.

An important issue for future research is that of family literacy. The interview protocol in Cycle Two of the current study asked students if they remembered being read to when they were young and if so, how old they were when this stopped. While not directly relevant to the purpose of this research, it has been found that the development of world knowledge and vocabulary occur through early reading experiences (Caccamise & Snyder, 2005). Although beyond the scope of the current investigation, further studies with a focus on family literacy for pre-school and early primary-level children may be useful. These could have implications, not only for long-term impacts on children but also in supporting adults with literacy difficulties that were undiagnosed or not dealt with during their education. This could have an impact on reducing inter-generational literacy difficulties. It is interesting to note that the Ministry of Education, in their response to the PISA results in 2018, has announced they have a focus on strengthening parental capability to read to children at home. The report emphasises that early reading to children makes a positive difference (Ministry of Education, 2019).

Finally, and perhaps the most sobering suggestion for future research relates to the group of students whose progress remains static. Although the current study suggests that this digital tool appeared engaging for students, the greatest shift was for the middle band of students. Participant teachers acknowledged that they felt they were making very little difference for the most learning-disabled readers; thus, a different solution is required to allow those students to make gains in reading.

Previous studies have highlighted that adolescents with extreme delays in reading require extensive support and this can be more challenging than with younger readers (Fogarty, et al., 2017; Wanzek, et al., 2013). A way of preventing long-term reading disability is the instruction given when children are younger (Fogarty, et al., 2017; Sahlberg, 2015; Wanzek, et al., 2013). Focusing on the explicit teaching of phonemic awareness when students are in the first three years of primary school, and using a tool such as *Actively Learn* in intermediate level education to address comprehension development at a younger age, could be valuable areas of future literacy research.

Significance of the Research and Implications for Educational Practice

This study is a trailblazer in the investigation of a digital platform and its affordances in providing students with the chance to develop their metacognitive abilities while reading. Reading *is* thinking (Coiro, 2011; Murphy & Murphy, 2018; Tovani, 2000) and the current research supports and expands upon this notion, by providing a platform that enables teachers to deepen the reading experience for their learners through immediately using strategies they have taught. This research offers new information that extends what is known in the field of adolescent literacy development using e-Learning technology. It reinforces the words of Schoenbach et al. (2012) that there is “no quick fix for reading inexperience” and provides a practical means by which students can gain reading experience that focuses on using thinking skills. This research offers practical application beyond using digital tools because of their ubiquity and has found that targeting reading comprehension when using a digital platform may have an impact on students’ reading development. The empirical evidence linked to engagement and use of tools suggests that *Actively Learn* may have a positive, though modest effect towards developing students’ reading comprehension.

At a micro level, this study contributes to the development of cross-curriculum literacy in the participant school and the local community cluster of schools. This study has added to the field of literacy that the zone of proximal development can be supported in a digital space through students having access to support from assistive tools, their teacher and each other. Technology enables peer-mentoring in the form of viewing the answers of others or connecting through a discussion thread and reinforces the power of technology to allow a student to connect with others to support their learning. The results of this study indicate that

adolescent readers want autonomy and agency when learning, a chance to have personal input and for their thinking to be valued. However, the teacher must establish positive interactions and support before using such a platform.

Despite the findings being context-specific, at a macro level, the study provides a useful broader contribution through the emergence of the ACT Model of Supported Reading Comprehension in a Digital Space. The results not only have relevance for other schools in the country of a similar demographic to the study school but to any school nationwide where students struggle with comprehension and the school has access to a reliable internet service. An important factor when using this platform is the role of the teacher to personalise the texts to suit the strengths and interests of their classes. There is no single identical model that can be replicated in all schools, as clientele, locality, culture, and learning needs all must be considered when introducing a digital tool.

This study has implications for the future practice of the use of e-Learning interventions to support literacy development. Findings in this study have indicated that when exploring which digital tools are efficacious in developing reading comprehension, teachers must establish that the tool is fit for purpose. This can be a time-consuming venture for teachers to fit in, wading through the plethora of tools available and trialling them to gauge suitability. To improve students' reading skills, adding a new tool will not have an impact unless it supports the pedagogical practice. This study has developed a checklist of affordances a teacher could look for when evaluating technology, in the form of the ACT Model for supporting digital reading comprehension. This proposed model appears to be an effective way to help teachers when finding tools to suit the current thinking on the development of reading comprehension.

This study found that some students in the middle band of readers can make improvements in their comprehension using the *Actively Learn* digital platform. While it would have been wonderful to see increases for all students, in alignment with the tenets of action research, we need to beware of happy endings (Cohen, Manion, & Morrison, 2017) and this realistic outcome is still useful. Supporting the development of middle-ability learners in schools may be an opportunity to have a positive shift in reading comprehension for those who fly below the radar.

A further significance of this study is the raising of concern that students who have exceptionally low literacy when they enter high school make little progress

despite the efforts of classroom teachers. A lack of self-efficacy and a lack of regular practice can influence a student's sense of agency. If an agentic approach is not evident, high school could be a time of reinforcing a negative self-concept. However, to say that is not enough. As educators, unless a student is cognitively impaired, they should be able to learn to read, and practice needs to change to allow this to happen. While the use of *Actively Learn* did not appear to have an impact on the lowest ability readers, we should not end there. We must keep looking to find better support for students who have got through eight years of formal education without gaining fluency in reading.

Conclusion

The present study adds to the growing body of research about reading comprehension and the use of technology to support the development of thinking skills. Given that Edu-companies often endorse their products supported by scant, or no, research evidence, independent investigation into the efficacy of digital tools to both engage students and support reading development are imperative. Without these studies, the validity of claims made in the promotion of products, such as digital reading programmes, simply goes uncontested and unproven.

The current study contributes to the field of literacy and technology by systematically examining one programme, *Actively Learn*, a free version of which is readily accessible as a Chrome Extension. This study identifies both the affordances and challenges of the programme and offers a model of supported reading comprehension, which teachers can use to evaluate the usefulness of other digital reading tools and programmes.

Three key affordances arising from the use of this particular digital tool have been identified. Firstly, it assisted students to be agentic by providing spaces for them to problem solve and to practise their thinking skills while reading. Secondly, it enabled students to connect with others, their teachers, or with other texts and sources of information that supported their knowledge building. Finally, it provided opportunities for direct involvement of teachers with individual students, enabling them to give targeted advice in relation to comprehension reading skills and strategies. The ACT Model of Supported Reading Comprehension in a Digital Space synthesises these three intersecting affordances and thereby provides teachers with a

tool for evaluating the efficacies of new digital platforms designed to scaffold the development of comprehension.

When choosing digital tools, teachers need to question platforms that offer a ‘one-size-fits-all’ approach. As the ACT model shows, platforms need to incorporate students’ agency and autonomy, and opportunities for students to connect to, and interact with, their peers and other sources of information. The concept of connection also applies to students’ referencing their thinking, experiences and ideas. Platforms that require a single correct answer from banks of multiple-choice questions encourage shallow thinking and should be avoided. The final important aspect promoted by the ACT model is the role of the teacher in guiding the process. A platform that provides no opportunities for teachers to interact with students, or make choices as to the teaching of strategies, or help students develop depth in their thinking skills may do little more than provide students with ‘busy work’. Literacy development should not be the sole responsibility of English teachers. Promoting reading comprehension in subjects such as science and social sciences can help students use their thinking skills to explore information, build knowledge, develop opinions, and respond to other perspectives. Programmes such as *Actively Learn* could provide a means for subject teachers, who may not have a background in literacy teaching, to incorporate their subject content in a way that supports literacy development. By actively thinking about and processing information by responding to well-framed questions, encourages active engagement with knowledge, rather than the learner being a passive receiver of knowledge.

However, judicious use of such programmes is recommended because findings suggest this tool may not be as valuable for students who already have highly proficient comprehension skills, as students who are not. Equally, the tool proved to offer relatively little comprehension growth for the most severely struggling high school readers. Despite these reservations, *Actively Learn* provided opportunities to practise making connections to text, thinking at the moment of reading, and keeping up with peers through the help of the assistive features, such as audio, in the platform. The programme has the facility to allow all students to have support when reading and enables students to participate in reading activities with the class, without feeling excluded or the need to ‘fake’ their reading.

The single most effective pathway to fluent reading is print experience (Castles, Rastle, & Nation, 2018). As pointed out by one participant teacher, if

struggling readers are reading only once or twice a week, any gains made will be limited by the lack of frequency of practice. Thought, therefore, needs to be given as to how to balance the teaching of metacognitive thinking, using short texts, and opportunities for students to listen to texts as a means of providing curriculum access (Westbrook, Sutherland, Oakhill, & Sullivan, 2019). Encouraging leisure reading of extended texts is a further issue for consideration (Willingham, 2017). Ritz (2014) stated that “a reader is not someone who *can* read, but someone who *does* read”. Whether that be on screen or paper, fiction, or non-fiction, it is the act of regular reading that will increase students’ reading comprehension. While the definition of literacy has broadened in the 21st-century, the underlying skills of communication remain the same. Using *Actively Learn* has been a positive and useful experience for many students, yet the challenge for literacy development does not stop there. Additional to such a targeted programme, students need to be regularly reading (in any of its multiplicities, which may include audiobooks and multimodal texts) and reading lengthy books.

It could be argued that *Actively Learn* may exacerbate the 21st-century problem of students browsing and grazing short excerpts of texts. However, the focus on critical literacy and thinking skills while reading using this platform have the potential to move students from surface understanding to deeper thinking – this more than makes up for a perceived complication of only offering short segments at a time. Using the ACT model as a support when determining the usefulness of a platform will help teachers choose tools through which they can target the learning for their students.

I end this thesis by reiterating a question from the start. What is so important that it cannot be left to chance? Reading. Reading with fluency, reading with understanding, reading with a thinking brain. Reading.

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Appendices

Appendix 1 – Online Conversations and Educationally Valuable Talk Indicators

Indicator		Acronym	Defined	Examples	Source
<i>Exploratory</i>		EPL	Recognition of some confusion/curiosity or perplexity as a result of a problem/issue arising out of an experience/course readings; posing a problem and enticing others to take a step deeper into it.	“I wonder.....” “I am not sure if what the author suggests.....” “In the article X, the author said This brought up a few questions in my mind”	Mercer (1994); Garrison, Anderson & Archer (2001)
<i>Invitational</i>		INVT	Inviting others to think together, to ponder, to engage by asking questions, requiring information, opinion or approval.	“Jane says What do you think?” “Do you think?” “The authors suggest, no?”	Uzuner & Mehta (2007)
<i>Argumentational</i>		ARG	Expressing reasoning (with analogies, causal, inductive and/or deductive reasoning etc) to trigger discussion	“If teachers, then” “Teaching is like” “X is important because”	Kumpulainen (1996)
<i>Critical</i>		CRT	Challenging or counter challenging statements/ideas proposed by others OR playing devil’s advocate	“I agree that However,”	Uzuner & Mehta (2007)
<i>Heuristic</i>		HE	Expressing discovery (similar to “A ha!” moments or expressions like “I find it!”); directing others’ attention to a newly discovered idea.	“I did not know that there is a name for XXX. I think XXX isHas anyone experienced that too?”	Kumpulainen (1996)
<i>Reflective</i>		REF	Examination of past events, practices (why/how they happened) or understandings in relation to formal content	“I’ve noticed that I had a tendency to After reading X’s article, I’ve learned not to”	Uzuner & Mehta (2007)
<i>Interpretive</i>		INTP	Interpretation of formal content through opinions that are supported by relevant examples, facts, or evidence.	“In my opinion X is Y is a good example of why”	Uzuner & Mehta (2007)
<i>Analytical</i>		ANL	Interpretation of content through the analysis, synthesis, and evaluation of others’ understanding	“The original question was ... Joe said ... Mary said ... As for me”	Uzuner & Mehta (2007)

<i>Informative</i>		INF	Providing information from literature and relating it to course content/topic of discussion	“I read an article about X once and the author said You can find more information about this in ...”	Kumpulainen (1996)
<i>Explanatory</i>		EXPL	Chain of connected messages intended to explain/make clear OR statements serving to elaborate on the ideas suggested in previous posts	“I want to build on your comment that”	Uzuner & Mehta (2007)
<i>Implicative</i>		IMP	Assertions that call for action OR statements whereby participants formulate a proposal/decision about how to achieve a certain end based on the insights they gained from the course readings/discussions	“Teachers should / should not” “X must not be forced”	Uzuner & Mehta (2007)

(Uzuner, 2007, Used with permission of the author)

Appendix 2 – Permission From Principal to Carry Out Research



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Faculty of Humanities, School of Education
GPO BOX U1987 Perth, WA 6855
AUSTRALIA

Letter of Consent for Principal

Research Title: E-Learning and literacy: An investigation into the impact of *Actively Learn* to raise reading comprehension levels of high school students

I hereby give my consent to Fiona Jeffries, a researcher/student in the Faculty of Humanities, School of Education at Curtin University, to record and document the participation activities of students in her research focus group.

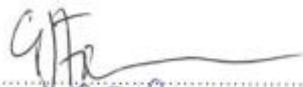
I therefore give permission for the use of these data, and other anonymised schoolwide information which I have agreed may be obtained or requested, in the writing up of this study, subject to the following conditions:

.....
.....
.....
.....
.....

My participation in this study is voluntary, and I understand that I may withdraw from the study at any time.

SIGNATURES

Participant



Date

8/9/17

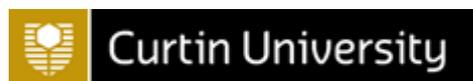
Researcher



Date

11/09/17

Appendix 3 – Information Form for Teachers



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Faculty of Humanities, School of Education
GPO BOX U1987 Perth, WA 6845
AUSTRALIA

TEACHER INFORMATION STATEMENT

HREC Project Number:	HRE2017-0589
Project Title:	E-Learning and literacy: An investigation into the impact of <i>Actively Learn</i> to raise reading comprehension levels of high school students
Chief Investigator:	Dr Paul Gardner, Senior Lecturer, School of Education
Student researcher:	Fiona Jeffries
Version Number:	02
Version Date:	21/08/17

Dear

I am writing to request permission for you to be involved in research at XXXXXXXXXX, to explore and investigate if the digital tool, *Actively Learn*, has an impact on raising the reading comprehension levels of secondary school students.

The proposed research will investigate whether the online tool *Actively Learn* can be used to raise the reading comprehension of junior secondary school students. The literature over recent decades suggests that despite the definition of literacy changing, and the use of digital tools being encouraged as part of learning programmes, investigations are still needed to discover what success looks like and whether these tools make a difference to achievement. I would like to request your permission for you to be involved in this research study at XXXXXXXXXX.

The guiding questions of the study are:

- 1) To what extent, if any, is *Actively Learn* effective in terms of its capacity to improve the reading comprehension of Year 9 and 10 students?
- 2) What characteristics, if any, are useful in *Actively Learn* to enable it to meet the reading comprehension learning needs of Year 9 and 10 students?
- 3) To what extent does *Actively Learn* have an impact on engagement in reading for Year 9 and 10 students?
- 4) What reading comprehension strategies are focused on in *Actively Learn*?

It could be argued that it is more important than ever to investigate the relevance of technology in literacy learning. This research will provide an evidence base for classroom practice, which will be useful and relevant to educators.

This research project will involve collecting information through:

- Schoolwide year start and year end data collected as documentary evidence, including PAT Reading Comprehension.
- e-asTTle results of students in teacher participants' classes.
- Survey on reading behaviours both outside and inside school.
- Voice-recorded interviews with students involved in using *Actively Learn*, involving discussion about their work and strategies they are using.
- In-class observations focusing on student behaviours when using *Actively Learn*.
- Interviews with teachers who are using this digital tool as part of their programme.

Only students whose parents and themselves have signed consent, will be interview participants in the research. There will be no coercion for them to be involved.

The data gathering process will begin in 2017 as part of a pilot programme, and will continue into 2018 whereby new student participants will be offered the chance to be involved and the consent of them and their guardians will be sought.

Interviews, surveys, classroom observations, and analysis of test results are the sources of data for this research. Dr. Paul Gardner, Senior Lecturer at Curtin University, and Associate Professor Lina Pelliccione, Head of the School of Education at Curtin University, and myself will be the only people who have access to the data. Data will be stored in Curtin University's secure password-protected Research Drive. Data and recordings will be kept for a period of seven years after which they will be destroyed or wiped electronically.

The findings from the research will be written up in the form of a thesis, which will be submitted for examination and to be deposited in the Curtin University Library. Anonymity of XXXXXXXXX and the participants involved will be maintained in the report.

I would like to request your consent to your participation in the research project. If you agree to this request, I would appreciate it very much if you would sign and date the attached consent form. Please note that you have the right to withdraw from the research.

If you have any further questions, or would like some more information, please do not hesitate to contact me at fiona.jeffries@postgrad.curtin.edu.au. You are also free to contact my supervisor, Dr Paul Gardner at Paul.Gardner@curtin.edu.au, or my co-supervisor Associate Professor Lina Pelliccione at L.Pelliccione@curtin.edu.au.

Curtin University Human Research Ethics Committee (HREC) has approved this study (HREC number: HRE2017-0589). Should you wish to discuss the study with someone not directly involved, in particular, any matters concerning the conduct of

the study or your rights as a participant, or you wish to make a confidential complaint, you may contact the Ethics Officer on (+61 8) 9266 9223 or the Manager, Research Integrity on (+61 8) 9266 7093 or email hrec@curtin.edu.au.

Yours sincerely

Fiona Jeffries

**English Teacher, Specialist Classroom Teacher, XXXXXXXXXXXXX
Doctor of Education (EdD) Student, Curtin University**

Appendix 4 – Consent Form for Teachers



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Faculty of Humanities. School of Education
GPO BOX U1987 Perth, WA 6845
AUSTRALIA

Letter of Consent for Participant Teachers

Research Title: E-Learning and literacy: An investigation into the impact of *Actively Learn* to raise reading comprehension levels of high school students

I hereby give my consent to Fiona Jeffries, a researcher/student in the Faculty of Humanities, School of Education at Curtin University, to record and document the participation activities of students in her research focus group.

I therefore give permission for the use of this data, and other information which I have agreed may be obtained or requested, in the writing up of this study, subject to the following conditions:

.....

.....

.....

.....

.....

My participation in this study is voluntary, and I understand that I may withdraw from the study at any time.

SIGNATURES

Participant Date

Researcher Date

Appendix 5 – Teacher Participants

Teacher	Subject	Year Level	Gender	Cycle 1 (2017) or Cycle 2 (2018) or Both	Total years of teaching	Highest Degree held
1	English	9	F	Both	27	M.Ed.
2	English	10	F	Both	20	B.A.
3	English, Social Studies	9	F	Cycle 1 & half of Cycle 2	17	B.A.
4	English	10	F	Cycle 2	15	M.Ed.
5	English, Music	9	M	Half of Cycle 2	11	B.Ed.

Appendix 6 – Student Participants

	Cycle One Interview Participants 2017	Type of class	Total students in classes 2017		Cycle Two Interview Participants 2018	Type of class	Total students in classes 2018
Class 1 Year 10	6 boys 2 girls	Learning Support	17 12 boys 5 girls		5 boys 4 girls	Learning Support	13 8 boys 5 girls
Class 2 Year 9	1 boy 5 girls	Mainstream	26 13 boys 13 girls		5 boys 7 girls	Mainstream	26 13 boys 13 girls
Class 3 Year 9	2 boys 6 girls	Dyslexia	20 10 boys 10 girls		8 boys 6 girls	Mainstream	27 15 boys 12 girls
Class 4 Year 10	NA	NA	0		1 boy 2 girls	Dyslexia	20 10 boys 10 girls
Total Participants	22		63		38		86

Appendix 7 – Gender and Ethnicity of Student Interview Participants

	Cycle 1 2017			Cycle 2 2018		Total
	Male	Female		Male	Female	
NZ Pākehā	3	7		14	9	33
Māori		3		4	4	11
Pasifika	2	2			3	7
Other	4	1		1	3	9
Total	9	13		19	19	60

Appendix 8 – Showing the Stretch

Showing the stretch in answering questions

Having just read a short amount about Tania, what are two or three things that you have found out in this short space of text?

She has had three wrist surgeries and she is a US-based Kiwi golfer

That she has had 3 wrist surgeries in the past three years but still was determined to achieve her goal. She is a 2013 Florida International University marketing graduate.

She is determined. Even after 3 wrist surgeries she carried on playing golf. She is talented. After all she is doing trick shots .

I have found out in this short period of text that ...Tania would really like to participate in this years LPGA Tour (Ladies Professional Golf Association). Tania has also had three wrist surgeries over three years (I'm really curious why she had to have three wrist surgeries). And I also saw that she hopes to finally get to go on the LPGA Tour this year after a frustrating period of time.

Why does the author include a personal story about the loss of his own dog to begin the article?

To help the reader understand that the writer knows and has experienced what they are talking about.

To make the reader more interested.

It also might hook you in by reading a story of their own too. Or to show that they can understand what it feels like to lose a loved pet and sympathize with how you feel when losing one.

Because they could just say a bunch of random stuff that is so brief but to add someone's deep personal story about how their dog died this will help people realize the bond is a lot stronger than you think. So to wrap it up I believe they added this to show people the real bond between man and dog and i still believe the only way to truly find out is to experience it yourself.

Making Connections



Good readers connect what they read to their own life, to another text, or to something in the world.

Language of making connections:

- I experienced this when ...
- I read about this in ...
- I have heard that this also occurred in...
- I'm going to talk to ... about this idea.
- I'll make a note for my classmates to comment on so I can find out what they think.

Image used with permission Jennifer Kirschner and Sara Gage @MakingConnections4

Appendix 10 – Encouraging Interaction and Comments on Notes

Encouraging you to interact on Actively Learn by writing and commenting on notes.

Although you might have started this process by stating "I agree with you" or "Thanks for sharing", or "I did the same thing when I ..." etc, the aim is to get doing some thinking, reacting and responding to the comments of others. The starting point is just to respond. As you get thinking you will start reacting to others. Gradually introduce some of these Educationally Valuable Talk (EVT) interactions to your notes and comments.

Exploratory talk (exploring ideas) – posing a problem or recognising a confusion or curiosity in the text:

E.g.

"I wonder if ..."

"When the author said this, it made me question ..."

"Do you think ...?"

"If ... then ..."

"I've noticed that I usually After reading this article I've learned not to ..."

"The authors suggest ... what do you think?"

"In my opinion, X is a good example of ..."

or even an "aha" moment:

E.g.

"I never knew there was a I now feel ..."

"I'm surprised to find out that ..."

In your responses to others, it is important to show you have done some thinking about their comment:

E.g.

"I kind of agree with you, however, ..."

"X is important because ..."

"I want to build on your comment by adding that ..."

"You can find more information about this by going to this link ..."

"I found a useful site that further explains the idea that ... and the link is ..."

"Have you thought about ..."

"You've really made me think about the idea of ..."

What we are hoping to avoid, when you become good at this, is simply agreeing with another person or purposely being argumentative.

Remember, politeness in communication is paramount.

(Modified from Uzuner (2007) with permission)

Appendix 11 – Survey 1: Finding Out About Year 9 & 10 Reading Behaviours

Finding out about Year 9 & 10 students' reading behaviours

This is a quick survey to find out what kind of reading you do on a regular basis. This will help teachers in their planning for your English classes.

1. Do you read outside of school time?
 Yes
 No

2. If you said yes to reading outside of school time, why do you read outside of school time? Tick all that apply.
 To do homework
 For pleasure, to relax
 To find out about things that interest me
 Other: _____

3. When you read (either at school or outside of school), what type of reading material do you prefer?
 Fiction (stories, novels, etc.)
 Non-fiction (true events, facts, real life situation)
 Both

4. Do you prefer to read off paper or off a screen?
 Paper copy (book, newspaper, pamphlet, etc.)
 Screen version (phone, iPad or tablet, computer, etc.)
 I don't mind
 Other: _____

5. Which of the following do you read? Tick all that apply.
 Newspaper
 Facebook
 Internet sites
 Novels
 Graphic novels

- Magazines
- Biographies, autobiographies, non-fiction books
- Other: _____

6. Do you ever see any members of your family reading?

- Yes
- No

7. If yes to the above question, who does the reading? Tick all that apply.

- Mother, auntie, grandmother
- Father, uncle, grandfather
- Sister, brother, cousin
- Other

8. If yes to question to question 6. What do you see being read in your home?
Tick all that apply.

- Newspaper
- Facebook
- Internet sites
- Novels
- Graphic novels
- Magazines
- Biographies, autobiographies, non-fiction books
- Other: _____

9. When you need to find out something at home, how do you access the information?

Appendix 12 – Survey 2: Actively Learn Feedback

This is a chance for you to give your teacher feedback about how you have felt about using the digital platform “Actively Learn” as part of your reading programme.

1. How did you feel about your reading comprehension before you started using Actively Learn?
 - Strong
 - Average
 - Weak
 - Other: _____

2. Has your attitude towards reading changed as a result of using Actively Learn?
 - Yes, I feel better about reading
 - No, I feel worse about reading
 - No, there has been no change in my attitude

3. What are the aspects of Actively Learn that you find helpful? (Tick all that apply)
 - It doesn't help me at all
 - Listening to the text if I choose
 - Highlight and define a word
 - Answering questions as I go
 - Seeing other students' answers
 - Writing comments on the notes written by other students
 - Teacher response, either grading or comments
 - Being able to change my answers with a revision
 - Being offered a choice of texts
 - Changing the font or background colour
 - Other: _____

4. Is there anything about Actively Learn that you find difficult or unhelpful?
 - Yes, some aspects are unhelpful
 - No. I find it all quite helpful

5. If you answered “yes” to the above question, what are the things you find difficult or unhelpful about Actively Learn?

6. If you used “Highlight and Make a Note”, what kinds of things would you put on your notes?

7. If you responded to the notes of others as part of a discussion thread, what kinds of comments did you add to the thread?

8. What are some topics you liked that were personalised to your interests when you used Actively Learn?

9. What are some strategies you use when reading that might help you with thinking? (Tick all that apply)

Summarising what has happened (in my head or on a question)

Visualising what is happening

Connecting beyond the text to myself or to the world

Figuring out the main ideas

Checking my understanding by defining a word, or going back over the text

Checking Google

Asking myself questions

Making predictions

Skimming and scanning back over the text

Other: _____

10. What are some areas of reading in which you would like further help?

Appendix 13 – PAT Reading Comprehension Test Structure

Test Number and Year Level		Text Title	Text Type	Noun count readability	Word count	Number of questions and sequence of question types
Test 6 Year 9		What's the problem?	Narrative	13-16 years	269	6:LI, LI, LI, LI, LI, LI
		Know Your Brain	Explanation	15+ years	391	4: R, LI, LI, GI
		Storm at Sea	Narrative	9.5-10.5 years	271	5: LI, LI, LI, LI, LI
		Uniform	Poem	15+ years	116	5:GI, LI, LI, LI, GI
		Salt	Report	12-14 years	252	5: LI, LI, LI, LI, GI
		The Tarawera Eruption	Recount	15+ years	332	5: LI, LI, LI, LI, GI
		An Afternoon's Work	Narrative	10-12 years	416	5: LI, LI, R, LI, LI
		Youth Parliament Speech: Factory Farming	Persuasive	15+ years	373	6: LI, LI, LI, LI, LI, GI
						6: R, LI, LI, LI, GI, LI
Test 7 Year 10		Cooling Off	Narrative	9-10 years	160	7:LI, LI, LI, LI, LI, LI, GI
		Why Do Onions Make You Cry?	Explanation	12-14 years	323	5: LI, R, LI, LI, LI
		Wind in the Wires	Poem	15+ years	89	4: LI, LI, LI, LI
		The Possum Fur Industry	Persuasive	13-16 years	342	5: LI, LI, LI, LI, GI
		The Bike	Narrative	8-9 years	274	5: LI, LI, LI, LI, LI
		The 1981 Springbok Tour	Recount	13-16 years	391	5: LI, LI, LI, LI, LI
		The Lizard Catchers	Poem	12-14 years	129	6: LI, LI, LI, LI, LI, LI
		Square Eyes	Report	15+ years	183	5: R, LI, GI, LI, LI
						5: LI, LI, LI, LI, LI

(Darr, McDowell, Ferral, Twist, & Watson, 2008) Used with permission, NZCER

Appendix 14 – Student Interview Questions

Interview Protocol Students (V2)

Date and Time of Interview:
Place:
Interviewer:
Interviewee:
Description of the project: The purpose of this study is to find out if there are ways that we as teachers can make your learning in reading easier to grasp. You have been using “Actively Learn” in class; I want to find out the aspects of “Actively Learn” that help you with reading and the aspects of “Actively Learn” that are difficult for you.
Possible probe questions: Could you explain that more? Can you give me a specific example? Tell me more about ... Ah hah. Go on. How did that make you feel? Repeating their answer then waiting. Reflecting an answer back by turning their comment into a question.
Open-ended questions (but allowing for flexibility – not a prescriptive formula to follow as students’ answers will direct the course of the interview): Concurrent Interview Process Questions, taking place during or immediately after using Actively Learn How do you feel about using the programme Actively Learn this year? Are there any differences between using AL last year and this year? Do you stick at it until you complete a reading activity? How do you feel your reading has developed since starting college? Are there aspects of reading that you find a challenge? Is Actively Learn helping you improve in your understanding of what you read? If yes, how? If not, why not? You have been using Actively Learn in class, what are some of the tools you use when using Actively Learn? (Take notes? Define words? Answer questions? Listen as well as read? Request a revision of answer? Check other students’ answers?) What types of questions does your teacher ask on Actively Learn? (e.g. finding information, asking for your thinking, etc).

Do you learn reading comprehension strategies in class that help you with Actively Learn? If so, what strategies do you use?

How do you feel about reading lots of writing in English?

... In your other subjects?

How much reading do you do in class time in the different subjects?

When using Actively Learn, what is happening in your brain as you read?

What happens in your brain when you get to a question and are forced to answer it before you can go on further?

(Going back over the text? Think about the section just read? Making inferences about stuff that wasn't directly in the passage?)

How do you feel about the text being broken up by questions?

Have you connected to links when using Actively Learn? Is this useful for you?

When responding to questions, what strategies do you use to get the answers?

Do you aim for depth of answers or a quick answer? How do you add depth?

What kinds of comments do you make on your own notes?

What kinds of comments do you make as responses to other students' notes?

How do you feel when you get a notification from your teacher that she/he has graded your answer or has written a comment?

Can you remember your parents reading to you when you were young? Any books you remember? How often did they read to you? How old were you when they stopped reading to you?

Thank you for your time and helping me in my learning.

Appendix 15 – Teacher Interview Questions

Interview Protocol Teachers

Date and Time of Interview:
Place:
Interviewer:
Interviewee:
Position of interviewee:
Description of the project: The purpose of this study is to find out if there are ways that we as teachers can make improve the reading comprehension of our students. You have been using “Actively Learn” in class; I want to find out the aspects of “Actively Learn” that you feel are positive, any aspects that are difficult and what your students’ reactions have been to this programme. I would also like to know any evidence you have of improvement or any anecdotal evidence you have collected in the form of a learning log or personal record.
Big Picture Research Questions: 1) What characteristics of <i>Actively Learn</i> , if any, meet the reading comprehension learning needs of Year 9 and 10 students? 2) In what ways, if any, can using <i>Actively Learn</i> focus on the development of reading comprehension strategies of Year 9 and 10 students? 3) To what extent does <i>Actively Learn</i> have an impact on the reading engagement of Year 9 and 10 students? 4) To what extent, if any, does <i>Actively Learn</i> improve the reading comprehension of Year 9 and 10 students?
Possible probe questions: Could you explain that more? Can you give me a specific example? Tell me more about Ah hah. Go on. How did that make you feel? Repeating their answer then waiting. Reflecting an answer back by turning their comment into a question.
Questions: Open-ended starter questions (but allowing for flexibility): In what ways do you use technology in as part of your classroom teaching programme? What are some aspects of technology or specific digital tools that you find either engaging for students or where you notice improved learning? You have been using Actively Learn in class, what are some things you do when preparing your class to use Actively Learn? (Are you setting questions that ask them specifically to Take notes? Define words? Answer questions? Listen as well as read? Use reading strategies? If yes to strategies, are there specific strategies you are focusing on? If yes, why have you chosen those strategies? Are you teaching the comprehension strategies that you want the students to use in Actively Learn?)

Are there aspects of Actively Learn reading that your students find a challenge?

How much reading do your students do in English class time?

Do you insert links for students to connect to? Can you explain the types of links or what makes you select particular links? Is there something you are looking for in a link?

How do you find the fact that you can only upload three texts a month on the free version?

Tell me your opinion of the time factor involved in using Actively Learn?

How many times a week do you use it? For how long?

What do you notice about the students' reactions whilst the lesson is taking place?

What do you notice about the students' responses to your questions?

Thank you for your time and helping me in my learning.

Appendix 16 – Example of Open Coding for Student Participants

Research question 1: What characteristics of *Actively Learn*, if any, meet the reading comprehension learning needs of Year 9 and 10 students?

Open codes for RQ1

Open code	Properties	Examples of participants' words
Background colour and font	Changing the font. Making it bigger. Changing the background colour. Visually clearer. Easier to read. Just for fun. Dyslexic support.	I change the background to blue. It just helps to see. just like a bigger kind of font, not bigger, more spaced out I just changed the font for fun, I didn't really need it. It just looks pretty. I find this one easier to read. change it to the dyslexic font and you can change the sizes. I prefer white, otherwise it distracts me.
Chunking of text	Text broken into smaller parts. Can't see whole text. Can't move on until question is answered. Comments about the ease or difficulty of reading long texts compared with chunked texts.	It makes you understand it better. The questions kind of help you process it better. Not so overwhelming. It's easier to understand what I'm reading. It breaks down the story more. Makes it a whole lot easier to read cos you get a smaller part. Then you answer a question, so you feel like it's taking a break. It's like bit by bit not a whole bunch at once. It splits up what you have to read so you can think about it before you have to read more. You just see one question at a time and it just slows you down to focus more. It stops you so you have to think right there and then which is good. Not as overwhelming as a long text. Makes it achievable. Easier when broken into sections. Directs your focus.
Define a word tool	Enables a word to be defined. Text to speech facility. Comments on the extent to which this tool was used.	If I don't know a word, I use the define tool. Sometimes I don't know some words. Because I'm doing this, I've learned so many new words. If I don't know what the word is, I'll listen and define it. Define is useful cos you can figure out what the word is if you don't know what it means. I would have just left it out. If I can't read it I don't know what it means. Helpful for the big words.
Feedback from teacher	The extent to which teacher input is taken onboard by students. Types of teacher input. Grading, comments, notes.	I check it straight away. I feel happy if she gave me Advanced grade. feel pretty good getting notifications. Don't check it straight away, just leave it. It catches my eye. If it's still there it distracts me cos it's a bright red thing. The first one today the teacher graded me 'basic' so I thought, right, I've got to put more depth into my answers. I look at it straight away to see if I want to re-do it. Sometimes I ask for a revision.
Listen to text tool	Using headphones and using a text-to-speech tool. The usefulness of such a tool. Comments on the nature of the tool and perceived effectiveness.	If I can't say it, I listen. It highlights each word as it reads to me so I can focus. It reads it slowly to me rather than reading it fast. It's a lot easier because it gives you the option to be able to have it listen to you. If I don't know what the word is, I'll listen and define it I don't like the listen one, it sounds like a robot. I read it myself. Cause I can read. I don't really like to listen to it.

Looking at others' answers	Feelings about being able to see others' answers. Feelings about other students reading own answers. Perceived impact on reading and understanding.	It's quite cool seeing what other people think It's useful if I'm stuck. They write a lot more than me. It helps me think of other aspects of the article. Lets me see where other people are coming from To see what they are thinking. You can see what other points of view people have. This helps me if I don't get it so I can see how others get it and how they understand it. To see if I'm on the right track. It's good seeing how other people interpret it and how they've processed the reading.
Make a note tool	Interacting in a discussion thread. Making a comment for others to react to. Reactions to being able to interact with other learners. Making a note as an annotation.	If it's something really important I make a note of it. And give a reason why. You have a good feeling if someone replies to your note and they give a good response. I write about what I feel and what I'm scared of, like snakes. I react to what they said. Putting ones out that are going to help people more like describing what I'm thinking. it's a good idea because like we interact with the other students in the class. We don't like, argue, but we debate with them and stuff. I usually say I see your side of the story, but this is my opinion. I'll say, "That's good work and I like how you're thinking." I do private notes cos I don't like people seeing my answers. I'm happy for the teacher to see that but not the other students.
Negative aspects	Areas that are disagreeable. Comments about lack of usefulness or aspects disliked by a user of the platform.	I just want to continue my reading. I would rather read the whole thing and then answer questions. I find summarising the text hard. It makes me double check to make sure my spelling is 100% since the whole class can see it. It puts me on pressure to make sure everything is perfect. It's annoying cos you wanna get it done and if you don't know the answer it's going to take a while. At the beginning I didn't enjoy it because it was like sharing my work with other people and they could see it but I sorta like it now. I've never been keen on sharing answers with anyone.
Revision of answer	Being able to request a chance to change an answer. Reasons why an answer would be changed. Explanations as to why this tool is used.	If I think I need to add more detail. because I made a mistake and it didn't make sense. If it's kind of short and a bit off topic I ask for a revision. If I ended up stuffing up my answer or wanted to add more. If I thought of something more that I didn't think of before. If you write something wrong and then you think of something you think Oh, I can write that again. because I didn't think the answer was complex enough.

Appendix 17 -- Example of Axial and Selective Codes Based on Open Codes for Teacher Participants

Open, axial, and selective codes for teacher participants

Open codes are tentative names for chunks of data that summarise what is happening.

Axial codes are relationships that have been identified among the codes.

Selective codes are the core variables that have been identified.

Open codes	Axial Codes	Selective codes
Answering questions	Depth of answers, showing the stretch, modelling, reacting with own opinions, higher order thinking, critical literacy, critical thinking.	Scaffolding the challenge through support systems
Challenges Avoidance	Practice is needed, increased quantity of reading, chunked reading makes it easier to attack.	
Reading quantity	Exposure to text, independence through using support tools, importance of high interest texts for students. Inhibiter for skill development.	
Differences in improvement noticed	Not all students make gains. Is this repeating the rich get richer cycle? Who makes the gains and why? How does this compare with the cohort as a whole?	
Focus through using a digital platform	Interactive platform, what they are used to, likes, chats, making notes and creating threads, seeing others' answers. Using a keyboard to write answers. A mode of learning that matches the tools students use outside of school.	
Capabilities of the tool to support reading	Inserting links to build prior knowledge, listening	

	to text, defining words. Enablers for reading support.	
--	---	--

Open codes	Axial Codes	Selective codes
Teacher workload	Setting the focus, finding relevant texts, feedback to students, grading questions, making choices available	Teachers guiding the process of reading support and development
Teacher guidance	Explicit teaching of comprehension strategies, showing the stretch and modelling answers. Setting the purpose for reading. Targeted instructions prior to reading. Showing the aspects of the tool and reminding students what they can do. Immediate feedback.	
Tailoring to suit interests	Finding high interest material, meeting needs and interests of students. High interest catalogue available. Choices. Specific targeting of needs and interests.	
Class culture	A sense of safety to share ideas, view others' work, have others' view own work, react to other students.	

Appendix 18 – Information Form for Parents



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CRICOS Provider Code 00301J (WA), 02637B (NSW)

Faculty of Humanities. School of Education
GPO BOX U1987 Perth, WA 6845
AUSTRALIA

PARENT INFORMATION STATEMENT

HREC Project Number:	HRE2017-0589
Project Title:	E-Learning and literacy: An investigation into the impact of <i>Actively Learn</i> to raise reading comprehension levels of high school students
Chief Investigator:	Dr Paul Gardner, Senior Lecturer, School of Education
Student researcher:	Fiona Jeffries
Version Number:	03
Version Date:	18/05/18

Dear

My name is Fiona Jeffries and as well as being a teacher at XXXXXXXXXX, I am a researcher and Doctor of Education (EdD) student at Curtin University, Western Australia. I would like to investigate the use of a digital tool, called *Actively Learn*, in helping junior secondary school students develop reading comprehension skills.

The proposed research will investigate whether the online tool *Actively Learn* can be used to raise the reading comprehension level of junior secondary school students. The literature over recent decades suggests that despite the definition of literacy changing, and the use of digital tools being encouraged as part of learning programmes, investigations are still needed to discover what success looks like and whether these tools make a difference to achievement.

The project will involve collecting information through:

- Schoolwide year start and year end data collected as anonymous documentary evidence, including PAT Reading Comprehension.
- e-asTTle results of students in the teacher participants' classes.
- Survey on reading behaviours both outside and inside school.
- Voice-recorded interviews with students involved in using *Actively Learn*, involving discussion about their work and strategies they are using.
- In-class observations focusing on student behaviours when using *Actively Learn*.

- Interviews with teachers who are using this digital tool as part of their programme.

Only students whose parents and themselves have signed consent will be interview participants in the research. There will be no coercion for them to be involved.

Interviews, surveys, classroom observations, and data analysis of test results are the sources of data for this research. Dr. Paul Gardner, Senior Lecturer at Curtin University, and Associate Professor Lina Pelliccione, Head of the School of Education at Curtin University, and myself will be the only people who have access to the data. Data will be stored in Curtin University's secure password-protected Research drive. Data and recordings will be kept for a period of seven years after which they will be destroyed or wiped electronically.

The findings from the research will be written up in the form of a thesis, which will be submitted for examination and deposited in the Curtin University Library. Students' names, and the name of the college, will not be used in the written report.

Although the class has been using *Actively Learn* as part of the learning programme once a week during terms two and three, taking part in the research project is voluntary. It is your choice for your child to take part or not. You do not have to agree if you do not want to. If you decide for your child to take part and then change your mind, that is okay, you can withdraw from the project. You do not have to give me a reason; just tell me that you want to stop being involved

I would like to request your consent for your child to be involved in the research. If you agree to this request, I would appreciate it very much if you would sign and date the attached consent form. Please note that you have the right to withdraw from the research at any time.

If you have any further questions, or would like some more information, please do not hesitate to contact me at fiona.jeffries@postgrad.curtin.edu.au. You are also free to contact my supervisor, Dr Paul Gardner at Paul.Gardner@curtin.edu.au, or my co-supervisor Associate Professor Lina Pelliccione at L.Pelliccione@curtin.edu.au.

Curtin University Human Research Ethics Committee (HREC) has approved this study (HREC number HRE2017-0589). Should you wish to discuss the study with someone not directly involved, in particular, any matters concerning the conduct of the study or your rights as a participant, or you wish to make a confidential complaint, you may contact the Ethics Officer on (+61 8) 9266 9223 or the Manager, Research Integrity on (+61 8) 9266 7093 or email hrec@curtin.edu.au.

Yours sincerely

Fiona Jeffries

**English Teacher, Specialist Classroom Teacher, XXXXXXXXXXXX
Doctor of Education (EdD) Student, Curtin University**

Appendix 19 – Information Form for Students



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CRICOS Provider Code 00301J (WA), 02637B (NSW)
Faculty of Humanities, School of Education
GPO BOX U1987 Perth, WA 6845
AUSTRALIA

PARTICIPANT INFORMATION STATEMENT 2018

HREC Project Number:	HRE2017-0589
Project Title:	E-Learning and literacy: An investigation into the impact of <i>Actively Learn</i> to raise reading comprehension levels of high school students
Chief Investigator:	Dr Paul Gardner, Senior Lecturer, School of Education
Student researcher:	Fiona Jeffries
Version Number:	03
Version Date:	10/05/18

Dear

My name is Mrs Jeffries and as well as being a teacher at XXXXXXXXXXXX, I am a researcher and Doctor of Education (EdD) student at Curtin University, Western Australia. In class during terms 2 and 3 we have been using the digital tool, *Actively Learn*. I would like to investigate if this tool is useful in helping junior secondary school students develop reading comprehension skills. As part of class work, we have been reading articles and stories using *Actively Learn* and answering some questions online.

I would like to find out from you how it has been for you when using this tool, what strategies you have used and what aspects of the tool are useful or not so useful. I want to be able to ask students what they think. I also want to compare the data from your test results from Term 1 to those we do at that start of Term 4. The results from the study will give me a better understanding of how teachers can work to help students develop better reading comprehension skills and will help with research I am going to do next year on *Actively Learn*.

If you choose to be involved in this study, you will be asked about your reactions to using the tool *Actively Learn*. I will also use information collected from reading tests over the year. I will ask you to fill in a survey. I will also observe the class while *Actively Learn* is being used. The whole class has been using *Actively Learn* as part of our normal classroom learning, once a week during terms two and three. I would like to know any impact this has had on you, either positive or negative.

Taking part in the research project is voluntary. It is your choice if you want to have your ideas collected for this study. You do not have to agree if you do not want to. If you decide to take part and then change your mind, that is okay, you can withdraw from the project. You do not have to give me a reason; just tell me that you don't want to have any interviews or test information of yours used in this study. Only students whose parents and themselves have signed permission will be participants in the interview research.

I would like to request your consent to your participation in the project. If you agree to this request, I would appreciate it very much if you would sign and date the consent form attached.

Please note that you have the following rights:

The right to withdraw from the research.

The right to check ideas from interviews for accuracy.

Dr. Paul Gardner, Senior Lecturer at Curtin University, and Associate Professor Lina Pelliccione, Head of the School of Education at Curtin University, and myself will be the only people who have access to the data. Data will be stored on Curtin University's secure Research drive.

The findings from the research will be written up in the form of a thesis, which will be submitted for examination and deposited in the Curtin University Library.

Your name will be kept private and so will the name of the college.

If you have any further questions, or would like some more information, please do not hesitate to contact me at fiona.jeffries@postgrad.curtin.edu.au. You are also free to contact my supervisor, Dr Paul Gardner at Paul.Gardner@curtin.edu.au, or my co-supervisor Associate Professor Lina Pelliccione at L.Pelliccione@curtin.edu.au.

Curtin University Human Research Ethics Committee (HREC) has approved this study (HREC number HRE2017-0589). Should you wish to discuss the study with someone not directly involved, in particular, any matters concerning the conduct of the study or your rights as a participant, or you wish to make a confidential complaint, you may contact the Ethics Officer on (+61 8) 9266 9223 or the Manager, Research Integrity on (+61 8) 9266 7093 or email hrec@curtin.edu.au.

Yours sincerely

Fiona Jeffries

**English Teacher, Specialist Classroom Teacher, XXXXXXXXXXXX
Doctor of Education (EdD) Student, Curtin University**

Appendix 20 – Consent Form for Students and Parents



CONSENT FORM

HREC Project Number:	HRE2017-0589
Project Title:	E-Learning and literacy: An investigation into the impact of <i>Actively Learn</i> to raise reading comprehension levels of high school students
Chief Investigator:	Dr Paul Gardner, Senior Lecturer, School of Education
Student researcher:	Fiona Jeffries
Version Number:	03
Version Date:	18/05/18

- I have read the information statement version listed above and I understand its contents.
- I believe I understand the purpose, extent and possible risks of my involvement in this project.
- I voluntarily consent to take part in this research project.
- I have had an opportunity to ask questions and I am satisfied with the answers I have received.
- I understand that this project has been approved by Curtin University Human Research Ethics Committee and will be carried out in line with the National Statement on Ethical Conduct in Human Research (2007).
- I understand I will receive a copy of this Information Statement and Consent Form.

Participant Name		Parent Name	
Participant Signature		Parent Signature	
Date		Date	

Declaration by researcher: I have supplied an Information Letter and Consent Form to the participant who has signed above, and believe that they understand the purpose, extent and possible risks of their involvement in this project.

Researcher Name	Fiona Jeffries
Researcher Signature	
Date	

Note: All parties signing the Consent Form must date their own signature.

Appendix 21 – Comparison of e-asTTle Questions in Test One and Test Two

e-asTTle Comprehension Pre-test May		e-asTTle Comprehension Post-test October	
Text Type	Number and type of questions	Text Type	Number and type of questions
Narrative (Our Cousin Anna)	3 – I,I,I	Advertisement (Alien Mask Voice Changer)	3 – V,R,V
Narrative (My Brother's Mess)	6 – I,I,S,V,I,I	South Pole Sentence structure	1 – S
Persuasive (It's not worth the risk)	3 – I,R,V	Book Report (Tales of a Fourth Grade Nothing)	3 – V,S,S
Info-graphic (Virginia Creeper Trail)	2 – I,S	Information (Four unrelated short texts – Iowa farmhouse, Angela's SS class, Jake skiing, Marco Polo)	4 – S,S,S,S
Information (Gonzalo)	3 – R,I,I	Letter (Greenpeace)	3 – I,I,S
Information (Weta)	4 – R,I,S,I	Descriptive (Bar codes: Reading between the lines)	7 – I,V,I,I,I,I,I
Information (The Trouble with Hairy)	5 – R,I,I,V,I	Information (Faces of Stone)	3 – S,S,S
Sentence about a Cartoon	1 – S	Poem	5 – I,I,I,I,I
	I – 16; R – 4; V – 3; S – 4		I – 13; R – 1; V – 4; S – 11

Key: I – Inference, R – Retrieval, S – Sentence structure, V -- Vocabulary

Appendix 22 – Copyright Permissions

Uzuner’s Online Conversations and Educationally Valuable Talk Table

Dear Dr Uzuner

My name is Fiona Jeffries and I am a Doctor of Education candidate at Curtin University, Western Australia. My thesis is looking at reading comprehension and how digital technology can support the development of the thinking that goes with reading. I have been doing research using the digital platform *Actively Learn* as part of being a high school teacher in New Zealand.

I am writing to request permission to use Table 1. Online Conversations and Educationally Valuable Talk (EVT) Indicators from the article Educationally Valuable Talk: A New Concept for Determining the Quality of Online Conversations, MERLOT Journal of Online Learning and Teaching, Vol. 3, No.4, December 2007 in my thesis.

As part of my teaching of high school students, I have adapted this to a more simplified version for my struggling learners and would like to use this in my thesis as well, with reference to your original article.

I see that the article has a Creative Commons Attribution Non-Commercial-Share Alike 2.5 License. My understanding of this is that as long as I give you appropriate credit and acknowledge your work, I am able to use it in a non-profit setting. Is this correct? I have not used an item like this before so I just want to make sure that I have understood this correctly.

Kind regards

Fiona Jeffries



Smith, Sedef <smithse@uhd.edu>

Wed 05/06/2019 02:15

Fiona Jeffries ✓



Hi Fiona;

You have my consent to use the contents of my article (Tables, ideas, etc) in your thesis and also in your work with your students. Thank you for your interest! I am not an expert on fair use rules, but I believe as long as you cite the work, you should be fine.

Best,

Sedef



PATC Test Structure and Reading Comprehension Scale, NZCER

From: **Fiona Jeffries** <fiona.jeffries@nzcer.org.nz>
Date: Thu, 16 May 2019 at 12:38
Subject: Permission to use a Table and a Figure from PAT Reading Comprehension Manual
To: Cathie Johnson <cathie.johnson@nzcer.org.nz>

Kia ora Cathie

I would like to gain permission to use part of a table and a figure from the PAT Reading Comprehension Manual in the methodology section for my thesis. With most publishing companies, there is usually an online process using RightsLink, however, I can't see what the process is for NZCER and I do not want to use copyrighted material without permission.

Can you please let me know the process for gaining permission from NZCER to use items from the PAT Manual? The request I am making is for the bottom two sections of Table 1, page 10, PAT Reading Comprehension -- content structure; and for Figure 9, page 36, Stanines and the normal distribution of scale scores for a year level on the PATC scale.

I would really appreciate it if you could please forward my email to the appropriate person.

Ngā mihi
Fiona Jeffries

From: **David Ellis** <David.Ellis@nzcer.org.nz>
Date: Thu, 16 May 2019 at 15:57
Subject: Re: Permission to use a Table and a Figure from PAT Reading Comprehension Manual

Kia ora Fiona,

Thanks for your request for permission. Yes that's fine to use the material described for the purpose described with suitable attribution.

Ngā mihi

David

Kivunja, 21st Century Skills Table

From: Fiona Jeffries

Date: Friday, 14 June 2019 at 1:40 pm

To: Charles Kivunja <ckivunja@une.edu.au>

Subject: Requesting permission to use your version of 21st century skills table

Dear Dr Kivunja

I have a copy of Trilling and Fadel's 21st Century Skills (2009) and have found it interesting as a high school teacher looking at 21st-century skills for learning and life. I am doing some research on using a digital tool to help students with reading comprehension and am looking at how the core skill of literacy can be developed, but also how connectivity and collaboration can add to the development of this core skill.

I came across your article published in the International Journal of Higher Education in 2014: *Do You Want Your Students to Be Job-Ready with 21st Century Skills? Change Pedagogies: A Pedagogical Paradigm Shift from Vygotskyian Social Constructivism to Critical Thinking, Problem Solving and Siemens' Digital Connectivism*. I found the table you created (Table 1.2 The 21st Century Essential Skills) as a summary of Trilling and Fadel's P21 and 7C Skills table on page 176.

I am seeking permission to use your version of the table. I have permission from John Wiley & Sons to use Trilling and Fadel's table, however, upon finding yours I find it clear and succinct. I would, of course, acknowledge that you have created the summary of the essential skills.

I would really appreciate including this table as part of my thesis for my Doctor of Education degree if you give your permission.

Kind regards

Requesting **permission** to use your version of 21st century skills table: All Good

 Charles Kivunja <ckivunja@une.edu.au>
Fri 14/06/2019 16:23
Fiona Jeffries ✕

Dear Fiona

Thanks for your email. I am happy for you to use the Table from my paper in the IJHE as you've requested. I am glad that you found it helpful. All the best with your research.

Kind regards.

Charles
=====

Dr. Charles Kivunja (PhD).
Associate Professor in School Pedagogy, Leadership, and Research Methods, UNE
Adjunct Professor in Education, University of Fiji.
Head: Social Sciences and Education Discipline.
Leader: Learning and Research Network
Researcher: Embedding Social Media Technologies in Pedagogy
Fellow Tshepo Institute of Contemporary African Studies, Canada
Fellow Australian Leadership Award
Manager: UNE Leximancer ICT Project
School of Education

Springer Nature. The Cycle of Reading Comprehension Difficulties – Gary Woolley

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John Wiley and Sons. The Reading Apprenticeship Framework – Greenleaf, Murphy and Schoenbach

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The Reading Apprenticeship Framework model Box 2.3 page 25

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Making Connections Image

Fiona Jeffries

To: makingconnections4@gmail.com

27 September 2019 at 11:34

Dear Jennifer

I am a high school teacher in New Zealand and have been teaching reading comprehension strategies to my English students. I have been making posters to reinforce these strategies. For the "Making Connections" poster, I came across the image that is attached to your blog.

I would like to have permission to use this on my poster in my classroom. It will not be used for profit. I am writing my thesis about reading comprehension using a digital tool and would also like to include the poster in the appendix. If you own the image, could you please let me know if I have permission to use this image on my classroom poster?

Kind regards,

Fiona Jeffries

Making Connections <makingconnections4@gmail.com>

To: Fiona Jeffries

1 October 2019 at 05:24

Hi Fiona,

Yes, I do own the image that was made for me a graphic designer, however I am happy to share with you to use for your classroom project.

Take care,

Jen

John Wiley and Sons Trilling and Fadel 21st Century skills

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Essential skills for 21st century learning and occupations Table pp175-176

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