

**Teacher Pedagogy to Develop Student Writing  
Through the Integration of Text-To-Speech Technology**

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## Acronyms

A	augmentation
AARE	Australian Association for Research in Education
ACARA	Australian Curriculum and Reporting Authority
ACER	Australian Council for Educational Research
BBC	British Broadcasting Corporation
CK	content knowledge
COPS	Capitals, organisation, punctuation, spelling
DEETYA	Department of Education Employment Training and Youth Affairs (Australia)
ICSEA	Index of community socio-educational advantage
ICT	information and communication technologies
LDWT	Learning Design Writing Team
IT	information technology
IWB	interactive white board
M	modification
MCEECDYA	Ministerial Council for Education Early Childhood Development and Youth Affairs (Australia)
MCEETYA	Ministerial Council on Education, Employment, Training and Youth Affairs (Australia)
MSWord™	Microsoft Word™
OECD	The Organisation for Economic Cooperation and Development
PCK	pedagogical content knowledge
PD	professional development
PISA	Program for International Student Assessment
PK	pedagogical knowledge
PTK	pedagogical technological knowledge
R	redefinition
R&WGS	Read&Write Gold™ software
RQ1	research question 1
RQ2	research question 2
RQ3	research question 3

RQ4	research question 4
S	substitution
SAMR	Substitution, Augmentation, Modification and Redefinition
SES	socio economic status
TCK	technological content knowledge
TK	technological knowledge
TPACK	technological, pedagogical and content knowledge
TPK	technological pedagogical knowledge
TTS	text-to-speech technology
UNESCO	United Nations Education, Scientific and Cultural Organisation
US	United States of America

## Abstract

Writing to communicate meaningfully with technology challenges teachers to think differently about their pedagogy. In the context of Australian writing classrooms it can be understood that a teacher uses new and different types of technology with limited professional development. This study provides insight into how seven individual primary school teachers harnessed the potential of a new digital technology - text-to-speech technology to transform their pedagogy through the design of learning experiences.

The study used an ethnographic inquiry within an interpretive framework to observe, analyse and interpret the teachers' pedagogy and instructional procedures when using new text-to-speech technology in writing lessons. The study also identified the level of technology integration adopted by the teachers and students and the factors that influenced the use of technology during the writing process. An ethnographic conceptual framework operationalised the field work within each teacher's writing classrooms using multiple data collection tools. The TPACK Framework, the SAMR Model and ratings of teacher instructional competencies when teaching with technology were used as theoretical guides to analyse and interpret how the teachers and students used the new digital technology.

The role of the teacher was significant in mediating the relationship between writing instruction and technology. The teachers designed instructional procedures where discussions on the potential use of text-to-speech technology acted as a catalyst for them to think differently about their pedagogy. The integration process showed how the teachers focused their pedagogy on facilitating good writing instruction rather than making student learning in the writing process more technologically enabled. The teachers who focussed on the relationship between the reader and the writer when composing texts with technology, redefined their pedagogy and generated rich learning to write experiences and innovative instructional procedures for both novice and more experienced writers. Not all the teachers did this to the same extent.

Students' explorations to integrate digital technology were also influenced by how well teachers transformed their own practices. The study shows that some students designed their own instructional procedures, moving beyond a teacher's traditional pedagogy.

The findings of the study suggest that some of the teachers promoted an openness in the inter-relationships between the teacher and students for writing with technology, resulting in a 'de-privatisation' of teacher practices. The study provides insight into the differences between how successful individual teachers were and how a range of factors beyond their control impacted on the teaching and learning process.

An outcome of the study's interpretive analysis showed a pedagogical transformation for teachers when they drew on the strengths of an explicit teaching philosophy and a socially-engaging learning culture. The findings suggest that it was how a teacher interprets the potential of new technology as a stimulus to think differently about their pedagogy that benefitted students to write as global authors.

## **Declaration**

I certify that this thesis does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any university; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

---

Elizabeth H Andrew

Date: November 2016



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Living with technology challenges teachers and students to think differently about teaching and learning. I would like to especially thank Professor David Giles, Emeritus Professor Mike Lawson, Dr Gerald White, Dr Gregory Yates and the late Dr Ken Rowe who provided me with valuable advice in the development of this thesis.

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May the outcomes of this thesis inspire others to become authors and know how they can communicate with technology within our global society.

# **Chapter 1: Teacher Pedagogy to Develop Student Writing through the Integration of Text-to-Speech Technology**

All students need to learn to write to communicate meaningfully in today's world. The Australian Government, through national education policy and the Australian Curriculum, recognises that technology is changing how students will communicate in the future (Australian Curriculum, 2013; Commonwealth of Australia, 2011; Ministerial Council for Education Early Childhood Development and Youth Affairs, 1999; Ministerial Council on Education Employment Training and Youth Affairs, 2008). As described in Australian education policy, students are required to develop skills of information processing and computing (Ministerial Council for Education Early Childhood Development and Youth Affairs, 1989) and to be 'creative and productive users of technology, especially ICT, as a foundation for success in all learning areas' (Ministerial Council on Education Employment Training and Youth Affairs, 2008, p.8). In meeting the challenges of the future, the Australian Curriculum recognises Information Communication Technology (ICT) as a general capability necessary for students' lives in contemporary society (Australian Curriculum, 2013).

The Program for International Student Assessment, commonly referred as PISA, recognises that today's students need to communicate their ideas meaningfully by developing the ability to analyse, reason and communicate effectively (OECD, 2011 [Organisation for Economic Cooperation and Development]). The PISA assessments highlight the positive effect of technology to 'help students to learn better, teachers to teach better, and school systems to become more effective' (p. 4). In 2008, the Melbourne Declaration on Educational Goals for Young Australians (Ministerial Council for Education Early Childhood Development and Youth Affairs, 2008), released a framework for Australian schooling, which included the provision for ICT as a component of successful learning (Ministerial Council on Education Employment Training and Youth Affairs, 2008). ICT was identified as a foundation for success in all learning areas and for further learning and adult life (Ministerial Council for Education Early Childhood Development and Youth Affairs, 2008). The international and national priorities suggest that literacy and technology are priority areas for educational policy development (Australian Curriculum, 2013; Commonwealth of Australia, 2011; Ministerial Council for Education Early Childhood Development and Youth Affairs, 1999; Ministerial Council on Education

Employment Training and Youth Affairs, 2008; OECD, 2011). Hence, there is a need for teachers to understand the relationships between literacy, technology and learning to ensure their pedagogies are effective for students learning to communicate their ideas meaningfully in contemporary society.

The title of this study, ‘Teacher pedagogy to develop student writing through the integration of text-to-speech technology’ reflects how an individual teacher acts to work with new digital technology in the everyday Australian classroom. Teachers today are teaching with new and varied types of digital technologies, at times, with limited professional development opportunities prior to the introduction of the technology. Commonly, teachers and students focus on working towards a learning outcome using technology integrated for the benefit of student learning within the learning process. As the title suggests, the focus on teacher pedagogy through the integration of technology is to provide insight into how a teacher plans to use new text-to-speech technology, the knowledge systems a teacher draws upon and the methods of integration used for designing writing experiences with digital technology. We know little about whether the use of text-to-speech technology can be integrated to create instructional writing procedures that can develop student writing, or if the potential use of a new digital technology can stimulate a teacher to think differently about their writing pedagogy. This study provides insight into what really happens to the pedagogy of seven teachers when new digital technology – text-to-speech technology is used to teach writing.

This chapter discusses the role of technology in the learning process, the writing process model and technology, the teaching of writing with technology and technology and students’ literacy development. The research aim and key research questions are identified. The study aims to increase understanding of the complex interrelationship between pedagogy, technology and learning by analysing how the study teachers actively worked to integrate text-to-speech technology into their practices to develop students’ narrative writing.

## **Literacy, Technology and Learning**

The role of technology in the learning process is changing the nature of how students learn and having a positive impact on transforming current teaching and learning practices (Jordan, 2011, p.429). However, to teach writing to benefit student learning, it is necessary for teachers to understand how to work with the complexities

associated through the integration of technology into their writing classrooms. This requires adopting a functional view of how text-to-speech technology has the potential to be used by both knowledgeable and novice digital learners. It also requires an understanding of the relationship between the reader and the writer of texts and how technological tools such as text-to-speech technology can be managed in the instructional process for writing. While there are positive uses of technology for learning using a range of devices and tools, Bosco (2006) suggested that technological cognitive tools in education would be a benefit for shaping the potential for how technology can be used to generate rich learning opportunities (p. 6).

Read&Write Gold software™ (TextHelp Systems Ltd, 2012a) provides an example of how software can incorporate a diversity of computer-based tools that can be integrated to individualise student learning. Lange, McPhillips, Mulhern, and Wylie (2006) discuss how a version of Read&Write Gold software™ (<http://www.texthelp.com/UK/our-products/readwrite>) is ‘widely used in educational settings throughout the world’ (p. 15). The software package led Lange et al to research the ‘compensatory effects of speech synthesis, spellchecking, homophone detection and dictionary use’ (p. 15), compared with the effectiveness of the features available on Microsoft Word™. Research participants were trained in how to use the software functional features to assist writing and reading by participating in hands on activities that modelled different possibilities of use. Lange et al. promoted the advantage of Read&Write Gold™ is its compatibility with Microsoft Word™ and other applications. The software has a floating toolbar that can be placed anywhere on a page and can be used with other applications. Abell and Lewis (2005) described the advantages of using Read&Write Gold™ software for students who have difficulties in reading and comprehension because the software tools can be used to support individual student learning. Abell and Lewis highlighted how the software provides a positive learning environment. The functionality of text-to-speech technology allows students to read without support from teachers or peers. Students can customize the speech output, speed, pitch and tones of the voices as required and personally customise their learning environment according to their individual learning needs (Abell & Lewis, 2005).

The rationale for focussing on text-to-speech technology in this study is to enable a writer to think and develop meaning within their texts by using the functional capabilities of the technology to backtrack over writing drafts. Writers can listen and think as both writers and readers of texts, while at the same time focusing on the meaning of what is being composed. Text-to-speech technology is unique as a technology integrated into the writing process because teachers can also maintain and further develop their own pedagogical writing practices without becoming technologically dependent on the software. The software enables teachers to create and use new instructional strategies, facilitating students to backtrack through their writing drafts as effective writers and readers of texts with a digital environment (Flower & Hayes, 1981; Hayes, 2012b; Pressley & McCormick, 1995; Pressley & Woloshyn, 1995).

This study explores how text-to-speech technology can be integrated as an instructional tool, to develop meaning in the writing process and strengthen the relationship between the writer and reader. This will involve investigating teachers' and students' adoption and use of text-to-speech technology in instructional writing procedures, the level of technology integration adopted and used by teachers and students when writing with technology, and the factors that influenced the use of text-to-speech technology as a new instructional tool for writing.

The Hayes (2012b) writing process model, the TPACK Framework (M. J. Koehler & Mishra, 2009), the SAMR Model (Puentedura, 2008) and a professional competency continuum of stages of instructional evolution that promotes a teacher's ongoing learning and skill development with technology (Russell, Finger, & Russell, 2006) were used in the design of this study. I have used them as theoretical frameworks to help with analysis of my observations.

The rationale for the selection of the frameworks as theoretical lens to understand teacher pedagogy is significant for a number of reasons. Firstly, the TPACK Framework can be used as a classroom observational framework for understanding if teacher knowledge for considering the functional use of technology can be used to meet students' writing goals. This includes using the framework as an analytical lens to understand the effective teacher behaviours and limitation of the technology that may emerge when the technology is being integrated into the writing environment (Hofer & Swan, 2008; Mishra & Koehler, 2011; Wetzel & Marshall, 2011-2012).

Secondly, while the SAMR Model has limitations in that there is no research to support the technology adoption stages proposed, the model is a useful lens to understand how teachers used technology in the design of learning experiences. This includes understanding if teachers designed instruction where text-to-speech technology could be used for any level of the SAMR Model or constrained to a particular level. The model is also useful for understanding if teachers used technology as a means to engage students in effective writing instruction within a digital environment or instead to reinforce their traditional writing practices (Applebee & Langer, 2011).

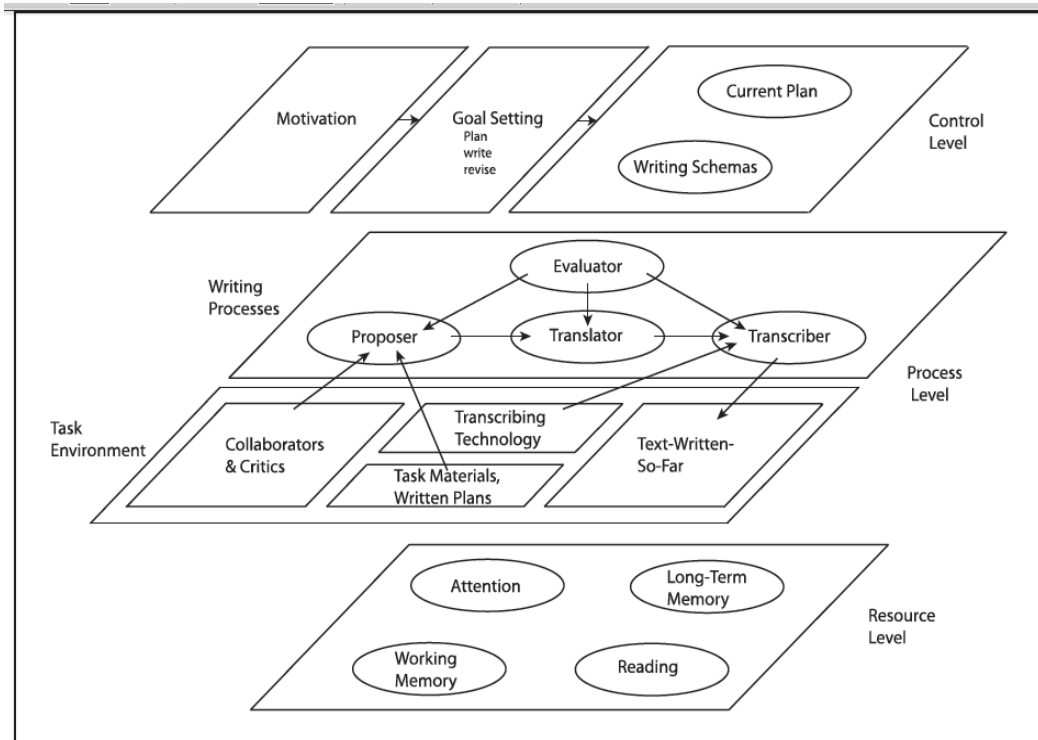
Thirdly, the professional competency continuum provides a means to understand a teacher's learning and skill development while teaching with technology (Russell et al., 2006). The continuum is especially useful for considering if teachers could design new learning experiences within a digital environment that could shape how novice and expert writers could gain meaning from texts when composing with text-to-speech technology.

While technological tools such as text-to-speech technology can be used to create a learning environment to promote student thinking, they can also have an impact on the knowledge, beliefs and capabilities that can be used to transform how culture is created (Bosco, 2006, p. 2). Understanding the factors that influenced teachers' and students' use of the new digital technology will provide further insights.

### **The Writing Process Model**

The Hayes (2012b) writing process model (see Figure 1 below) defines what the act of writing means and provides a framework for considering what a teacher might attend to in facilitating the development of student writing with technology. The model views the composition of texts reflected through thinking processes. The thinking processes can be viewed as thinking acts, which occur at any time through the writing process. From this perspective a student could think about their ideas for generating texts by planning, writing and revising, making it easier for teachers to understand the differences between writers as they generate their ideas (Flower & Hayes, 1981). The model is underpinned by extensive research drawing attention to writing instruction, writing strategies or procedures and effective teaching. The model provides a foundation for investigating instructional procedures with text-to-speech technology, which will be discussed later in chapter 2.

Figure 1 Modeling and remodeling writing. Hayes, J. (2012, p. 371). Reprinted by Permission of SAGE Publications: New York



**The TPACK Framework.**

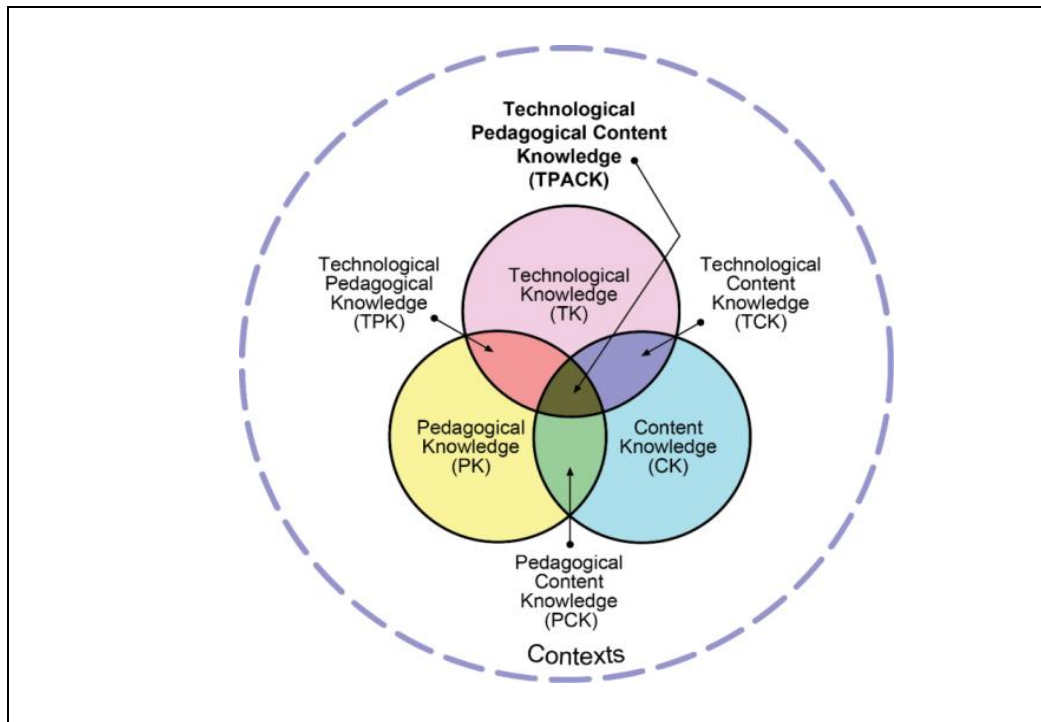
TPACK – representing, Technological knowledge, Pedagogical knowledge and Content Knowledge, is a framework designed by Koehler and Mishra in 2006. The framework incorporates the knowledge that teachers need to integrate technology into classroom learning (M. Koehler, 2014). Figure 2 (below) shows the TPACK Framework. The TPACK Framework can also be used for understanding how teachers teach at the ‘intersection’ between teacher technological knowledge (TK), pedagogical knowledge (PK) and subject content knowledge (CK) when integrating technology into classroom practice (Wetzel & Marshall, 2011-2012, p. 74). The framework does not suggest that technology is to determine the instructional decisions of the learning experience, but rather used by teachers to support them in considering if the functional use of technology can be used to meet student learning goals.

The TPACK Framework can also be used as an organisational model for studying ‘the behaviours of teachers for showing evidence that fits the TPACK framework’ (p. 81).

The TPACK Framework as suggested by Wetzel and Marshall (2011-2012) is therefore a useful ‘lens for classroom observation’ and understanding of teacher practice (p. 73) and will be a valuable tool in the present study.

Figure 2 TPACK Framework (Koehler, 2014)

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The figure clearly shows the three different types of knowledge and the integration of each within the TPACK Framework.

Teaching with technology as suggested by Mishra and Koehler (2011) is a complex challenge. To achieve success in integrating technology into a particular subject, teachers need to know their content, know how to design learning experiences, and know the technology and how to integrate it into their teaching. They also need to be aware of the challenges that students may encounter during learning with the technology. This includes an awareness of the limitations of the technology being used (Hofer & Swan, 2008, p. 223). Technology should be used as a tool to facilitate students to become effective learners (Wetzel & Marshall, 2011-2012). This is particularly true for teachers who can think of novel ways to use technological tools — that is, other than the purpose for they were originally designed (Mishra & Koehler, 2011). The research of Wetzel and Marshall (2011-2012) shows how one teacher used technology as a tool to enhance learning of content and technological



skills and how the researchers used the TPACK Framework (M. Koehler, 2014) as an analytical lens to understand the effective teacher behaviours that emerged from integrating technology into classroom learning.

**The TPACK knowledge domains.** As shown in Figure 2 above, there are seven different knowledge domains of teacher knowledge associated with the interaction of content, pedagogical and technological knowledge (M. Koehler, 2014; Mishra & Koehler, 2011; Wetzel & Marshall, 2011-2012).

Teacher pedagogical knowledge (PK) refers to effective classroom management and organisation, lesson planning and implementation, teaching methods, strategies and assessment. Content knowledge (CK) refers to subject curriculum knowledge, which includes the key concepts, facts and procedures associated with what teachers are trying to teach. Technological knowledge (TK) includes knowledge of skills needed to integrate technology and knowledge of technological tools, software and hardware. Technological knowledge is important in the TPACK Framework (M. Koehler, 2014) because teachers need to understand what are the technologies that impact on teacher strategies and vice versa, how technology changes ways of representing teaching content and the design purpose of a technological tool as promoted by the software developer (Puentedura, 2008).

Teachers can use the TPACK Framework (M. Koehler, 2014) flexibly to think about ways of connecting teaching, learning and technology and especially the four intersection parts between all three components. These parts are pedagogical content knowledge (PCK), technological pedagogical knowledge (TPK), technological content knowledge (TCK) and the combination of all. This is expressed as technological, pedagogical and content knowledge (TPACK). All components or areas of the TPACK Framework interact with each when implemented and they can be constrained or influenced by the teaching and learning process (M. Koehler, 2014).

**Intersecting TPACK domains.** The research of Hofer and Swan (2008) considered the three domains of teacher knowledge within the TPACK Framework (M. Koehler, 2014) and how teachers intersected with each when students were learning through a digital documentary project. While previous research highlighted there may be cognitive and social communication benefits from learning with technology, Hofer and Swan (2008) discussed the challenges that impacted on the integration process in the intersections of pedagogy and content knowledge (PCK) and pedagogy and

technological knowledge (PTK). Hofer and Swan (2008) identified the challenges that teachers experienced through the integration of the different types of knowledge when changing from their traditional classroom practices. These challenges related to an imbalance in their own knowledge between content, pedagogical and technological knowledge. This impacted on how they planned and implemented learning experiences. The research studied the practices of two teachers who were believed to be strong in all three knowledge areas by focusing on the student learning outcomes to be achieved rather than the challenges that impacted on learning.

***Pedagogical content knowledge.*** Wetzel and Marshall (2011-2012) promote the idea that pedagogical content knowledge ‘refers to how to teach [...] Content’ (p. 73) and it is this knowledge which is the ‘key to successful teaching’ (p. 73) of specific subject content. To determine the most effective ways to think about facilitating student learning of subject content, teachers need to understand the specific topic being presented, possible challenges students can face in this learning, possible misconceptions that students might hold and how these can be addressed.

***Technological content knowledge.*** Mishra and Koehler (2011) claimed that technology can influence and change ways of representing content knowledge and that some content lends itself to particular technologies more than others. Teachers need to be aware of what happens when technology is integrated with content knowledge because the interaction of knowledge with technology may change, inform or develop differently (Wetzel & Marshall, 2011-2012).

***Technological pedagogical knowledge.*** While students were engaged in the process of learning in the research of Wetzel and Marshall (2011-2012), the teachers explained how they needed to guide students in how to integrate technology. The research highlighted the technological knowledge challenges the teachers faced when designing learning, the technological expertise required to mentor and support pedagogical growth and for knowing how to restructure and manage the learning environment. It was argued by Wetzel and Marshall (2011-2012) that there were some technologies, such as word processing that can be used across multiple content areas (p. 74) and that classroom routines and behaviours need to be considered in the technological learning environment. Understanding how to teach different types of technologies that influence teaching strategies to achieve learning goals is important technological pedagogical knowledge (TPK) for teachers (Mishra & Koehler, 2011).

***Technological pedagogical content knowledge.*** The process of using technology to achieve learning outcomes posed multiple challenges for teachers in the Wetzel and Marshall (2011-2012) research. This included the complexity of the tasks students were asked to do and the TPACK of teachers that was necessary to guide the learning process. Experienced teachers as suggested by Wetzel and Marshall (2011-2012) demonstrated how technology impacted on student learning at every stage of the learning process. Teachers needed to synthesise and evaluate their teaching approaches and analyse problems in all TPACK areas (Wetzel & Marshall, 2011-2012).

When teachers introduced software, Wetzel and Marshall (2011-2012) explained how the teachers required more complex thinking than if they were designing learning without technology. The research of Wetzel and Marshall (2011-2012) found that teachers needed to draw on the strengths of their strong content knowledge and diversity of pedagogical experiences multiple times to overcome challenges as they arose. The research also found that the teaching characteristics that provided the basis for teachers to persevere with integrating technology required having a deep understanding of content knowledge, having skills to facilitate student-centred learning and having a commitment to integrate technology for learning. Hofer and Swan (2008) explained that having knowledge of these characteristics enabled teachers to focus their efforts on the learning to be achieved and to identify the activities that engaged and motivated themselves and students to use technology during the learning process.

The research of Wetzel and Marshall (2011-2012) indicates that traditional learning might have to be revised when technology is integrated for the purpose of acquiring knowledge about learning, especially if the learning requirement is very different from traditional learning. Teachers will need to decide how, what and when to introduce technological skills. They may also need to rethink and change their approaches to teaching and the instructional scaffolds they use at different stages of learning. It will be a necessity for teachers to identify the types of technological and pedagogical challenges that they may encounter, based on their level of content, pedagogical and technological knowledge. They will also need to decide on how they merge content knowledge and skills with new knowledge and new skills. Wetzel and Marshall (2011-2012) recommended that teachers begin by focusing on the content learning goals and then choosing the most appropriate technological tools to meet those goals. They also stress that teachers need to identify and explicitly teach new

classroom management routines and guidelines for student interaction when technology is being used.

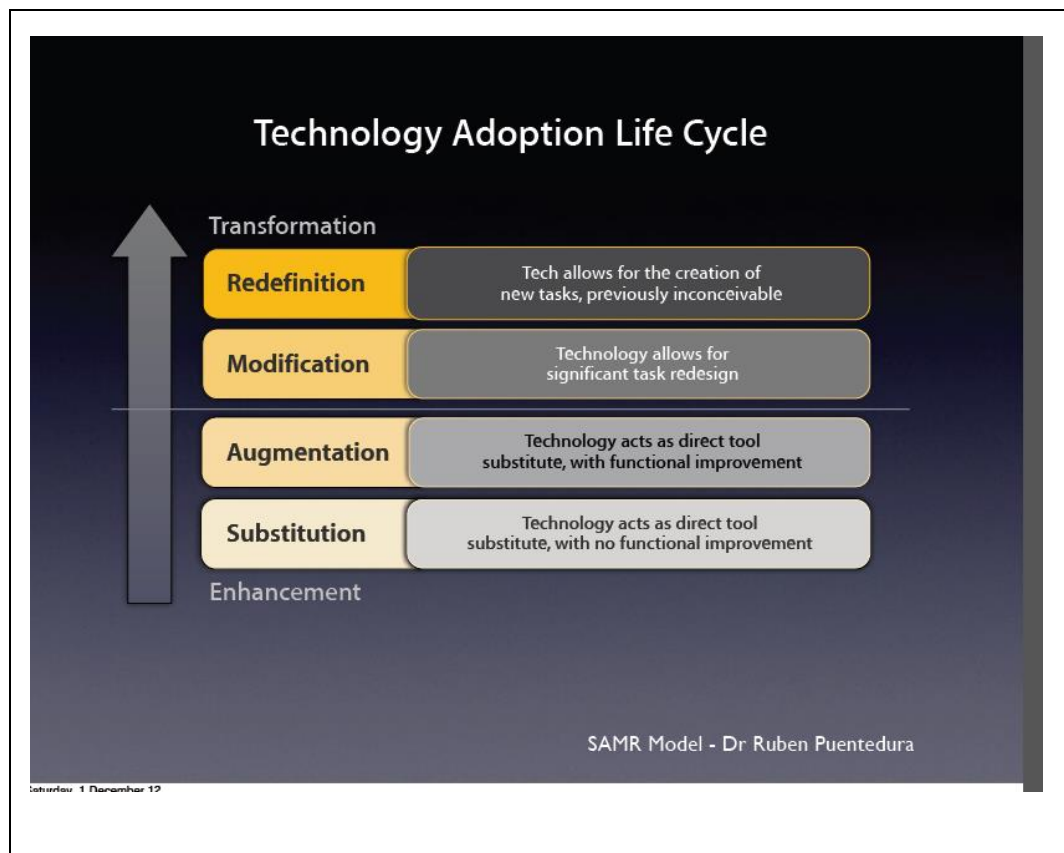
It is anticipated here that the use of the TPACK framework could provide insight into the integration of technology into the teaching and learning experience. The framework may make more explicit the teachers' knowledge in each TPACK domain, identifying the teaching relationship along with the learning relationship between the integration of literacy practices, technology and learning.

### The SAMR Model.

The SAMR model references four levels of technological use that teachers can consider when designing learning experiences. Figure 3 shows the substitution, augmentation, modification and redefinition levels within the adoption lifecycle. It is anticipated that use of this model will provide a means to provide a different estimate of the level of integration of the technology into teaching practice in this study.

Figure 3 SAMR Model (Puentedura, 2008)

Retrieved from <http://www.hippasus.com/rrpweblog/> December, 2012.



The figure also outlines the level of technology use at the substitution, augmentation, modification and redefinition levels of technology adoption.

**Substitution level.** Substitution is the lowest level where technology is used to only substitute another tool without changing anything. The technology is used as a means to enhance learning.

**Augmentation level.** The next level is augmentation, where technology is also used as a direct substitution tool to enhance learning in either online or offline learning environments. At this level the technology improves learning or provides added functional improvement.

**Modification level.** At the modification level, technology is modifying or significantly redesigning learning activities. This is exemplified by using digital communication and technological tools. Digital communication encourages collaboration and analytical thinking. Technological tools can facilitate student engagement in the process of learning. Students can develop higher levels of expertise in their subject matter and use the tools in a creative way, which would not have been possible at the substitution or augmentation levels. Significant improvement in student learning occurs at this level. The effect of technology at this level, moves from an enhancement level to a transformational level.

**Redefinition level.** At this level, technology use, enables students to participate and collaborate in their learning as experts, but with the added skill of communicating with purpose for a variety of audiences. As technology encourages opportunities for students to rethink their learning by receiving evaluative global feedback, students may improve in their learning beyond what they would have when technology had a modification effect on learning. The technology use at this level has a transformational effect on learning because it promotes the creation of learning tasks. The SAMR Model was used in this study to observe the nature of technology use by the teachers and students.

#### **Combining TPACK and SAMR.**

When teachers integrate technology for improvement in student learning and wish to determine the type of effect the technology integration will have on their students learning, Puentedura (2008) presents guiding questions that teachers can use to reflect on different aspects of the TPACK Framework (M. Koehler, 2014) and the SAMR Model (Puentedura, 2008). The questions also have the potential to inform this study for understanding teachers' thinking and actions when teaching with technology. The questions can be used to consider if the technological tools the teachers promoted to teach writing could achieve the best learning outcomes and how teachers were improving the effect of technology integration on students' learning.

The TPACK Framework and SAMR Model will also be used in this study to reflect on whether teachers integrated technology into an existing learning task or created new learning experiences for students.

## **Stages of Teachers' Instructional Evolution**

The three stages on a professional competency continuum of instructional evolution for teachers ongoing learning and skill development with technology are the entry, adaption and transformation stages. At stage one, the entry stage, a teacher is aware of the possibilities that technology can have for improving learning. However, the teacher does not have access to technology or the requisite skills to sustain a change in their practise. At stage two, the adaption stage, a teacher can integrate technology to support their existing practise enabling the technology to enhance the teaching and learning already in place. In the final transformation stage, the technology acts as a catalyst for significant changes to existing pedagogy. New learning opportunities are possible for both teachers and students, including the adoption of new roles and relationships (Russell et al., 2006).

## **The Writing Process and Technology**

To teach writing, teachers need to understand the relationship between reading and writing and the mechanics of writing. Much is known about the process of writing, particularly based on the well-known research of Hayes (2012b), and Flower and Hayes (1981). The process model of writing promoted by Flower and Hayes (1981) encourages writers to focus on three major processes: these are planning, writing and revising of texts. These processes can be applied many times throughout the writing process in a cyclic fashion. This approach will be referred to as 'plan-write-revise' throughout this study.

The process approach to writing encourages teachers and students to focus on the thinking skills writers use. This enables comparisons to be made between the composing procedures of 'good and poor writers' (p. 368). Pressley and McCormick (1995), argue that 'good writers spend a lot of time planning' what they are going to write (p. 491) and are 'aware of the needs of a reader' (p. 497). They suggest that students can learn to write well if they understand the audiences they are writing for, know how to generate content, organise what they are writing, formulate revision goals and attend to the mechanics of their writing. This may include attending to the meaning of what is being written, while simultaneously attending to spelling and sentence construction (p. 498).

However, over the last twenty years the use of technology has changed how teachers teach writing (Applebee & Langer, 2009). These authors have suggested that word processing software is having a positive effect on student writing and that the

process-orientated instructional skills and strategies that students are taught can improve student writing outcomes. Research highlights that technologies are best used to support the writing process model when teachers have knowledge of the evidence based practices and technologies that can be effective in improving the quality of students' writing (De La Paz, 2009; Peterson-Karlan, 2011; Whitney, Blau, & Bright, 2008). In this study, teachers' understandings about their pedagogy to develop student writing through the integration of text-to-speech technology, will provide insight into how the new digital technology can be used as an instructional tool in the writing process.

### **Teaching Writing with Technology**

Writing lessons should be meaningful for students, 'relevant to life' and allow students to write for a real purpose. Students should also be taught written language so they can communicate their ideas and not just focus on the mechanics of writing (Vygotsky, 1978). Some researchers have argued that communicating meaningfully through writing should be a shared collaborative process (Glenn, 2007; Stahl & Hesse, 2006; Vass, Littleton, Miell, & Jones, 2008) between the writer and their audience of readers. Researchers have also suggested that when the relationship between scaffolding and learning is taught together, literacy learning is enhanced (Shanahan, 1988), students become more critical in their thinking (Glenn, 2007), and students who struggle to write are supported (N. Anderson & Briggs, 2011).

Research has suggested that it is important for teachers to make explicit to students the connections between reading and writing when teaching students to write (N. Anderson & Briggs, 2011). Pressley, Mohan, Raphael, and Fingeret (2007) argue that effective teachers engage students to think as they write, read and discuss their texts. They make the point that effective teachers balance classroom instruction with writing and reading experiences for students. Teacher instruction, as suggested by Shanahan (1988) should reflect the developmental nature of the reading-writing relationship. In particular, instruction should include both subject content knowledge and writing process knowledge to enable students to develop their knowledge and thinking processes (Shanahan, 1988), and the critical thinking or reasoning skills needed to enable students to evaluate the quality of the texts they are writing (OECD, 2011).



In addition, students need to have learning experiences where they can think about being the author and the reader of texts (N. Anderson and Briggs, 2011). There are similarities in the cognitive processes used in both reading and writing which enable students to develop literacy skills (N. Anderson and Briggs, 2011). In this way, writing can help students' overall literacy development as they internalise the thinking processes that help to form both good writers and good readers.

### **Technology and Students' Literacy Development**

There is an abundance of research that focuses on the role that technology can provide in assisting students' literacy development (Beck, 2002; Caverly, 2008; Edyburn, 2005, 2006; Wepner & Bowes, 2004; Wollak & Koppenhaver, 2011). In my own teaching experience, I have noted how students who struggle to write are often encouraged by my colleagues to use a computer to assist in the composition of texts. There have been positive outcomes for using computers to facilitate literacy development (Akbiyik & Seferoğlu, 2012; Morphy & Graham, 2012; Peterson-Karlan, 2011; Riley & A°hlberg, 2004; Turner, 2011). However, there is also a lack of understanding about how teachers develop the conditions necessary to integrate technology as an instructional tool to teach writing (Abell & Lewis, 2005; Al-Alaoui et al., 2008; Englert, Wu, & Zhao, 2005; Garrison, 2009; Lange et al., 2006; Silió & Barbetta, 2010). It is this area that will be the focus of the research in this thesis, with a specific focus on the introduction of text-to-speech technology in relation to teachers and students.

This thesis is about how seven teachers acted to work with new digital technology in the learning process. Over recent years I have participated in professional learning programs where a range of new digital technologies have been promoted to engage students or assist them to write. While the literature review in this thesis suggests that technology can have a positive influence on student learning experiences (Figg & McCartney, 2010), my own experiences in understanding how to work with new digital technologies have been challenging and inconclusive. I have not attended professional learning or found research which has set down and understood how teachers have used new digital technologies in real life teaching and learning situations within their classrooms, in situations where they have not been involved in related professional development. This deficit encouraged me in this research study

to observe how teachers were able to work with new digital technology (text-to-speech technology) and how they integrated it into their real life writing classrooms. In current research there are three approaches to understanding how text-to-speech technology has been used in the literacy classroom. The first approach considers the functionality of text-to-speech technology as an assistive tool, to compensate for individual students' learning or literacy difficulties (Lange et al., 2006, p. 13). Some findings suggested that students with reading difficulties benefited in their reading comprehension and proof reading skills (Garrison, 2009; Lange et al., 2006), while others showed fewer spelling errors (Silió & Barbetta, 2010) and benefited and maintained narrative organisational skills (Silió & Barbetta, 2010). The first approach also found that students with literacy difficulties could develop computer literacy skills where the technology was seen as an enabler of writing (Al-Alaoui et al., 2008).

In a second approach, research by Englert et al. (2005) has highlighted how text-to-speech technology can be used by teachers to prompt and guide (p. 196) students with a learning disability to think specifically about their writing performance. When the teachers showed students how to use the functions of the new technology, students were observed accessing 'text-to-speech tools to support [...] metacognitive and self-monitoring tasks' (p. 194). The research found that teachers who used technology to drive thinking, enhanced the teaching of writing (Englert et al., 2005, p. 185) of students with a learning disability.

However, the present study is different from the research of Englert et al. (2005) described above, where the focus was on using text-to-speech technology as a skill enabling or instructional tool to prompt the thinking of 12 students with a literacy disability. This study does not use technology to provide instructional prompts. This thesis is an observational study of how seven teachers acted to integrate text-to-speech technology for **all** students within the natural conditions of their writing classrooms.

Thirdly, when Garrison (2009) researched the potential of using text-to-speech technology as a proofreading or revision tool in the writing classroom of first year university students, the research was unable to conclude if student use of the new technology or teacher writing instruction with technology was more useful than traditional teaching of writing methods (p, 297). That research was conducted as an empirical study and concluded that further research was necessary to determine

whether the use of text-to-speech technology could be effective for students' revision of their texts.

There is no clear position on whether text-to-speech technology is beneficial for primary school students who do not have a learning disability and there is also not a clear picture of how teachers can integrate the technology into the teaching of writing. The literature review within this study makes clear that success in student writing with technology is influenced by how teachers design writing activities with the use of technology and suggests that it is not the technology that determines the writing process. The review also suggests that writing success is influenced by what teachers and students can do collaboratively with computers.

Recent research in relation to writing (Applebee & Langer, 2009, 2011; Harris, 2011; Kervin & Mantei, 2009) and teacher planning to combine writing, reading and technology (Tarasiuk, April 2010), highlights the need for a systematic approach that integrates technology where all students are engaged in writing to create meaningful texts. Research on the use of text-to-speech functionality (Englert et al., 2005; Garrison, 2009) found that the technology was beneficial as an instructional software tool in classrooms to support students to achieve writing autonomy and for revising texts. That research focused on individual students or at a level specifically for special needs students or those who have English as a second language. The literature also suggests that students required the use of earphones and was not necessarily focused for use by all students within the culture of a classroom, where socially collaborative teaching and learning approaches were promoted.

This current study extends the research on text-to-speech technology, by observing how teachers integrate the new digital technology as an instructional tool suitable for **all** students to construct narrative texts in **all** writing experiences. The study looks at how each of the seven teachers acted to use the potential of text-to-speech technology to achieve a writing outcome. This will firstly require understanding how teachers' views about pedagogies for teaching writing with technology impact on the integration of the new digital technology into their teaching. The study will observe how text-to-speech is integrated, not only to scaffold or assist individual writers or readers as previous research on has found (Englert et al., 2005; Silió & Barbetta, 2010), but where the focus of learning how to write through instructional procedures is on the relationship between reading and writing during the construction of texts. This extends previous research where the use of text-to-speech technology was found

to compensate for individual students' reading or writing difficulties (Englert et al., 2005; Lange et al., 2006; Silió & Barbetta, 2010). The more detailed observation of classroom process in this research is aimed at providing information about factors that might contribute to effective integration of text-to-speech technology in writing lessons.

Secondly, this research will focus on how instruction designed with text-to-speech technology can influence teacher pedagogy. The research of Garrison (2009) suggested that sound should be incorporated into the writing classroom to provide students with greater opportunities to succeed (p. 298). Choosing to use sound for the purpose of memory reflection can also heighten students' awareness of their writing environment (Brabazon, 2015). However, it is not known how a combination of sound, text, listening, writing and revising can be integrated into writing instruction. The potential benefits and pedagogical and technical challenges of integrating text-to-speech technology for writing in primary school classrooms is also unknown, especially as teachers and students move between a paper-based writing environment as suggested by Al-Alaoui et al. (2008), to a screen writing environment. This study will observe how text-to-speech can be integrated into the writing process model as an instructional tool for all students inclusive of one-to-one and whole group instructional situations. This is different from research that focused on specific writing activities such as proof reading and revision (Garrison, 2009) or for activities where the technology was used to compensate for individual students literacy or learning disabilities (Al-Alaoui et al., 2008; Englert et al., 2005; Lange et al., 2006; Silió & Barbetta, 2010).

### **Research Aim and Key Research Questions**

Teacher pedagogy to develop student writing through the integration of text-to-speech technology has the potential to enhance and redefine a teacher's instructional procedures. Limited research has been published to fully understand the relationships between text-to-speech technology and established writing process models. There is a gap in the literature for understanding how text-to-speech technology can be integrated by teachers who do not have the support of external support personnel, such as researchers or professional development staff. There is a gap in the literature for understanding how text-to-speech technology can be integrated to create instructional writing procedures within the culture of a socially collaborative writing

classroom (Nail & Townsend, 2010; Silió & Barbeta, 2010). There is also a gap in understanding if and how text-to-speech technology as a literacy-based technological tool can be used by students to make meaning of their own texts while writing.

To facilitate students' thinking when composing texts with digital technology requires investigating how teachers' knowledge and writing experiences can impact on the design of instructional procedures. Researchers have found that teachers' beliefs are difficult to change (Fullan, 2007) and can have an impact on the shaping and success of technology integration (Chen, Looi, & Chen, 2009; Hew & Brush, 2007). Research has not yet explored the many factors that can influence how effective teacher pedagogy is in this area (Chen et al., 2009). We know little about how text-to-speech can be integrated as an instructional tool to facilitate the production of texts within collaborative whole-class approaches (Vass et al., 2008).

To ensure that students can communicate meaningfully through writing and capitalise on the social experience between the author and the reader of texts, research into using collaborative approaches has highlighted the impact of teacher beliefs about writing instruction and the nature of writing (Chen et al., 2009; Nail & Townsend, 2010; Subramaniam, 2007; Westwood, Knight, & Redden, 1997). It is likely that teachers' beliefs do impact on the integration of digital technology in the writing process model. This study will provide insight into how a group of teachers shaped their pedagogy to design writing instruction and/or how successfully they were able to integrate technology into writing practices. This will be useful research as it will highlight the factors that may emerge when digital technology is integrated into the writing process to facilitate student learning (Chen et al., 2009; Ertmer & Ottenbreit-Leftwich, 2010; Hew & Brush, 2007; Merrill, 1988; B. Somekh, 2008; Subramaniam, 2007).

To the knowledge of the author, the widely acclaimed TPACK Framework (M. Koehler, 2014) and SAMR Model (Puentedura, 2008) have not previously been applied to the integration of text-to-speech technology to analyse a teacher's instructional writing strategies for primary students. There has been a growing interest in the research using the TPACK Framework developed by M. Koehler (2014) to explore the teacher knowledge required to integrate technology into classroom learning (Hofer & Swan, 2008; Mishra & Koehler, 2011; Mishra, Koehler, & Henriksen, 2010; Wetzel & Marshall, 2011-2012). This also includes the SAMR

Model (see Figure 3) for understanding how technology or technological tools interact with pedagogy and subject knowledge (Puentedura, 2008).

I have not been able to locate research where the SAMR Model (Puentedura, 2008) has been used to look at the use of text-to-speech technology. The design of this study is significant as the TPACK Framework and SAMR Model are used as guides for reviewing instructional writing strategies.

This study aimed to investigate how primary school teachers integrated text-to-speech technology from the Read&Write Gold Software™ (TextHelp Systems Ltd, 2012a) with their students.

The following four research questions will be addressed:

1. What procedures did teachers and students adopt in introducing new text-to-speech technology into their writing lessons?
2. What procedures did teachers and students use in writing lessons using new text-to-speech technology?
3. What was the level of technology integration adopted by the teachers and students when teaching with technology?
4. What factors influenced teachers' and students' use of the new text-to-speech technology in writing lessons?

## **Structure of the Thesis**

The thesis is presented as 11 chapters. This chapter has provided an overview of what research has suggested as the complex relationship between literacy, technology and learning. The literature reviews of Writing; Writing Pedagogy, Technology and Learning; Learning Theory and the TPACK Framework and integration of technology are explored in Chapter 2.

The ethnographic inquiry within an interpretive framework is outlined in Chapter 3 to show insights into the appropriateness of the qualitative approach and ethnographic data collection methods and analytical framework adopted for this research.

Each teacher's approach to teaching with digital technology is reported from Chapters 4 to 10. The rich descriptions of how each teacher integrated technology in the writing classroom clearly demonstrates the complexities associated between teacher pedagogical, technological and writing knowledge.

Chapter 11 provides an analysis of seven emerging themes from the collective findings of each teacher. The chapter concludes with a discussion of each theme and offers further insights into the outcomes of teachers' pedagogy when text-to-speech technology is used by students in the writing process.

### **Definitions**

To maximise reader clarity of the terminology used in this thesis the following definitions are provided.

**Digital technology or digital technologies.** Where the word technology is used in this thesis it refers to digital technology.

**Educational technology.** In a socially-engaging environment the potential of technology can be integrated to generate a rich learning culture for shaping the learning process. The focus of teacher pedagogy in this environment is on the process of teaching and learning with technology for the benefit of learning and skill development, knowledge acquisition and learner achievement. The integration of technology has the potential to personalise and de-privatise practice for the creation of new knowledge. This definition is adapted from the following references (J. Anderson, 2010; Bosco, 2006; Fullan, 2007; Lloyd, 2005; Muffoletto, 2003; Pearson & Somekh, 2006; Roblyer, 2004a; Russell et al., 2006)

**Effective learning design principles.** The five principles advocated by Yates (2008) include:

1. Consider personal stories and statistical feedback.
2. Promote questioning techniques to acquire a deeper understanding.
3. Consider what is meaningful and relevant.
4. Know how to use, analyse and reflect on data.
5. Acknowledge and believe in the complexity of being and life experiences.

**Effective teaching.** Here my view of effective teaching is adapted from the research of Pressley et al. (2007) based on a strong literacy-focused curriculum and positive social learning environment, where classroom literacy instruction and educational motivation is complemented with effective school characteristics of strong leadership and high expectations for student writing achievement.

**Half mast.** The teachers at Wattle Creek School (pseudonym) used the terminology '*Half mast*' when requesting students to close their laptop lids half way so they could focus attention on explicit teacher instruction.

**Narrative genre.** The narrative genre or text is defined in accordance with the Australian Curriculum Assessment and Reporting Authority. “*A narrative is a time-ordered text that is used to narrate events and to create, entertain and emotionally move an audience. Other social purposes of narrative writing may be to inform, to persuade and to socialise. The main structural components of a narrative are the orientation, the complication and the resolution*” (Australian Curriculum Assessment and Reporting Authority, 2011).

**Pedagogy.** ‘Is the interactive process by which a student’s learning is mediated by teachers using a range of tools. These tools including language, conceptual frameworks and artefacts such as computers are continually developing and changing’ (B. Somekh, 2008, p. 450).

**Technological literacy software.** Refers to any software for the use of literacy with a computer or on any digital device.

**Writing.** In this study, reference to writing, digital writing or writing with ICT is adapted from the definition as cited in Peterson-Karlan (2011, p. 41), where digital writing is defined as ‘compositions created with, and oftentimes for reading or writing on a computer or other device that is connected to the Internet’ (National Writing Project & DeVoss, Eidman-Aadahl, & Hicks, 2010, p. 7).

**Writer’s Workshop.** The term Writer’s Workshop originated from the work of Graves (1985). The term refers to ‘how teachers can establish a community of learners and the writing process’ (p.36), by teachers and students working together. Graves recommended that the Writer’s Workshop approach should be inclusive of teachers using ‘explicit instruction in writing strategies and skills’ (p. 36).

**Zone of proximal development.** As defined by Vygotsky (1978b) ‘is the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers’. (p.86).



## **Chapter 2: Review of the Literature**

This chapter is presented in four sections as follows: 1. Theory of writing and writing models; 2. Relationships between literacy, technology and learning; 3. Theories of learning and instructional strategies; and 4. The TPACK Framework and integration of technology.

### **Writing Process Theory and Writing Process Models**

There are two parts to this section. The first section on writing process theory describes how writing as a complex cognitive process focuses on the ‘plan-write-revise’ conceptual understanding of the writing process. The second section introduces writing process models and considers how these may support teachers to embed effective teaching and learning strategies into the writing classroom and guide the use of technology to create opportunities to develop innovative instructive practices.

Writing is a complex cognitive process and an essential tool for living, learning, communicating and participating effectively in the society (Graham & Perin, 2007). With the increasing demands placed on being able to write using different tools and devices and for different purposes, it is important that teachers understand how technology can be integrated into teacher pedagogy for effective instructional writing strategies. When exploring technology as a tool to shape writing instruction, it is also important to keep in mind that technology alone is insufficient to enable students to write effectively. Teachers and students need to understand and learn how to manage the interconnected complexities of technology, literacy and learning in the writing classroom. Writing today may not be the same as writing in the future and teachers will need to know how to teach emerging and different types of writing (Warschauer, 2007).

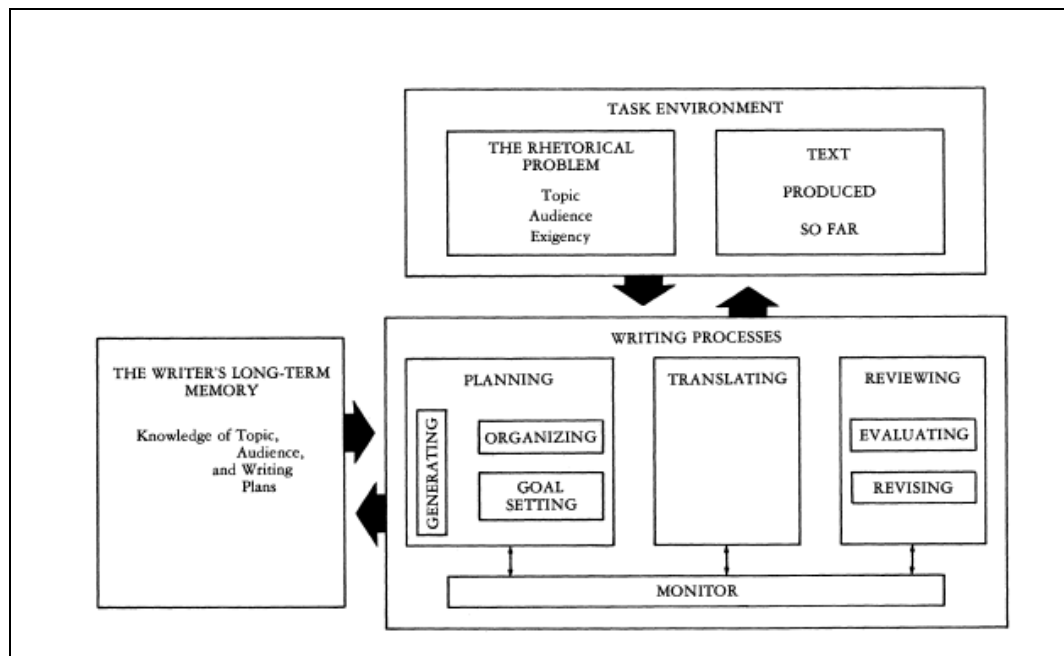
Engagement with cognitive writing process theory and writing process models is therefore a first step to shape approaches to the teaching and learning of how to write.

#### **Writing process theory.**

Several decades ago Flower and Hayes (1981) developed their cognitive process theory of writing which delineates the choices students make during the act of writing (see Figure 4 below); this led to their Cognitive Process Model, which illustrates students’ thinking processes as they compose texts. The model highlights

ways in which teachers can instruct students effectively to achieve writing success. The composing process is viewed as including ‘three major elements’, (p. 369): the task environment, a writer’s long-term memory and the writing process. The task environment includes everything within the writer’s environment, the rhetorical problem of composing a text associated with a specific genre and the actual text produced while composing (p. 369). The writer’s long-term memory includes knowledge of the topic, identification of the audience and the formulation of writing plans. Lastly, the writing processes relate to the planning, translating and reviewing activities that writers use while composing. These thinking processes are goal-oriented, reflecting that writers create their own goals while composing. The Flower and Hayes model, as illustrated in Figure 4, should not be seen as a linear process where a writer composes in rigidly sequential stages of planning, remembering, writing and then re-reading a text (p. 387). Rather, the model represents the interaction of dynamic processes where writers are continually generating ideas, using their thinking skills and monitoring the creation of their texts as they continually think and use their knowledge about writing when composing texts.

Figure 4 Structure of the writing model (Flower & Hayes, 1981, p.370)



The model reflects how students’ thinking processes while composing texts can be centred through the interaction of the task environment, the writer’s long term memory and the writing processes.

Much research on what makes good writers (Flower & Hayes, 1981; Graham, Harris, MacArthur, & Schwartz, 1991; Pressley & Woloshyn, 1995) has made substantial use of Vygotsky's (1978) zone of proximal development (see Research Definitions, Chapter 1) and Learner Control Theory (Reed, 1996).

Vygotsky (1978b) suggested that “learning and development are inter-related” and that to understand the developmental process of learning capabilities, teachers need to consider a student’s actual developmental level and that of their zone of proximal development (p. 84). The zone of proximal development stresses the importance of scaffolding as a means to guide students through the learning process and through the acquisition of new knowledge by collaborations with others. These collaborations may be between teacher and students, students and students, the wider community and more recently between technology and the student user. Research by Subramaniam (2007) highlights the potential of using computer technology as a tool for learning within the zone of proximal development when teachers integrate computer technology into their teaching. Understanding the thinking skills or cognitive procedures used to develop students’ writing within their zone of proximal development, will be important for understanding the impact of integrating technology into the writing classroom.

**The cognitive process theory of writing.** Writing process theory as explained by Flower and Hayes (1981) focused on the mental processes and thinking skills or strategies that writers use throughout the writing process. Flower and Hayes (1981) cognitive process theory of writing emphasises the thinking process which writers’ plan and implement when writing (p. 366). Planning may occur before or during writing, revision may occur from when writing starts and a final draft may include a ‘cycle’ (p. 491) of ‘plan-write-revise’ many times (Pressley & McCormick, 1995). According to cognitive process theory, a writer's long-term memory, the learning environment and the writer's prior writing experiences can be considered as part of the cycle of planning, writing and revising. McCutchen, Covill, Hoyne, and Mildes (1994) claim that the writing process model developed by Flower and Hayes (1981) provides a ‘powerful organising framework’ (p. 256) for other researchers. They state that ‘individual differences in writing skills are related to differences in planning and reviewing’ of differences between good and poor writers (p. 256). Various researchers have made explicit the different conceptual understandings of the planning, writing and revision processes for learning to write. For example,

Pressley and McCormick (1995) concluded that good writers spend a lot more time planning than less effective writers. They write more than poor writers, plan before they write and continue planning and revising while writing. In acquiring a deeper understanding of the reflective revision processes when writing, Scardamalia, Bereiter, and Steinbach (1984) argued that school children could sustain reflective processes when writing. However, their reflections did not necessarily lead to the creation of better quality texts. Furthermore, research by Mason, Harris, and Graham (2011) demonstrated how ‘well-constructed planning strategies’ can guide students to generate ideas and organise their writing (p. 21).

Writing process theory has been often associated in research with successful student writing (Pressley & McCormick, 1995). This is exemplified through knowledge and use of procedural facilitators (Scardamalia et al., 1984), use of cognitive strategies (Graham et al., 1991; Graham & Harris, 1989; Pressley & Woloshyn, 1995), scaffolding (Brown, Collins, & Newman, 1989) and using reflective processes when writing (Scardamalia et al., 1984).

Scardamalia et al. (1984) describe how the reflective or revision processes used by writers can be sustained while they are writing. Scardamalia et al. (1984) termed the procedure used by many primary school children or novice writers as a ‘knowledge-telling strategy’ (p. 174), where writers use a routine approach to writing that does not involve detailed consideration of goals for writing. Students focus on ‘what to say next and how to put it into appropriate language’ (p. 174) and structure their writing in a sequential fashion such that one idea prompts the next one (e.g. and then... and then), in a strategy somewhat similar in a way to a ‘dump’ of knowledge from a data source. As novice writers, they focus on the structural and language writing elements rather than formulating goals such as to entertain a reader. Characteristics of the knowledge-telling strategy indicate that novice writers compose their ideas in the order in which they think and deal with the complexity of writing problems in the order in which they are presented. Scardamalia et al. (1984) explain that at a sentence-to-sentence level, novice writers may achieve little coherence between sentences or across paragraphs in terms of meaning — in fact, students often do not reflect on the meaning of their writing as they write. The changes novice writers make to their texts may therefore not reflect their original ideas or facilitate the writing of more elaborate texts.

A more sophisticated approach to writing is knowledge-transformation (Bereiter & Scardamalia, 1987). Students who compose texts using a knowledge-transformation process, use problem solving strategies for writing and they approach writing as a 'complex goal-directed activity' (p. 17). These students also develop knowledge about writing as they problem solve and 'actively rework their thoughts' (p. 10) during the writing process. This is in contrast to students who use a knowledge-telling approach to writing. Students who use the knowledge-telling approach rely on writing content knowledge and information already stored in their long term memory. The two different models of knowledge-telling and knowledge-transformation as suggested by Bereiter and Scardamalia (1987) are helpful in understanding the different approaches to writing used by novice or more experienced writers. Bereiter, Burtis, and Scardamalia (1988) suggest there are 'intermediate states' that mediate between knowledge-telling and knowledge-transformation approaches to writing (p. 277), where writing instruction can facilitate novice writers to think about writing as a problem solving process rather than as a 'routine process of content generation' (Bereiter et al., 1988, p. 275).

Writing process theory has also been associated in research as having a positive effect on the teaching of writing. Graham and Harris (1989) studied writing process theory when teachers were modelling and monitoring student writing and Pressley and McCormick (1995) suggested that writing process theory can be used to promote positive effects of peer interactions during the writing process. Brown et al. (1989) suggested that the use of cognitive apprenticeship teaching methods would provide students with the opportunity to 'observe, engage in [...] or discover expert strategies' in the context of their writing process (p.18).

While the teaching and learning of writing was originally understood through stages of writing, today the 'plan-write-revise' model is more commonly used as a model for teaching students to compose texts. The revised model theorises writing as a process rather than an activity with discrete stages. Stage models of writing as promoted by Flower and Hayes (1981) view the development of a written text through completed stages of writing in a linear sequence to the completion of a final product (p. 367). However, a process model of writing views the composition of texts reflected through thinking processes. The thinking processes can be viewed as thinking acts, which occur at any time through the writing process. From this perspective a student could think about their ideas for generating texts by planning, writing and revising, making it easier for teachers to understand the differences

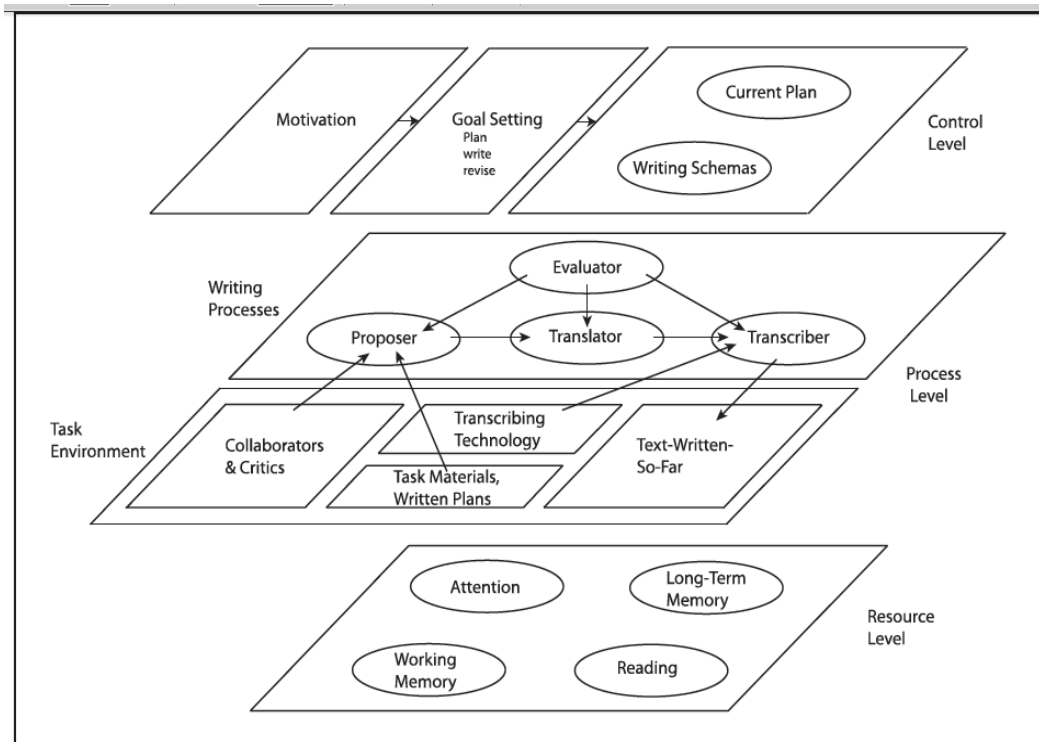
between writers as they generate their ideas (Flower & Hayes, 1981). Flower and Hayes (1981) emphasise this as important for teachers because ‘comparison strategies can be compared between good and poor writers’ (pp. 367-368) through the three major elements of the ‘task environment, the writers long-term memory and the writing processes’ (p. 368). Teachers who are conscious of how writing concepts can inform their practice, focus their teaching and learning on how to ‘shape the cognitive structures’ (p. 21) that assist individual student achievement (Bereiter, 1994) and the development and enjoyment of writing. More effective writers do not write using a simple linear process but rather backtrack through their writing drafts, checking for meaning and improvement in their ideas (Flower & Hayes, 1981; Hayes, 2012b; Pressley & Woloshyn, 1995).

The Writing Process Model (Flower & Hayes, 1981) has emerged as a useful one with which to understand the writing process. The model is underpinned by extensive research drawing attention to writing instruction, writing strategies or procedures and effective teaching. The model provides a foundation for investigating instructional procedures with text-to-speech technology, which will be discussed later in this chapter.

The drawing together of these ideas has been inspired by the necessity to draw on diverse and current related literature that is understood through the process models of writing (Flower & Hayes, 1981; Hayes, 2012b). The literature provides important background information about how the writing process model is underpinned by cognitive process theory and a recent remodelling of the original Flower and Hayes (1981) model. Figure 5 (see below) shows the remodelled writing process (Hayes, 2012).

Figure 5. Modeling and remodeling writing. Hayes, J. (2012, p. 371).

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This remodelled writing process model shows how the thinking processes for composing texts are represented as a process involving three different sub-processes.

**Remodelling writing.** The remodelled writing process model of Hayes (2012b) is divided into different sub-processes, at a control, process and resource level. The sub-processes interact with each other as specialist writing activities and not as a separate writing process. The structures of the activities or separate tasks are explained by Hayes (2012b), ‘as a kind of plan stored in memory’ (p. 374). Individual writers attend to goals within the plan to guide how to carry out revision. Hayes (2012) views these processes as complete activities within themselves and therefore, whilst essential for writing, they must be viewed as ‘separate writing processes parallel’ to the act of writing (p. 376). At the control level Hayes (2012b) has included student motivation in combination with cognitive processes. While the focus of motivation is to account for a teacher’s or student’s willingness to engage in writing or to attend to using instructional strategies (p. 372), it is the different writing goals which are represented by novice or expert writers that guide how revision is performed at the control level. At the process level specialised activities are represented for the purpose of composing a text which can be read by others. This includes the task environment which may be influenced by collaborative writing

activities, transcription technology, the plans that facilitate text generation and the text written so far. The separate activities include planning, setting writing and revision goals, generating ideas and evaluating written texts. How texts are revised in this research to detect writing errors while composing, will be significant for understanding how technology is integrated at the process level. At the resource level all the knowledge and tasks stored in memory or accessible for reading and writing are represented. The tasks can be stored in long-term-memory at the resource level and then integrated at the control level.

The new Hayes (2012b) model is relevant to this research because it illustrates the complexity of writing that needs to be recognised by teachers. It also provides a valuable conceptual framework for modelling primary schools students' writing. The revised model includes motivation, transcription and working memory as processes important to the writing process. While Hayes (2102) outlines reasons for the inclusion of transcription and motivation, he suggested that the inclusion of working memory was an 'obvious oversight' (p. 370) which should have been included in his original model (Flower and Hayes, 1981).

***The monitor, planning and revision processes.*** The monitor, planning and revision processes included in Flower and Hayes (1981) original writing process model, sought to sequence the processes of writing to individualise how students may decide to plan, write or revise approaches to writing. More recently, Hayes (2012b) explains how he has revised his view of writing as comprised of different 'specialised writing activities' (pp. 375-376) within the writing process model. The revision of written texts is therefore a complete specialised writing activity within the different levels of the writing process model. Revision involves planning how to detect writing problems, how to understand those problems and how to rewrite or replace what is written.

Hayes (2012b) explains that many novice writers have difficulty revising texts. They do not necessarily have the skill to problem solve, detect writing problems and know how to attend to textual meaning, structure and organisation. Novice writers may focus only on local problems of spelling and grammar, whereas expert writers can attend to local problems as well as textual meaning and organisation. Hayes (2012b) suggested that when novice writers are provided with writing goals to focus on the meaning of a text or reading goals to focus on detecting local writing problems, they can improve the quality of how they revise their written texts. Hayes (2012b) realised



that writing experiences and instructions can facilitate novice students to adopt the writing revision processes used by more experienced writers. Novice students can be taught how to monitor and revise their written texts as a specialised writing activity and that doing so would improve the quality of how the students' revised their texts. Hayes (2012b) makes the point that continuing research on revision approaches to writing, highlights that a writer's ability to revise what they are writing is stored as declarative knowledge in a writer's long term memory. Declarative knowledge as explained by Hattie and Yates (2014) is knowledge that can 'potentially be expressed through words' (p.126). The declarative knowledge of students about the writing process can be expected to become more complex as they change from writing using a novice knowledge-telling strategy to more elaborate knowledge-transforming and reflective processes used by expert writers. This change can be facilitated by instruction (p. 375). In remodelling the process approach to writing, Hayes also expanded on the Bereiter and Scardamalia (1987) knowledge-telling and knowledge-transforming model by including three strategies that to an extent are seen to bridge the original gap between knowledge-telling and knowledge-transforming.

Hayes (2012b) termed the new sub approaches within the knowledge-telling strategy as 'flexible-focus' texts, 'fixed-topic' texts and 'topic-elaboration' texts. When novice students compose using a flexible-focus to text production, Hayes (2012b) suggested they do not have a global or overall topic and change from one statement or sentence to another as they write. Novice students who use a fixed-topic text approach reference a global topic in every statement or sentence constructed. Hayes noted that expert writers more generally use a topic-elaboration text approach when writing, where they use a global topic and elaborate on the topic by developing different subtopics or ideas around that global topic.

The implication is that writers who use these approaches to produce texts can also use a range of writing strategies and can produce texts more effectively when differentiated writing instructional procedures are used. As teachers better understand the different knowledge-telling processes, they may be able to individualise student learning by using specific instructional strategies — they can progress from novice knowledge-telling strategies to using the more elaborate expert approaches to writing.

**Motivation.** To understand how students write, Hayes (2012b) suggested it is necessary to learn how to combine motivational and cognitive processes. Mayer

(1998) suggested that a combination of motivational skills, cognitive skills and metacognitive skills are necessary for ‘successful problem solving in academic settings’ (p. 49). Hayes (2012b) also suggested that motivation to write may be attributed to the relationship between the different writing experiences of novice and expert writers and how they respond to their writing goals. The different writing activities throughout the writing process have specific writing tasks. When students attend to these tasks, motivation may affect how they think and attend to developing the quality of the texts they are composing (p. 373). When students construct new understanding by using what they already know and then socially communicate their new knowledge to their peers, they can then develop an understanding of their own capabilities about how they can communicate more effectively and develop more meaningful texts. The motivational and metacognitive skills necessary during this problem-solving process can be identified. They include skill components related to domain-specific [writing] knowledge, strategies for how to use the knowledge in problem solving, and self-belief in one’s ability to solve the problem (Mayer, 1998, p. 61).

***Transcription and technology transcription.*** Hayes (2012b) has included handwriting and typing as an integral element in students’ writing development in his model (see Figure 5 above). In the model, transcription refers to texts written by hand and transcription technology refers to texts that are typed on a computer. Hayes (2012b) suggested that transcription skills compete with other cognitive processes when students are writing, and therefore should be considered by teachers when aiming to improve students’ writing performance.

Other researchers have reported positive effects that transcription and transcription technology have on student writing outcomes. For example, Snyder (2000), found that students who were good writers were being rated higher using technology than students with different writing abilities. Similarly, research by Bangert Drowns (1993) claimed that a writer’s keyboarding skills could make students better writers. Morphy and Graham (2012) argued that ‘word processing enhances the writing of students who experience difficulty learning to write and read’ (p. 674), and that a student’s length of story, organisation of text, quality of writing and mechanical errors improved along with their motivation to write when compared to hand-writing. Christensen (2004) suggested that typing practice improves the quality of students’ texts that are typed. Writing researchers have claimed a positive benefit for using a

combination of word processing and speech synthesis software. This is particularly the case for improving the quality of student writing and as intervention tools for students with a learning disability (Andrews, 2004). Transcription and technology transcription are relevant skills to develop, to support students to write. If students can develop fluency to write by hand or when using a keyboard, they arguably can focus more on the development of their ideas when composing texts. Also, they may not be overcome by the technical challenge of having to learn how to use a keyboard. Rogers and Graham (2008) suggested that teachers can develop students' writing skills with the use of a word processor as the primary tool for writing.

Regardless of the writing instructional processes implemented by a teacher, there are functional differences that some children bring to the writing classroom when learning to write (Berninger, Abbott, Abbott, Graham, & Richards, 2002; Berninger & Hart, 1992). These differences may relate to a writing performance disability over a learning disability and therefore students' cognitive and language development may be quite different from their motor development. Learning to write or learning to type as Hayes (2012b) suggested, should be considered separately from a student's reading or writing skills. He suggested that language by hand and language by eye are completely different learning systems despite the direct connection at the text level of reading and the text level of writing.

This section outlined the effects of a cognitive process theory of writing for developing student-writing outcomes. The models of writing processes (Flower & Hayes, 1981; Hayes, 2012b) represent writing as a complex task, involving interacting levels of control, process and cognitive resources.

Research also suggests that writers can develop writing skills using technology, that practice may overcome the need to use technological tools and that students' motivation to write can increase when computers are used to compose texts (Andrews, 2004; Bangert Drowns, 1993; Hayes, 2012b; Morphy & Graham, 2012; Rogers & Graham, 2008; Snyder, 2000).

If the integration of technology with cognitive psychology? provided Hayes (2012b) with the 'courage' (p. 385) to remodel writing and included possibilities to improve student's writing, then the integration of technology into the writing classroom may provide teachers with the courage to remodel their teaching practices in teaching students how to write. This is one of the major themes of interest in this thesis.

Models of writing that can account for current representations of writing in a globalised society, highlight the importance for knowing how to use different tools, devices and purposes for writing, along with knowing how to integrate writing, technology, literacy and learning into the writing classroom. As writing is an activity designed to create a text for an audience or oneself, then teachers and students will need to know how to integrate technological tools effectively to create meaningful texts as global authors for global audiences.

### **Writing Pedagogy, Technology and Learning**

This section reviews the relevant literature related to the use of technology to support writing instruction. This is important because of the difficulties teachers face in understanding how they can integrate technology as an effective tool to enrich the writing process. The section concludes suggesting that text-to-speech technology research, the use of laptops in schools and students' out of school learning experiences with technology can be important influences that impact on the development of primary school students' writing capabilities.

#### **Impact of Technology on primary school students' writing experiences.**

Researchers have highlighted how new technologies can impact positively on students' writing through changing approaches to teaching practice, the use of word processors, effective instructional practices and computer mediated communication (Akbiyik & Seferoğlu, 2012; Morphy & Graham, 2012; Peterson-Karlan, 2011; Turner, 2011). When thinking about the relationship between literacy, technology and learning and their implications for teaching practice, the evidence suggests that teachers can consider the complexity of all three together. Teachers may then understand how they can integrate technology to redefine and deepen literacy experiences for their students.

Some researchers have investigated how teachers combine literacy, technology and writing (Figg & McCartney, 2010; Kervin & Mantei, 2009; Wolz, Stone, Pearson, Pulimood, & Switzer, 2011) to improve learning, develop students' computer thinking skills and their skills in composing texts. Figg and McCartney (2010) found a combination of writing, technology and learning experiences promoted opportunities for student voice when students were encouraged to express their individual creativity when composing digital stories. The research of Kervin and Mantei (2009) highlighted how teacher-writing pedagogy must focus on providing

opportunities for students to make their own authoring decisions and that technology must not lead the learning-to-write experience. The research highlighted the challenges teachers encountered and the importance of teacher pedagogy for reflecting on and responding to student learning experiences rather than focusing just on the mechanics of the technology (p. 30). The research method used by Kervin and Mantei (2009) entailed the researchers providing ‘moments of modelling the technology’ (p. 30) to support students during writing lessons. In contrast, the observational method of the present study involved no direct influence of the researcher on teachers or on students’ use of technology.

In another study to encourage teachers and students towards a greater participation in using computers to write stories and procedural animations using technology, Wolz et al. (2011) found that teachers in collaboration or partnerships with schools’ administrators was essential (p. 9:6) for understanding problems associated with computer concepts and knowledge structures for classroom learning. This suggests that such collaboration might be of interest in this study.

A need for deeper understanding of designing and improving collaborative learning experiences has also been suggested (Nail & Townsend, 2010; Viilo, Seitamaa-Hakkarainen, & Hakkarainen, 2011), along with reflections on writing (Whitney et al., 2008) and instructional and assessment possibilities (De La Paz, 2009). When Nail and Townsend (2010) used technology to mediate student writing, the research highlighted how teachers needed to develop closer relationships with their students to gain a deeper understanding for how to differentiate learning using different technological devices, and collaborative approaches. In another study, collaborative strategies focused on the ability of teachers to motivate students to use inquiry methods independently (Viilo et al., 2011). Again, this teacher-student collaboration may emerge as an issue of interest in the current study.

The potential benefits of focusing on the process of writing, and of designing writing experiences that promote authorial voice, are important considerations as we think about the relationship between pedagogy, technology and writing. Previous research cited in this literature review has highlighted the challenges for teachers; it shows that collaborative methods, guided by experienced practitioners, were more successful when the focus was on the process of learning rather than on the technology itself. This finding is relevant to the present research because it indicates

the complexity of the issues and suggests what needs to happen if teachers are to integrate technology into their writing pedagogy.

**Technology and student learning.** Badia, Barberá, Guasch, and Espasa (2011) raised one of the key issues associated with the use of technology in teaching when they considered the question of the relative influence on students' work of the technological design of learning activities and that of the teacher's teaching practices. One of the possible scenarios is that the design of the technology dominates and could dictate how the writing lesson proceeds. Alternately, the teacher could mediate the influence of the technology and the way that students interact with it during lessons. Practical matters may also be of relevance. Instructional approaches to teaching how to use software to facilitate learning and how to develop student's computer literacy skills, depends on the amount of lesson time teachers have available for learning (Akbiyik & Seferoğlu, 2012). When examining instructional approaches for teaching how to use software, Akbiyik and Seferoğlu (2012) found that teacher-centred literacy instruction required the development of computer skills and effective approaches to teaching.

It is clear that the potential of technological tools for supporting learning may impact on the way technology can be integrated for student motivation, achievement and opportunities for students to think about and plan their own learning (Webb, 2005). However, Webb (2005) also argues there are a number of challenges teachers can face when designing pedagogy with technology, especially student-centred and personalised approaches to learning (Webb, 2005). These challenges include understanding the potential for how technological tools can support student cognitive development, having knowledge about learners and curriculum pedagogy and knowing how to work with students to develop a technological learning environment (Applebee & Langer, 2011; Webb, 2005).

The sobering report on teaching of writing in the US by Applebee and Langer (2011) found that technology was mainly used for presentational and formal presentations of students' texts. They suggested that some teachers had not used technology as a means to cognitively engage students in learning, and instead preferred to use technology to reinforce their traditional teacher-directed instructional practices. Less than half of the teachers surveyed had used computers for student revision of their own work. When teachers used Smart Boards™ (also known as Interactive White Boards) students were found to have revised their texts more often, created different

kinds of writing and engaged with social networking tools. These findings have relevance for the Australian context, given that such detailed knowledge about use of technology in writing lessons is not yet available. The current study will provide information relevant to this particular field.

**Writing improvement with technology.** To explore the potential of movie-making technology and to promote students' writing, language and technological skills, Figg and McCartney (2010) developed a model of digital storytelling. The focus of the research was on middle-school underachieving student learners and teacher candidates who participated in an invitational teaching and learning experience in a community-learning environment. Student learners from the outset of the research were encouraged to 'control their learning environment and design [their own] learning experience [...] with assistance from their teachers' (p, 54). While this research involved only students with a learning disability and trainee teachers, the findings provide useful information for inquiring into teacher pedagogy in a mainstream classroom through the integration of text-to-speech technology in this study. The findings also suggested there was an improvement of students' writing and technical skills and trainee teachers' knowledge for redesigning learning experiences. The researchers used the TPACK Framework (M. Koehler, 2014) to reflect on the experiences of the training teachers, suggesting teacher knowledge developed in understanding how to facilitate learning.

**Interactive technology and multimedia in writing.** One of the issues of integrating technology into writing that is relevant to this research is how technology can change traditional writing experiences. Wolz et al. (2011) investigated how the increasing use of the Internet and digital devices in print based writing, changes writing experiences for students. The researchers found collaboration amongst practitioners was necessary to understand problems associated with technology. They found that pedagogy must be customised to the culture of the school, that teachers must collaborate with the pedagogical expertise of others, focus on curriculum content rather than the technology and use instruction that reflects the individual skill levels of novice and expert learners. The research provides useful evidence that is relevant towards understanding how teachers' beliefs and practices impact on pedagogies for teaching writing with technology. The research also provides evidence for how, using interactive approaches, teachers can promote technological thinking within the design of many different learning experiences.

Wolz et al. (2011) posited that although today's teachers are encouraged to use technology in their classrooms, they might not have the conceptual knowledge for knowing how to design learning experiences with technology. They concluded that while teachers were capable of drawing on their out-of-school technological experiences and peer mentors to guide them to integrate technology into their writing classrooms, these approaches may be insufficient to sustain its use. Wolz et al. (2011), suggested that the formation of 'multidisciplinary collaboration' (p. 9.6) opportunities between educators, school administrators and others could facilitate prospects for teachers to engage students in computer thinking skills so they can read, analyse and write texts within multimedia environments.

**Text construction using technology.** In studying how technology afforded teachers to use technology to teach the construction of texts, Kervin and Mantei (2009) observed students and teachers over an extended time. The research suggested that teachers need to carefully plan for and communicate to students the learning tasks and activities that promote relationships between literacy, technology use and learning. The researchers found that 'computers have the potential to transform and deepen literacy experiences for primary students' (p. 30) when teachers embed technology into their writing practice. However, while the use of technology was found to support student learning when used within the 'conceptualisation of the learning process' (p. 28), the research did not show how teachers planned and designed learning experiences that integrated technology to support student writing goals. The inclusion of teachers and students having to have a clear understanding of being goal-orientated during the learning experience for constructing texts will be relevant for understanding how the TPACK Framework (M. Koehler, 2014) and SAMR Model (Puentedura, 2008) informed teacher pedagogy. It can also help us, in this study, to explore the technical and pedagogical challenges that emerge when teachers and students integrate text-to-speech into narrative writing experiences. Puentedura (2008) developed the SAMR Model to answer the questions that he suggested for 'the four types of technology use that would have a greater or lesser effect upon student learning' (p. 5). In the two lower levels of substitution and augmentation, the level of technology use enhances learning. At the two higher levels of modification and redefinition, the level of technology use can have a transformative effect on student learning.



**Collaborative writing processes.** Collaborative design teams have a positive influence for supporting teachers to design instructional writing experiences for students. Over the last ten years, research suggests that collaboration is important for teachers and students when designing instruction and during the writing process (Hmelo-Silver, Duncan, & Chinn, 2007; Nail & Townsend, 2010; Viilo et al., 2011). Collaborative practices do not necessarily mean successful teaching or learning with technology (Nail & Townsend, 2010). The findings from the mentoring opportunities between students and teachers using online communication technologies suggested that for collaboration to impact positively on instructional teaching practices it should be viewed as a learning process for everyone under the guidance of experienced practitioners (Nail & Townsend, 2010). To overcome technical and pedagogical challenges that emerge when teachers and students explore the impact of integrating technology for writing, Nail and Townsend (2010) found that it would be a benefit for collaborative teams to consider the use of problem solving approaches, authentic learning experiences and involve a diversity of peoples' interests when designing writing instruction. When teachers' traditional teaching conditions are challenged by new learning aims, Viilo et al. (2011) explained how teachers may need to become learners themselves as well as being responsible for scaffolding student learning. This is an important consideration for observation of teachers integrating text-to-speech technology as an instructional tool using collaborative writing processes in this study. Insights from inquiring into teachers TPACK (M. Koehler, 2014) and levels of technology use through the SAMR Model (Puentedura, 2008) may also show how teacher pedagogy can build new knowledge and understanding to ensure students know how to inquire collaboratively and take responsibility of their own learning (Villalon & Calvo, 2011) when writing with technology. Hakkarainen (2009) suggested that teachers can promote collaborative social practices where technological tools can be used to create shared knowledge. The practices he suggested would involve teachers facilitating student participation in collaborative knowledge building using 'shared instruments [...] objects and teachers' and students' activities' (p. 221).

The research on fostering of collaboration when using technology in the writing process is relevant to this research because it suggests that the use of technology 'can integrate to enhance learning through transformed social practices' (Hakkarainen, 2009, p.214). Teachers should focus on direct guidance and planned collaborative learning sessions when introducing technology into writing lessons as the knowledge

of this aspect of technology use would not be familiar to students. This approach can be particularly successful when collaborative design teams and instructional scaffolding is used (Hmelo-Silver et al., 2007). Clearly, the nature of collaborative social practice in writing lessons involving the use of digital technology is a key interest in the current research.

### **Technology impacts on the teaching of writing and classroom writing instruction.**

Technology is impacting on the new skills and capabilities that students require for twenty-first century writing and the purpose for making meaning through written communication (Akbiyik & Seferoğlu, 2012; Applebee & Langer, 2011; John & Sutherland, 2005; Mavers, Somekh, & Restorick, 2002; Warschauer, 2007).

Research on the relationship of technology and writing and the implications for English language learning and teaching highlights the challenges for teaching writing and for how teachers ‘conceptualise writing and its role in education and society’ (Warschauer, 2007, p. 915).

The following reviews provide an overview of pedagogical research on how to integrate technology in the teaching and learning process (John & Sutherland, 2005; Mavers et al., 2002), how students use technology for learning (Akbiyik & Seferoğlu, 2012; Badia et al., 2011), how technology impacts on learning (Applebee & Langer, 2011; Webb, 2005) and the influences of technology that impact on the designing of pedagogical experiences to enhance learning (Conole, Dyke, Oliver, & Seale, 2004; John & Sutherland, 2005; Webb, 2005).

**Technology in the teaching and learning process.** There are different kinds of learning experiences and the role that technological tools have for impacting on learning (John & Sutherland, 2005; Mavers et al., 2002). Technological tools, according to Mavers et al. (2002) can provide users with new opportunities and may change their teaching or learning capabilities. These researchers found that students have different ways of experiencing technology and students vary in their awareness of how technology can be used. The findings are significant for understanding how students work to integrate technology for writing texts. The research suggests that students who have a deep understanding of networked technologies, and how the technologies can be used in society, may already have their own understandings of how the potential of technology as a tool for learning can be integrated into the

learning process. This means that teachers must also consider how students' previous experiences of using technology can be valued and incorporated into the design of new learning experiences.

Similarly, in researching the relationship between teacher pedagogy, a single subject domain and technology, John and Sutherland (2005) suggested that teachers need to develop an understanding of the concept of how technological tools can be used.

Their findings suggested that when teachers design learning experiences, they must be aware of the complex interrelationship between the design of the learning experience, their own teaching intentions, and the students' own understandings for how technology can be integrated to construct learning.

information relevant to this particular field.

**Influences of technology that impact on pedagogy.** Teacher pedagogy is integral to integrating technology into the writing classroom and for how students can use technology to produce quality writing outcomes (Conole et al., 2004; John & Sutherland, 2005; Webb, 2005). These researchers suggest that teachers may need to be cautious about understanding the impact that technology may have on the learning process. Their research highlights that teachers need to consider not just the addition of the technology but also consider the technology as a catalyst for redesigning new pedagogical approaches (Conole et al., 2004; John & Sutherland, 2005; Russell et al., 2006). A review of the factors that impact on teacher motivation and confidence to teach writing with technology may show how teachers in this study were influenced to use different teaching methods and design new instructional procedures.

We have learnt from John and Sutherland (2005) that teachers need to design learning activities and strategies that use both digital and non-digital resources and tools and that introduction of a new technology may require a change in teaching practice that can impact on both teacher and student traditional beliefs about approaches to learning. Teachers need to understand that they can change their beliefs from a focus on learning to a focus on teaching (Webb, 2005). The use of the TPACK Framework (M. Koehler, 2014) and SAMR Model (Puentedura, 2008) will provide insight into teachers' awareness of student computer literacy skills and technological skills, (including those acquired outside of the classroom) that Mavers et al. (2002) suggested are relevant for understanding how learning experiences can maximise learning outcomes for every student.

As teachers become aware of the potential for using technology as a tool for writing, they may realise that the technology and how it can be used for learning may challenge their traditional teaching practices (John & Sutherland, 2005; Lankshear et al., 1997a; Mavers et al., 2002; Warschauer, 2007; Zappen, 2005) even as it deepens students' literacy experiences (Akbiyik & Seferoğlu, 2012; Morphy & Graham, 2012; Peterson-Karlan, 2011; Turner, 2011). This has implications for this research. We could not be sure how teachers would make use of a new technology without support, as this study was an observational study of how teachers made use of a new technology in their own classrooms — which is a common scenario within Australian schools today.

### **Benefits of the use of technology.**

Research into the barriers and potentials for using and integrating software into classrooms has been referenced by Bingimlas (2009), Brunelle and Bruce (2002), Haddad and Jurich (2002) and Hogan and Farren (2000). Common themes emerging from these researchers are applicable to this research because they indicate that while teachers may have a strong desire for integrating literacy software into their classrooms, the following implications need to be addressed to enable success in the teaching and learning process:

1. School administrative structures need to ensure the school intranet can support how software is to be used in classrooms.
2. Software should be able to access the Internet, subject to security requirements and should support collaborative learning.
3. Financial commitments and the ongoing costs of licensing and updating software licences can be met.
4. Teachers should not become technologically dependent; they should be able to maintain and develop effective pedagogical practices.
5. Professional training needs to ensure that teachers and students can understand how to use the software and can share new practices as they emerge.
6. There should be an emphasis on developing competencies in both literacy and computer literacy skills. Brunelle and Bruce (2002) and Bingimlas (2009) advocate that while teachers may be motivated to use technology in learning, they may not have the skills necessary to sustain use. A lack of technological

confidence, competence, access to resources and knowledge of computer software and hardware may not ensure success.

**The process of using technology.**

**Preparation.** Effective teaching with digital technology requires that teachers think about how the functionality of the software features can be integrated into teaching practice (Brunelle & Bruce, 2002). If teachers do not think about how they will use the software and how they will design effective learning experiences for students, they could be putting students at risk (Brunelle & Bruce, 2002). Giving students access to computers and software does not necessarily mean they will achieve.

***Understanding the purpose of the software.*** When integrating literacy based software into the teaching and learning process, it is necessary that teachers and students understand the main purpose for which the software is to be used (Al-Alaoui et al., 2008; Brunelle & Bruce, 2002; Lange et al., 2006; McVee & Dickson, 2002; Webb, 2005). The software, as argued by Brunelle and Bruce (2002), must be chosen to meet the needs of teachers and students and be easy to use. It is important that teachers are aware of how the software can be used to design student-learning experiences. Teachers should not rely on the software or on the software developers' ideas to promote student learning or to compensate for student learning difficulties. Software use should not restrict teachers and students only to the functionalities of the software.

Using software effectively means that teachers and students need to think about computer and non-computer based strategies for improving student learning. Al-Alaoui et al. (2008) argue that teaching and learning while using technology can bridge the gap for students who struggle with learning and also enable them to become technologically literate through the use of assistive and/or instructional software and hardware. They advocate that designing effective learning experiences with appropriate software can speed up literacy learning, provide positive motivational outcomes for students and encourage self-paced and responsible learning (Al-Alaoui et al., 2008; Webb, 2005).

**Understanding the specific features and capabilities of the technology.** There are different types of software and technological uses that are promoting cognitive change, formative assessment and opportunities for life-long learning experiences to support student's with literacy difficulties (Lange et al., 2006) and in science education (Webb, 2005). There are lessons to be learnt from this research. In

promoting cognitive change, Webb (2005) argued that it is how students use the technological resources to effect their learning and not just a focus on curriculum, that is important. It is the identification of technological features to support learning and teachers' pedagogical approaches that Webb (2005) promoted as critical for using technology for teaching and learning. To support students with literacy difficulties, Lange et al. (2006) suggested it is how computer-based tools or assistive technologies are used that improves literacy outcomes.

In determining how to choose literacy software for instructional purposes, McVee and Dickson (2002) created a rubric to evaluate the qualities of specific software features. The rubric acted as a guide for teachers to consider the appropriateness and capabilities of software for literacy skill development, teaching and learning purposes, assessment use and compatibility and ease of students' use for reading, writing, speaking and listening.

Learning how to use computers for classroom instruction is not only about developing students' computer literacy skills. It also includes developing pedagogical and assessment knowledge applicable for ensuring students can learn how to write. The recent focus on accountability and evidence-based literacy practices (Hattie, 2009, pp. 254-255) has seen the emergence of Writing Assessment Software (Fang, 2010; Vojak, Kline, Cope, McCarthey, & Kalantzis, 2011). However, Vojak et al. (2011) suggested, there can be a disconnection with testing and accountable writing outcomes. This is because computer assisted writing programs tend to focus more on the mechanics and skills of writing rather than the creation of meaningful texts. Vojak et al. (2011) argued that new technologies can potentially connect writing to learning experiences either inside or out of the classroom. They also suggested to caution the use of writing software programs as they do not consider the potential of emerging technologies as a means to promote writing for today's world.

**Possible effects on teaching.** The growing body of research on learning how to use computer software in classroom instruction has found that speech software has the effect of developing speed and efficiency in computer use (Brunelle & Bruce, 2002), that instructional software can be used to self-pace lessons (Al-Alaoui et al., 2008), that software can be used to integrate reading and writing instruction for students with learning disabilities (McVee & Dickson, 2002) and that students' reading comprehension can improve through the use of assistive software (Lange et al.,

2006). It has also been reported that it is an advantage to classroom instruction when teachers first evaluate the benefit of software through the use of exploratory approaches and collaborations with colleagues (McVee & Dickson, 2002) and to promote opportunities for students to develop keyboard typing skills before writing (Al-Alaoui et al., 2008).

Research into using laptops also has relevance even though laptop use is not part of this project. That research confirms that laptop use can motivate and enhance student learning in all curriculum areas. However, to achieve this benefit, the research of Conway and Amberson (2011) and Warschauer, Arada, and Zheng (2010) found that schools need to develop ICT policies to manage technology. This includes highlighting suitable pedagogical approaches to support teachers with limited technological experiences in their teaching practices (Conway & Amberson, 2011). Failure of schools and teachers to address organisational and pedagogical initiatives when using laptops for learning in classrooms could impact on the positive integration of technology into the classroom and the successful inclusion of all students learning to write.

Managing technology especially laptops and other mobile technological devices is important for being able to integrate technology for learning in different locations. Opportunities to become familiar with the functional use of technology can be an advantage for teachers with limited technological experiences. To support teachers to use laptops in their teaching practices, especially those with limited computer experiences, the research of Conway and Amberson (2011) argues that teachers need to develop strategies to introduce laptops into classrooms. These strategies include developing procedures to provide students with access to computers within the classroom. The procedures include developing collaborative processes to enable teachers to reflect on their own teaching practices, to participate in ongoing professional development, to encourage parental involvement and the provision of network, structural and financial supports. The research points out how teachers value opportunities to inquire into their own practices to facilitate student learning and to learn as a 'part of a community of learners' (Conway & Amberson, 2011, p. 7).

These authors claim that when teachers support students learning to write using laptops, they can promote opportunities for students to achieve effective writing outcomes and encourage students to develop the knowledge and skills that are

necessary to become flexible users of technology within a world of changing technologies (Conway & Amberson, 2011).

Warschauer et al. (2010) advocate that students benefit from access to cloud-based Google™ Apps, so they can save, retrieve and access their writing as required within a secure easy-to-navigate operating system. They can also be encouraged to communicate with teachers, peers and the wider community via Gmail™, Twitter™ and other social media to receive feedback on their writing and share their ideas. These researchers have argued that authentic writing can be encouraged by teacher practices that model sound approaches to genre writing and provide multiple opportunities for students to collaborate and share their writing with others.

In promoting the potential of free software over commercially produced literacy software, Brunelle and Bruce (2002) advocate that new commercial technologies tend to reinforce traditional classroom practices and testing outcomes. They suggest that the emphasis could be on the potential for students to make meaning by writing within more social contexts. They also explain how writing software should not be restricted to software automated writing prompts and traditional organisational genre features which often appear in commercial products.

**Possible effects on students.** Research has found how the use of individual laptops and students' out-of-school uses of technology impacts on student writing (Conway & Amberson, 2011; Warschauer, 2007; Warschauer et al., 2010). Students who had daily access to Internet connected laptops for writing were found to write, revise and publish more, ask for feedback on their writing, use a wider range of writing genres and produce higher quality texts.

Student feedback on the use of laptops when they are engaged in writing highlights the positive value for writing with laptops (Conway & Amberson, 2011). The research of Conway and Amberson exemplifies how students had their 'identities as writers' (p. 179) acknowledged and had opportunities to share in different types of writing activities as authors. Students also indicated they found the writing experience more enjoyable.

In promoting student voice, Warschauer et al. (2010) identified six themes that highlighted the 'value students placed on learning with laptops at school' (p. 2).

These included:

1. 'Tools for Better Writing' (p. 222) — such as spelling, grammar, formatting and keyboarding skills to facilitate students' ability to draft, revise and publish their writing without writing fatigue



2. 'Access to Information' (p. 222) — using online resources to develop content and form opinions
3. 'Share and Learn' (p. 223) — strengthening students' sense of authorship by sharing their writing with others
4. 'Self-directed Learning' (p. 223) — enabling students to retain control over their own learning to write approach
5. 'Remaining Relevant' (p. 223) — encouraging students to value technological knowledge and see the relevance of their present and future uses of digital technology
6. 'Engagement with New Media' (p. 223) — motivating students to write by having pedagogical approaches that integrated technology into the process of writing, and having ease of access to laptops, the Internet and social media.

Students' out-of-school uses of technology can impact on how students use technology in the classroom and their continued motivation and engagement when technology is integrated for learning. Sutherland et al. (2004) argue that 'teachers are not aware of the nature and extent of students' expertise' (p. 418) in their out-of-school uses of technology and the influences this may have on multi-media text production in writing classrooms. The influences they suggest may be in the production of a product, managing and selecting images and information, managing files, downloading images, using e-mail and word processing, visual competencies such as Internet browsing, awareness of different styles of music and for working with a diversity of software. These may be areas where students have capabilities that exceed those of their teachers and raise the possibility that some students may find the introduction of new technology quite engaging.

Teachers will need to be aware of students who have experiences with networked technologies outside school, such as web surfing and playing interactive games (Mavers et al., 2002). These influences may ensure that the students who have already acquired technological skills can transfer these skills across multiple technological devices. Teachers will also need to be aware of the language for using technology to that of the literacy context in which a technological function is to be used to ensure that the integration of technology can maximise and not hinder student achievement (Sutherland et al., 2004).

**General effects of use of computers for composing texts.** Research findings suggest it is a teacher's pedagogy that can move students from 'illiteracy to computer literacy' (Al-Alaoui et al., 2008, p.4). In developing a model of using technology in teaching and learning, Al-Alaoui et al describe how assistive technologies can enhance learning by personalising the design of lessons for individual students. In researching the use of speech and handwriting recognition engines in software, the

researchers found it was important to understand how software can support literacy acquisition. They also explained that there are software systems that can be trained to recognise student utterances, written gestures and to identify textual mistakes. The structure of these software systems may be useful for providing teachers with flexibility to design individualised instruction and for self-pacing student learning. An implication for the use of these systems, highlights how a teacher's pedagogical skill is necessary to ensure that it is not what students use the technology for, but rather the interaction between the features of the technology and the teaching and learning aims that ensure the software can be beneficial for composing texts.

While the above research outlines how assistive technologies can be used by teachers and students to build and sustain student literacy skills, more recent research has focused on how text-to-speech technology can be used as an enabling tool to detect writer and reader breakdown when composing texts. The functionality of text-to-speech technology has shown to improve the quality of texts being read by students when revising their writing and to facilitate student independence as confident writers (Englert et al., 2005; Garrison, 2009; Silió & Barbetta, 2010).

Research by Englert et al. (2005) within a web-based learning environment found that it was easier for students to write and edit their texts when using text-to-speech technology. When the students used the functions of the software to have their texts read back, they were able to compare what they had intended to write with the spoken text to what they actually wrote. The research explains how students used the functions of the technology to revise their texts by adopting a metacognitive approach to improve their writing. One student in the research of Englert et al (2005) focused on using his listening skills with the new tool to refine sentence structure, name recognition and to attend to detail to convey the meaning of his writing for an audience. Englert et al. (2005) discussed the advantages of using cognitive technological tools to support students to focus on the cognitive processes of learning to write. When teachers provided the conditions for students to collaborate within a technological environment and when the teachers mediated student learning using technological tools, they advocated that students with learning disabilities could be guided to perform at higher levels of writing when composing texts by themselves (Englert et al., 2005).

Silió and Barbetta (2010) researched the effect of word prediction and text-to-speech technology to improve student narrative writing. Their research indicated an

improvement for students with learning disabilities in upper primary school years in both the quantity and quality of their narrative texts. However, the research is based on students' first narrative drafts and not on the different writing activities within the process of writing. When text-to-speech technology was used on its own without the word prediction functionality, students maintained their composing skills but did not improve in their writing achievement. Silio et al. (2010), advocated that more research is still necessary to understand whether students, especially those with learning disabilities, can benefit from direct instruction in how to use text-to-speech technology.

Research by Garrison (2009) on student use of text-to -speech technology for reading texts aloud for the purpose of revising writing, found students benefitted from hearing their mistakes read aloud. However, Garrison (2009) cautions the use of the technology and suggested it should be incorporated into informed pedagogical practice with engaged listeners. Used in this way it may then help students to achieve writing autonomy. Research by Nisbet, Aitken, and Shearer (2008) on using text-to-speech technology with students with a disability for examinations purposes, found that students liked using the technology because it enabled them to become more independent and confident in their writing. Although a major focus in this project will be on teacher integration of technology into teaching, the recently reviewed research suggests that the impact of the technology on students should also be a focus. It may be that the range of student responses is considerable.

Understanding how text-to-speech technology in this study can be integrated into the design of learning experiences will be critical for understanding the instructional potential of the new technology. Teachers and students as suggested by Brunelle and Bruce (2002) should not become dependent on the functionality of the software. Teachers need to maintain and develop effective teaching practices (Lovell & Phillips, 2009) while enabling students to acquire new meaning, compute and solve problems when technology is integrated into learning (Al-Alaoui et al., 2008; Brunelle & Bruce, 2002; Fang, 2010; Vojak et al., 2011; Webb, 2005).

**Effects associated with software specific for teaching of writing.** Using software specifically for teaching writing effectively necessitates understanding the software and how to integrate it into teaching and learning practices. In addition, using literacy software and literacy programs also requires building a student's computer literacy skill (Al-Alaoui et al., 2008).

Lovell and Phillips (2009) suggest that users should note the software manufacturer's educational claims and evaluate how appropriate the software may be for teaching writing and reading. They also suggest it is important that users understand whether writing software will match the intended writing outcomes to be achieved, as writing software may only 'assist with specific aspects of the writing process [...] and not the entire process' (p. 210). Lovell and Phillips (2009) explain how software may be categorised as literacy assistive software to access writing, writing product software, writing process software or online writing software.

**Effects of use of RWG software.** Read&Write Gold software™ (TextHelp Systems Ltd, 2012a) provides an example of how software can incorporate a diversity of computer-based tools that can be integrated to individualise student learning. Lange et al. (2006) discuss how a version of Read&Write Gold software™ (<http://www.texthelp.com/UK/our-products/readwrite>) is 'widely used in educational settings throughout the world' (p. 15). The software package led Lange et al to research the 'compensatory effects of speech synthesis, spellchecking, homophone detection and dictionary use' (p. 15), compared with the effectiveness of the features available on Microsoft Word™. Research participants were trained in how to use the software functional features to assist writing and reading by participating in hands on activities that modelled different possibilities of use. Lange et al. promoted the advantage of Read&Write Gold™ is its compatibility with Microsoft Word™ and other applications. The software has a floating toolbar that can be placed anywhere on a page and can be used with other applications. Abell and Lewis (2005) described the advantages of using Read&Write Gold™ software for students who have difficulties in reading and comprehension because the software tools can be used to support individual student learning. Abell and Lewis highlighted how the software provides a positive learning environment. The functionality of text-to-speech technology allows students to read without support from teachers or peers. Students can customise the speech output, speed, pitch and tones of the voices as required and personally customise their learning environment according to their individual learning needs (Abell & Lewis, 2005).

### **Summary.**

The above research highlights the different pedagogical outcomes that should be considered when integrating text-to-speech technology to sustain literacy skills, develop students' writing performance and enable students to gain confidence as

independent writers. The literature suggested that teachers can provide direct instructional methods on how to use the functionality of text-to-speech technology to revise texts. This includes the development and customisation of a technological writing environment to enable students to learn as independent writers. The evidence also suggests that when teachers establish the appropriate environment for using text-to-speech, it can enable students to collaborate and develop good listening and composing skills (Englert et al., 2005; Garrison, 2009). However, little is known about the integration of text-to-speech in the context of pedagogical procedures for teaching and learning how to write when teachers do not have access to external support or specialist professional development. Thus, this research aims to explore how a group of teachers integrated text-to-speech, what knowledge and levels of technology were used, and what challenges emerged during the integration process in their regular classroom settings.

This section on literacy, technology and learning provided an overview of the research on how technology can redefine and deepen students' writing experiences and how technology, technological tools and computers have impacted on teachers' pedagogy and classroom instruction. Computer literacy software can provide benefits for student cognition and for how teachers can think about the design of effective learning experiences. New kinds of literacies are needed today and technology is challenging teachers to think differently about their traditional writing pedagogies. In order for the teachers of this study to understand the complexity of the relationship between literacy, technology and learning, the literature review highlights the importance of a teacher's pedagogical practice to maximise the benefits of the potentials of computer literacy software. This includes teachers gaining knowledge about the functionality and capability of software and the possibilities for how students can use software to effect their learning. As students are requiring a different set of writing skills to communicate, teachers will need to understand how to develop student's computer literacy skills as well as students' writing capabilities. The challenge for teachers is how to teach writing using the potential of technology in the process for learning, how to use writing models to design learning experiences and effective instructional procedures that enable students to engage with writing. An understanding of the theories of learning and instruction, and effective teaching and writing practices may enable teachers to design innovative learning experiences, where technologies such as text-to-speech can be integrated.

## **Theories of how Students' Learn**

There may be a perception amongst educators that the use of technology will typically enhance student learning, especially when used with traditional teaching practices. When considering the integration of technology for educational purposes, teachers may think of the many technological devices, the diversity of available software, the learning and Internet experiences that can build skills and knowledge and the growing social networking opportunities that are engaging learners.

However, Edwards-Groves (2012) and Sutherland et al. (2004) argue that it is not the technology on its own or the functions of technology that transform educational practice, but rather how a teacher interacts with and uses the technology to enable learning that has the most significant impact on student learning. Research on teaching and learning without technology to enhance student learning may inform teaching and learning with technology (Sutherland et al., 2004).

When students use technology to communicate or for instructional purposes, Roblyer (2004a) argues they are not just using technological products of the latest in technological entertainment. The process of applying the technological tools, the tools themselves and the materials used must all be the focus of learning with technology (Roblyer, 2004a). In understanding the function of learning with technology as a process for learning, rather than seeing the technology as just a product to enhance learning, Roblyer (2004a) provides an evolving definition for using technology, termed Educational technology. 'Educational technology is a combination of the processes and tools involved in addressing educational needs and problems, with an emphasis on applying the most current tools: computers and their related technologies' (p. 6).

The definition of educational technology used for this research (see below) extends the Roblyer (2004a) definition and includes educational technology use in an environment where the potential of technology can be integrated to generate a rich learning culture for shaping the learning process. The definition encompasses having an accessible structure for integrating technology and the interactions between teacher pedagogy, the technology and the learning environment to respond effectively to individual learner differences.

The focus of teacher pedagogy in this environment is on the process of teaching and learning with technology for the benefit of learning and skill development, knowledge acquisition and learner achievement.

In terms of using and applying technology to develop student writing Kervin and Mantei (2009) argued it is necessary for teachers to promote the relationship between literacy, technology use and learning. Teachers can then make teaching and learning choices based on the needs of their students and the potential of the technology (Kervin & Mantei, 2009, p. 31).

Principles derived from the field of psychology can arguably provide a means for teachers to focus their thinking on how students learn. Cognitive psychology, according to Mayer (1981) and Sweller, Ayres, and Kalyuga (2011a) provides the scientific analysis of mental processes and memory structures to understand students' thinking behaviours. How students develop and store knowledge and then retrieve that knowledge to use and perform a writing task requires focusing on cognitive psychology. Mayer (1981) points out that the goal of cognitive psychology is to create a description of students' thinking and knowledge development, description that teachers can use to understand how students learn. The choices students make when integrating technology into different writing activities in the writing process may provide useful information to teachers when considering how to design learning experiences with text-to-speech technology. In a cognitive view of learning the students really are regulators of their own learning. The research of Mayer (1981), Sweller et al. (2011a) and Hollender, Hofmann, Deneke, and Schnitz (2010) is relevant to this study because it provides a framework for understanding the influence of teacher instruction and student learning experiences when text-to-speech technology is being used to teach writing.

There are two categories of instructional load suggested by Sweller et al. (2011a), that impact on learning and it is the function of the load that determines the category of load. The two categories are defined as intrinsic and extraneous cognitive load. Cognitive load that is caused by the structure of information to be learnt and not by the instructional procedures used is defined as an intrinsic cognitive load. The intrinsic load of a learning task is relevant to the level of a learner's expertise. Cognitive load that is caused by the instructional procedures that a teacher uses is termed as extraneous load. This load occurs when teachers do not present information to students to help them learn. The load also occurs if students participate in learning activities that are irrelevant to the learning that is happening (Hollender et al., 2010). A combination of intrinsic and extraneous cognitive load determines the amount of cognitive load that a student needs to overcome for

learning success. Sweller et al. (2011a) advocate that any learning that needs to take place to overcome cognitive load, takes place in a learner's working memory.

A third category of instructional load that can impact on student learning has been outlined by Hollender et al. (2010). This category is germane cognitive load, which refers to methods that need to be fostered when teachers are designing learning processes within technological environments. The importance of this category recognises the shift of instruction from paper based learning environments to using software tools to facilitate students learning to write using a technological writing process.

The above research also provides a framework for understanding the skills that are required by teachers for successful problem solving to integrate text-to-speech technology into their writing pedagogy.

When understanding the cognitive psychology of learning, it can be assumed that a learner can actively interpret new information with the use of their own prior knowledge and experiences (J. R. Anderson, Reder, & Simon, 1998). While the process of interpretation by both teachers and students is dependent on each other's input, both also need to know how it can be possible to effectively manage and make meaning of the learning process. This particularly will apply when technology is being used in the learning process because we know from previous research discussed in this review how the use of technology can impact on the teaching and learning process (refer section on Technology can impact on primary school students writing experiences). The interpretive input from the technology will also need to be effectively managed to ensure learners can make meaning of the use of technology in the learning process and be successful in transferring their knowledge and skills to new learning experiences. As learning can be understood as a self-regulated activity (Schunk & Zimmerman, 2007) a teacher will need to require knowledge about student's thinking behaviours and the functions of technology to capitalise on the potential use of technology for learning.. Research has shown that students need to be able to regulate their own learning when teachers have limited time for one-to-one interactions during lessons (Galton & Pell, 2012).

Meaning, as suggested by Sweller, Ayres, and Kalyuga (2011c), is constructed as information is processed as it moves from active memory, to working memory and then to long-term memory. Sweller et al. (2011a) suggest that a student's ability to learn from or use information depends on their prior mental connections and their



ability to transfer this knowledge into new knowledge. As students are actively composing narrative texts, they may also build knowledge about learning as well as about writing, through the skills and understandings they acquire throughout the writing process. The extent to which they do this will be influenced by both teaching and their own motivational, cognitive and metacognitive actions (Mayer, 1998). The implications of how cognitive psychology and constructivist principles inform the integration of technology have been outlined by Roblyer (2004a). In his discussion Roblyer identifies key sources for the cognitive view of learning from the following contributors:

1. John Dewey's beliefs in social constructivism for student-centred instruction around relevant and meaningful activities (Roblyer, 2004b, pp. 62-63).
2. Lev Vygotsky's scaffolding to help students acquire new knowledge through collaboration (Vygotsky, 1978a). Vygotsky claimed that teachers could promote students' cognitive development by presenting them with learning that could only be completed with assistance within a student's Zone of Proximal Development (Vygotsky, 1978b). Vygotsky (1978a) also concluded, 'That children solve practical tasks with the help of their speech, as well as their eyes and hands', and that the combination of all 'produces internalisation of the visual field' (p. 26).
3. Jean Piaget's simulations or authentic learning experiences for cognitive thinking and reasoning. Piaget's stages of cognitive development and processes of cognitive functioning have influenced how the teaching of concepts using explicit examples and experiences can help students with difficulties in learning (Roblyer, 2004b, pp. 63-65).
4. Jerome Bruner's interest in discovery learning through an understanding of stages in cognitive development. If students could explore and discover relationships between ideas through stages of cognitive development, they would be more likely to remember concepts. Discovery learning within a constructivist environment can facilitate opportunities for teachers to design learning opportunities that build the student's potential for learning with multiple demands (Roblyer, 2004b, p. 66).
5. Seymour Papert's theories about the right kind of environment and supports to improve intellectual ability (Roblyer, 2004b, p. 67).

Roblyer (2004a) also argued that the research of Scardamalia et al. (1984), referred to earlier, has enhanced our understanding of the process of writing and its implications for pedagogy and for alignment when learning in a technological environment. As writing will be a critical skill for living in a technological society (Rogers & Graham, 2008), it will be a benefit for students to be able to create strategies that address their individual approaches to learning and enable them to self-regulate how to communicate and make decisions (Graham & Perin, 2007; Rogers & Graham, 2008).

There is a need to find ‘appropriate pedagogical methods’ (Hakkarainen et al., 2000, p. 104), for knowing how to teach with technology, how to structure technological learning and instructional procedures and how to facilitate students’ collaborative skills and practices of using technology (Hakkarainen et al., 2000). Further research by Elshout-Mohr, van Hout-Wolters, and Broekkamp (1999) on reflective theory and strategy change in professionals, explains how instruction in the ‘cognitive domain’ (p. 58) provides a process for reflecting cognitively on change. The characteristics of constructivism using cognitive psychology principles and technological tools can provide rich ‘knowledge building’ opportunities for developing the skills and knowledge to integrate technology for learning to write.

***Cognitive Apprenticeship.*** Understanding student thinking and learning involves a focus on problem solving and learning strategies. Cognitive apprenticeship is an instructional model formulated by Collins, Brown, and Holum (1991) that can make thinking visible (p. 1). The model addresses problem solving skills and knowledge building within the social context of classrooms (C. Lee, 1995). Cognitive apprenticeship methods have been used for the teaching of reading, writing and mathematics. Cognitive apprenticeship is not a model of teaching, but understood as an instructional context where teachers make the processes of learning complex tasks visible to students (Collins et al., 1991). Students can acquire the expertise and problem solving skills used by experts when the focus of learning is on cognitive and metacognitive guided experiences (Brown et al., 1989).

Cognitive apprenticeship as advocated by Brown et al. (1989) is different from traditional apprenticeship approaches because teachers can specifically choose the tasks and problems they wish to teach. The cognitive apprenticeship approach enables students to practise and apply their growing knowledge and skills as they are supported to deal with different complexities within learning tasks. Teachers can use cognitive apprenticeship approaches to enable students to develop control of their own learning, to promote collaboration, problem solving, questioning techniques and help students to discover new meanings for themselves (Epstein & Ryan, 2002). Cognitive apprenticeship used in the process of learning can be embedded into different learning activities to make ‘deliberate use of the social and physical context’ (p. 238) of the learning environment (Jarvella, 1995; C. Lee, 1995). Successful learning in situated learning environments depends on a student's ability to think about their skill of learning and will to learn (Mayer, 1998). This cognitive apprenticeship body of research is relevant to this study because it alerts us to the

possibility of use by teachers of cognitive apprenticeship approaches within the different writing activities they design in the process of teaching students to write with technology.

### **Principles of effective teaching and instruction.**

Knowledge of cognitive learning theory is critical if teachers are to use evidence-based pedagogical knowledge and skills (Rowe, 2006) to teach writing. It is what teachers get students to do in the learning process by ‘focusing on students’ cognitive engagement with the content knowledge of what they are teaching’ (Hattie, 2009, p. 238) that promotes successful teaching and learning. Teachers can also design social learning and direct instructional approaches to develop students’ subject skills and knowledge (Yates, 2008).

Within the context of social learning, students’ cognitive and learning behaviours are acquired through developing knowledge and skills associated with concepts and the development of linguistic competencies (Pressley & McCormick, 1995). In a social learning environment students learn in many ways, by observing others, by reinforcing the learning intent, by learning from errors made or from self-instruction and by reflecting on their own learning behaviours when applying cognitive strategies to learning tasks (Pressley & McCormick, 1995).

Direct instructional approaches are active and guided instructions which focus on students being able to actively construct a personal understanding of what is being taught. Instruction is made explicit and can consist of directions being given for how to perform a task (Kirschner, Sweller, & Clark, 2006; Pressley & McCormick, 1995). To accelerate the performance of student learning using direct instructional methods, Hattie (2009) suggested teachers can promote learning intentions, student success criteria and provide opportunities for students to evaluate their learning performance.

**Effective teachers.** Effective teachers consider the developmental learning needs of their students and approaches relevant or not relevant to achieve improved student learning outcomes (Sutherland et al., 2004), including with and without the use of technology (Mavers et al., 2002). Arguably, ‘teachers are the most valuable resource available to a school’ (p. 107) and if equipped with evidence based pedagogical skills can be effective in meeting the developmental and learning needs of all students (Pressley et al., 2007; Rowe, 2006).

Yates (2008) argues that effective teachers when designing learning experiences need to consider the cognitive advantages that could change thinking based on five principles. These principles as defined in this research in Chapter 1 (see Research Definitions, Chapter 1) are relevant for this study if teachers are to construct learning experiences for writing with technology.

**Culture.** Sutherland et al. (2004) define the role of the teacher ‘as involving a complex shifting of perspectives from the more knowledgeable-other’ through to a ‘vicarious participant’ (p. 420), the actions of effective teachers when integrating technology into the design of learning experiences can also be interpreted through Wertsch's theory of learning where all actions are mediated by tools (Roblyer, 2004b). This framework of Wertsch emphasises that different curriculum cultures can impact differently on how tools can be used in classrooms. The availability and access to computers, literacy software and teacher training on how to use new software or design learning experiences with technology, can all impact on the successful integration of technology into the classroom. This perspective, raised by Wertsch, points to a relevant issue in this research — the influence of the culture of the school on how teachers integrate technology into writing lessons. If teachers within the same schools have different teaching and learning methods and limited opportunities for what Sutherland et al. (2004) term ‘communities of inquiry’ (p. 146), or understandings for how to construct knowledge with different technological tools, then effective technology integration could be inhibited.

**Teaching and learning methods and practices.** Developing the conceptual understanding of literacy or more particularly the concept of writing may be different than a focus on traditionally known structures and technical skills. The focus on using technology as an instructional tool rather than to motivate learning or to be integrated to assist individual student learning will be an important finding from this research that has not been considered with text-to-speech technology before. If technology is not to become an added complexity, or an added load on teacher and student thinking (Sutherland et al., 2004), the challenges teachers experience when teaching students to write will highlight how technology acted as a tool to transform or inhibit teaching practices and knowledge creation.

What do we know about these effective practices? Mohan, Lundeberg, and Reffitt (2008b) explained that effective teachers explicitly teach and model a diversity of skills and strategies within the context of reading and writing experiences. They identified individual student needs, encouraged high expectations and encouraged students to become ‘independent and active thinkers’ (p. 112). The research shows that effective teachers do encourage student engagement with tasks and monitor the cognitive learning demands placed on individual students.

### **Characteristics of expert teachers.**

If effective teachers are to achieve the teaching and learning outcomes discussed in this review, it will be important for them to have some of the characteristics associated with teaching expertise. An expert teacher is defined as one who can perform at the top of their skill (Hattie & Yates, 2014), with characteristics which identify them as being different from novice teachers

In the context of the teaching of writing with technology we could look for characteristics such as:

- They have developed a depth of knowledge about the subject of writing and about using technology for teaching writing.
- They can perceive patterns of language and genre structure and the relationship between how patterns of use with specific technological tools can be integrated into meaningful writing.
- They can solve problems quickly as they arise, or ignore problems if they are judged to be irrelevant. Novice writing teachers may not make informed decisions or consider the use of resources, tools or ideas that may enable them to overcome difficulties.
- They are highly knowledgeable about writing as well as technology and are able to draw on this combination of knowledge.
- They can see the teaching of writing based on principles. These teachers focus beyond the patterns and mechanics of writing or the functional aspects of the technological tools to achieve their teaching aims. They can structure student practice and provide corrective feedback.
- They spend time carefully analysing problems about the teaching of writing and the aid of technology. They persist and take time to reflect and understand all aspects, by drawing on their prior knowledge and past experiences. These teachers may take longer to make decisions as they consider a range of possible options.
- They can self-monitor the effectiveness of their teaching by using reflective, metacognitive thinking. They can make plans, develop processes, and continuously adjust their teaching strategies.

**Effective classroom environment.** Effective classrooms as observed by Pressley et al. (2007) use a variety of writing and teaching approaches. The research of Pressley is relevant to this study because it shows the importance for how a reading and writing-focused curriculum (p. 229) must be taught in the context of a safe learning environment. This also includes the use of explicit teaching approaches which value reading comprehension and opportunities for students to listen to and read texts. When the teachers participated in academic conversations Pressley et al. (2007) also found that students were encouraged to think, make predictions and lead communications. The research also found there were challenges associated with teachers differing philosophical approaches to teaching to produce high reading and

writing achievement. The research however did not include the use of text-to-speech technology. This study will provide insight into what teachers do and the challenges they experience when teaching students to write with technology.

**Effective writing instruction and strategies.** Research on effective writing instructional practices (Graham & Perin, 2007) and evidence based writing strategies (Dunn & Finley, 2010; Mason et al., 2011; Rogers & Graham, 2008) highlights how students can develop writing competence and skills. Writing instruction and strategies that have used a cognitive apprenticeship approach to scaffold learning, have focused on specific instructions at different stages or processes within the cognitive writing model (Dunn & Finley, 2010; Graham & Perin, 2007; Hattie, 2009; Kolikant, Gatchell, Hirsch, & Linsenmeier, 2006; Mason et al., 2011; Rogers & Graham, 2008). In this study observation of instructional writing strategies will include evidence of:

1. Story-grammar, concept mapping and story mapping to enhance text production and comprehension (Villalon & Calvo, 2011)
2. Procedural facilitators to guide strategies and text structures to enhance the quality of writing (Englert et al., 2005)
3. Multiple teaching strategies and guided feedback (Baker, Gersten, & Scanlon, 2002)
4. Handwriting or typing skills (Christensen, 2004)
5. How teachers use the potential of technology for writing (Harris, 2011)

Expert writers according to Kolikant et al. (2006) use sophisticated writing strategies. They create and revise their own writing goals, generate ideas, explore relationships between ideas and analyse how to construct their texts for a specific audience. Some writers struggle when working with effective strategies needing scaffolded instructions, writing experience, the ability to master writing skills to a high level and self-regulated strategy instruction to become successful writers (Dunn & Finley, 2010; Kolikant et al., 2006; Mason et al., 2011). However, it is not known what strategies can be effective for all students, especially with the added complexity of writing with text-to-speech technology. In summary, Hattie (2009) explains that teachers need to help students to develop a range of learning procedures that enable students to take control of their learning.

### **Cognitive load**

The purpose of learning is to increase the effectiveness of the link between acquiring knowledge and the retaining and application of this knowledge for future learning (Sweller et al., 2011a). Instructional procedures need to take into consideration

working memory load with an aim to reduce unnecessary load (Sweller et al., 2011a, p. 45).

There are categories of instructional load that can impact on student learning (Hollender et al., 2010; Sweller et al., 2011a). These include the structure of a learning task, the instructional procedures that a teacher uses and the learning goals of a task that are not relevant to the level of a learner's expertise. The cognitive load occurs during the learning process if students participate in learning activities that are irrelevant to the learning that is happening (Hollender et al., 2010). Teachers can assist students to acquire new information through scaffolding or through worked examples using direct and explicit instructional approaches (Retnowati, Ayres, & Sweller, 2010). Worked examples as explained by Retnowati et al. (2010) have been found to be successful when supporting novice learners in a range of subject areas for individual and group learning experiences. Sweller et al (2011b) advocate that teachers need to understand how to use effective instructional procedures so students have the working memory capacity to achieve a learning goal.

In terms of cognitive load theory and cognitive psychology when teachers promote opportunities for students to actively construct knowledge through learning processes, they seek to have students construct 'mental schemata' (Hollender et al. 2010, p. 1279), which can then be stored in students' long-term memory. Schema is defined by Sweller (1988) 'as a structure which allows problem solvers to recognise a problem state as belonging to a particular category of problems' (p. 259).

There are two ways teachers can consider reducing cognitive load for students when they are designing instruction. They can focus on one element of an activity at a time, such as correcting a spelling error or by focusing on element interactivity such as story-grammar questions (Villalon & Calvo, 2011) that can only be understood within an instructional process. Sweller et al. (2011a) illustrate that learning new vocabulary and symbols are examples of learning individual elements at a time.

These elements do not have an impact on other learning and can be learnt in isolation. However, the amount of vocabulary or symbols to be learnt at any one time may determine the amount of difficulty a student has with a learning task. Some learning tasks cannot be learnt in isolation to each other and can only be learnt within an instructional process. To make learning meaningful within a process, instructional design needs to consider the steps required for students to not only understand the process but to also learn from the process. Students can learn different technological



symbols or tools for example, but they need to be able to use the tools in a way that enables them to construct meaningful texts. The high level of element interactivity between the different tool combinations, processes or constructions necessary to develop meaningful texts, increases the cognitive load on students when learning and requires learners to know how to process these interactions at the same time and the steps required within the process.

The level of cognitive load activity can be reduced by teachers by understanding how to design instruction that focuses on the number of elements that need to be processed at one time. If the cognitive load in working memory is too great for a learner to process information, then learning may stop. The amount of cognitive load can be changed by teachers as they are aware of how students can process information.

Cognitive load theory enables teachers to understand how learners learn and how they can differentiate learning experiences to facilitate novice learners to process information and overcome difficulties in learning. Hattie and Yates (2014) suggest that teachers who have an understanding of the relationship of cognitive load theory with working memory, are able to design instruction to make learning easier for students and facilitate new information to be stored in long term memory.

### **Teacher beliefs about technology for learning and writing.**

There are other factors that have been identified as influential for successful technology integration — the beliefs of the teachers about themselves and the task, and the organisational culture of the school. Teacher beliefs are important when designing curriculum experiences (Albion, 1999), and to understand the teaching approaches and challenges that impact on integration outcomes (Chen et al., 2009). Albion (1999) suggests that a teacher's technological skills and self-efficacy beliefs are significant factors for the successful integration of technology. If teachers have difficulty integrating technology into the design of curriculum learning experiences, then Albion (1999) suggests the difficulties they face may be explained by reasons of self-efficacy beliefs.

Research has shown it is very difficult to change teachers' belief systems when they are using technology for literacy acquisition, as teachers may be resistant to adapting their teaching approaches (Westwood et al., 1997). There are three different teaching approaches outlined by Westwood et al. (1997), that form teachers' beliefs of literacy

acquisition. These include top down, bottom up and interactive approaches. Teachers who believe in top down approaches to teaching as outlined by Westwood et al. (1997) focus on the meaningful acquisition of literacy through functional use. These teachers value engaging students in collaborative approaches to teaching and learning. Bottom up approaches to teaching as defined by Westwood et al. (1997) focus on the more explicit teaching of skills, where the teacher's role is more structured, rather than child-centred or developmental approaches. Teachers who facilitate learning using bottom up approaches to learning design, carefully structure learning experiences where all students follow a sequential approach to learning (Westwood et al., 1997). These teachers might also accord more influence to the technology itself as distinct from adapting the technology in pursuit of teaching goals.

Teachers who use an interactive approach to literacy acquisition are supportive of both top down and bottom up approaches and may often use a balance of each in their teaching practices (Westwood et al., 1997). The findings of Chen et al. (2009) suggest that it is not just a teacher's beliefs that impact on the pedagogical decisions they make, but also their knowledge and teaching and learning goals for enhancing learning. Donnelly, McGarr, and O'Reilly (2011) and Wang (2008) stressed the importance of a teacher's pedagogical beliefs and careful planning prior to integrating technology into the literacy curriculum.

Teacher beliefs are also influenced by what they actually implement in the classroom and the degree to which they persevere with the implementation process. Albion (1999) suggested that teacher beliefs may be influenced by their confidence in being able to affect student learning, their own perceptions of self-concept and their confidence for being able to integrate technology for the purpose of improving learning. To increase teachers' use of technology, Ertmer and Ottenbreit-Leftwich (2010) promoted that teachers existing classroom teaching beliefs need to be considered. This may then increase their technology skills and uses. Teacher knowledge of technology is influenced by the time they have to explore and play with technology to become familiar with technological features, their need to develop "technological literacy" as a basic skill of teaching (p. 259) and opportunities that can build their knowledge for integrating and valuing technology as an instructional tool. Albion (1999) explains that the amount of time a teacher spends using computers and professional development opportunities can improve a teacher's self-efficacy belief.

The role of the teacher when integrating technology is complex, requiring a focus on teachers' use of technology, the language used in the classroom, the role the teacher takes when adopting technology, the opportunities provided for collaborative discussion during the writing process and the computer technology knowledge required for success (Subramaniam, 2007). There is compelling research highlighting the belief barriers to integration and strategies to overcome these barriers for meaningful technology integration (Chen et al., 2009; Ertmer & Ottenbreit-Leftwich, 2010; Hew & Brush, 2007; B. Somekh, 2008). This also includes research that identifies the necessary characteristics or qualities of teachers to enable them to adopt and integrate technology as a meaningful teaching tool (Ertmer & Ottenbreit-Leftwich, 2010; Hew & Brush, 2007; B. Somekh, 2008; Subramaniam, 2007). Findings from the above-mentioned studies are that teacher beliefs do have an impact on integration success and in particular teacher confidence in being able to affect student learning (Albion, 1999). Teacher beliefs are key to the effective integration of technology, if teachers believe that technology will help them to achieve a teaching task more efficiently then they will acquire the appropriate knowledge and confidence within a supportive teaching context and an existing belief system (Ertmer & Ottenbreit-Leftwich, 2010; Hew & Brush, 2007; B. Somekh, 2008; Subramaniam, 2007). These beliefs will be a focus in the analysis in this study.

### **Creating an organisational culture.**

Integrating technology into the classroom that results in pedagogical change through the use of technology, is dependent on the culture or educational values of a school for adopting and supporting change (Yuen, Law, & Wong, 2003). This includes the role of leadership in promoting change, the school vision and how teachers' pedagogical practices using ICT are supported through the change process.

Transforming learning within the complexities of twenty-first century learning requires working within a system that values the interconnected relationship between all considerations. It requires an understanding of how one consideration may impact or influence another through the process of change. Fullan (2007) identified three dimensions of change for a teacher using computers in the classroom:

1. The use of hardware and software;
2. The adoption of new activities, behaviours and practices; and
3. Changes in teacher beliefs and understandings.

Teachers, as suggested by Fullan (2007), need to think about the process of change and identify the possible innovative characteristics, professional learning, leadership possibilities, commitments and support structures and networks that facilitate and sustain change.

This review has provided an overview of how the TPACK Framework (M. Koehler, 2014) and the SAMR Model (Puentedura, 2008) can support how teachers integrate technology into their pedagogy. The review references how teacher beliefs, the culture of a school and models of change can influence a process of systemic change where the potential of technology can be integrated to generate a rich learning culture.

### **Summary.**

Redefining teacher pedagogy means taking into account teacher beliefs and the organisational culture of the educational environment, but the success or failure of such redefinition may be measured by the quality of learning occurring within an educational environment that is receptive to the creation of new knowledge (refer Educational Technology Definition, Chapter 1). Successful teaching is not so much about how a teacher approaches the teaching of writing. Rather, the key to success lies with how the teacher shapes learning experiences for students (Hattie & Yates, 2014).

## **Chapter 3: Methodology and Methods**

The design of this research is based on the aim and questions that were presented in Chapter 1. The method of ethnographic inquiry within an interpretive framework was chosen because of its relevance to my research questions. This method, with its associated inquiry process, can facilitate an understanding of teacher beliefs, (Lincoln, Lynham, & Guba, 2011, p. 116) In particular, it can reveal how the seven participating primary school teachers understood the complex interrelationships between writing pedagogy, technology and learning and how this impacted on their motivation and confidence to teach with technology. The chapter is presented in two sections: the first section relates to the qualitative research and ethnographic data collection methods; the second section explains the ethnographic analytical framework adopted for the research.

### **Section 1. Qualitative Research and Ethnographic Data**

The first section of this chapter discusses the relevance of adopting a qualitative research methodology using ethnographic data collection techniques to identify and interpret findings regarding the four research questions. The five elements discussed include several constructions of education that relate to the inquiry process and can influence how knowledge about teaching can be understood. They include qualitative research as a means of understanding and interpreting the social world, the research design which supports data analysis, the ethnographic methodology adopted to illuminate the research phenomena, and the appropriate choice of data collection methods to interpret the interrelationships between writing pedagogy, technology and learning.

#### **Constructions of education.**

Constructions of education have different theories, discourses and methodologies to represent how education might be understood; they also offer varied methodologies for identifying, describing, categorising and analysing ways of understanding and explaining how and what we know (Crotty, 1998; Bridget Somekh, 2001).

This research has adopted a qualitative research methodology with a focus on collating and interpreting ethnographic data. This approach, as promoted by Denzin and Lincoln (2011, p. 593), is suitable for a research topic that involves inquiring into and analysing social meanings. Collecting ethnographic data from within writing lessons given by primary school teachers is an appropriate method for inquiring into

and analysing how knowledge about teaching with technology can be understood and communicated to others.

**Epistemology and ontology.** Qualitative research is based on principles that combine epistemology and ontology. When considered together they can shape how a researcher inquires into the knowledge world of others. Epistemology is a way of understanding knowledge and how that knowledge can be used, while ontology provides the foundation for how the knowledge can be acquired and communicated. While there may be different epistemological ways of understanding the nature of knowledge from the perspective of the seven participating teachers, it is important to remember that some approaches are not more privileged over others (Denzin & Lincoln, 2005).

There are different ways of thinking about learning, how knowledge is constructed and knowing what counts as truth (Packer & Goicoeche, 2010, p.227). Studying the cognitive aspects of gaining knowledge and acquiring expertise with the participation of learners in a social community can illustrate how learning changes or transforms its objects (Packer & Goicoeche, 2010, p. 239). How the seven participating teachers construct new knowledge as they integrate text-to-speech into their pedagogy is a valid way we can begin to understand the emerging role of technology in the curriculum. An ethnographic approach is consistent (p. 593) with a focus on the process of investigation and for examining the context of how the participating teachers constructed knowledge during the inquiry process (p. 592).

While the research questions explore and respect individual teachers beliefs, pedagogy, and challenges for teaching with technology, their collective interpretations can be examined through the lens of the ethnographic inquiry within an interpretive framework to identify emerging themes that are central to the research questions. Lincoln et al. (2011) suggest that this is a bringing together of a 'community consensus' for making meaning about 'what is useful and what has meaning' (p. 116) for each of the research questions.

### **Qualitative research.**

This qualitative research is a means to contribute to knowledge building, improving practice and for informing policy (Creswell, 2012b). Qualitative research provides a set of procedures to inquire into the meanings of a social world (Lankshear et al., 1997b). In this study, meanings were constructed in the world of teachers, who were exploring pedagogical approaches for writing with technology, in the social

environment of six primary school classrooms. While the social world in reality can be complex, Creswell (2012b) suggests that qualitative research provides a means to examine the complexities by understanding the relationships within that world. Creswell (2012b) also suggests that qualitative research provides an interpretive approach in which to investigate and explore a phenomenon (p.16). In this research an interpretive approach will view the teachers' actions when teaching with technology as a multilayered text which requires interpretation (Miles & Huberman, 1994). The interpretation is not the sole responsibility of the researcher, working in isolation as an observer in the field; the teacher and student participants actively contribute through the various data collection tools. In this study, the observed phenomenon is the teachers' pedagogy in developing student writing through the integration of text-to-speech technology.

There are two different qualitative methodologies that influence the design of this research. They are case study research and ethnography. Suryani (2008) suggests these methodologies are 'popular qualitative research approaches' (p. 117), with their own particular strengths for collecting and reporting on data. Ethnography, according to Miles and Huberman (1994), is an interpretive method which involves direct participation by the researcher, focusing on rich description of the individual perspectives of the case, using multiple data sources. The task of ethnography is therefore to 'uncover and explicate the ways in which people in particular (work) settings come to understand, account for, take action and otherwise manage their day-to-day situations' (Van Maanen, 1979, p. xxx).

This study is guided by the Fetterman (2010) ethnographical conceptual framework which operationalises methods for data analysis. The findings from the research can help to interpret teachers' personal beliefs and pedagogies when teaching writing with technology and to understand what happens when teacher beliefs and pedagogical practices converge in the actuality of teaching writing with technology.

#### **Advantages of ethnography as qualitative research.**

The twin advantages of ethnography and case study research according to Suryani (2008), is that they both use similar data collection methods; however, while a case study uses observations and interviews to gain a deeper understanding of a phenomenon, ethnography can focus on the characteristics of a 'specific culture' within a case (Suryani, 2008, p. 122). In this research the rich descriptions and interpretations of teacher practices for teaching writing with technology can be

captured through descriptive data which has been collected from the ethnographic field work. These first-hand observations are important for being able to record what is actually happening (Suryani, 2008) in the context of teaching writing with technology in the classroom.

Ethnography, according to Fetterman (2010), can enable a researcher to make meanings of the world of others, where the researcher can be both an instrument of the research and be directly involved as a participant of inquiry in the research process (Creswell, 2012c; Denzin & Lincoln, 2005; Fetterman, 2010). Post-modernist approaches, as explained by Freebody (2003), posit that ethnographic approaches to research are important for understanding how a research product can be representative of the ‘complexities and richness’ of people’s lives (p. 79). In this research ethnographic approaches are therefore appropriate for understanding how knowledge is created through the redefinition and experiences that have resulted from understanding the impact of teachers’ integration of writing pedagogy, technology and learning.

While there are challenges for being able to authentically represent research participants’ views and actions, an ethnographic methodology can provide design flexibility (Freebody, 2003). This is an important consideration in this study for studying a single school and also for analysing and interpreting data from across all three of the research schools. If data collected is found, through the analytical triangulation process, to be irrelevant to the research questions or lacking in evidence to support the generalised findings, then that data can easily be classified as redundant (Suryani, 2008).

### **The design of the research.**

This research has been designed to align the four key research questions and the review of the literature with the methodology and methods. The ethnographic methodology enables the researcher to observe the classrooms from inside and report on the communications and practices of the seven teacher participants from within their writing classrooms. There are criteria important for guiding social inquiry (Lincoln et al., 2011; Suryani, 2008; Yin, 2009). The design of the ethnographic approach can be understood from six perspectives (Yin, 2009), which are commonly used for structuring qualitative research (Suryani, 2008). The six perspectives have been incorporated into the design of this research and are described in terms of six



objectives which form a structural framework for this research in an ethnographic design approach.

The first objective for the ethnographic methodology concerns the opportunity for the research to be knowledge building. In studying teacher pedagogy with technology this research observed both how the study teachers were teaching with technology and also the organisational context within the classroom and school environment.

The second objective, as suggested by Suryani (2008), relates to the uniqueness of the research through the phenomena of this particular study, 'Teachers' pedagogy to develop student writing through the integration of text-to-speech technology'. In this study the four research questions guide the research and assist in shaping meanings of the phenomena. As an ethnographer, the researcher stays physically in the writing classroom environment to capture the teaching and learning experiences of teachers and students when integrating teaching, learning, and technology. This enables the researcher to understand the complexities of the relationships among teaching, learning and technology, including those that focus on the adoption and use of text-to-speech technology.

The third objective concerns the goal of capturing individual teachers' understandings and beliefs about the teaching of writing with technology and from the study and comparison of teacher pedagogies. The data captures teachers' understandings about the management of the learning environment, their pedagogical methods when teaching with text-to-speech and their knowledge about the integration and design of instructional procedures to achieve TPACK (M. Koehler, 2014). Data collection tools involve the use of observations and records, student writing samples, a teacher questionnaire, student survey questions, interviews, field notes, staff meeting transcripts and reflective teacher feedback. However, as Suryani (2008) suggests, the ethnographer also becomes an instrument in the data collection method, insofar as they need to judge what is relevant or not.

The fourth objective of the ethnographic methodology concerns the revelatory case where the ethnographer has the advantage of being a passive observer within each of the six writing classrooms over a 20-week time frame. The extended time frame in each classroom was important for enabling the researcher to record the complexity of the teachers' pedagogies, their understandings, beliefs and challenges when integrating technology. The evidence captured in field could then be validated

through pattern matching and triangulation (Fetterman, 2010; Suryani, 2008). This research uses the Hayes (2012b) writing model and the combined TPACK Framework (M. Koehler, 2014) and the SAMR Model (Puentedura, 2008) to explore the phenomena and ‘enhance the depth of data interpretation’ (p. 124).

The fifth objective, while not specifically longitudinal in nature, relates to the ethical concerns and approvals of the in-depth study taking place in separate schools over time. The 20-week period of research in each of the three schools facilitates the gathering of a breadth of data through multiple data sets for each of the four research questions (see research data collection methods relating to each of the research questions as Tables 2 to 9, outlined in in this chapter).

The final objective focuses on the cross-cultural frame of reference (Suryani, 2008 p.124) for making research data comparisons and proposing the evidence. A strength of using ethnographic design in this study is the triangulation opportunity for critiquing the data. The ethnographic design, using an Ethnographical Concept Framework (Fetterman, 2010), promotes procedures that can be used to describe, analyse and interpret the teachers’ shared patterns of teaching behaviours and beliefs when inquiring into teacher pedagogy through the integration of text-to-speech technology. The six objectives above form the structure for Section 2 of this chapter which describes the study’s analytical framework.

**Adopting a methodology.** The design of this research considered the guiding steps as referenced by Yin (2009), Creswell (2012a) and Freebody (2003). I adopted the following plan of action:

1. Preparing and organising the data for analysis by formulating the four study questions to guide the research. This has been done and set out in Chapter 1.
2. Capturing the teaching and learning experiences by establishing the ethnographic data collection and data storage methods (Fetterman, 2010), including the development of data collection procedures and instruments.
3. Understanding teacher pedagogies, beliefs and management of the learning environment by exploring, analysing and interpreting the multiple data sets collected. I set out to explore the complexities of the research phenomenon through the lens of the TPACK Framework (M. Koehler, 2014), the SAMR Model (Puentedura, 2008), the five principles of the information processing system (Sweller et al., 2011a) and the Hayes (2012b) writing process model.

4. Pattern matching and triangulation of the data by using the outcomes of the data analysis to address each research question. This is done by cross-checking the data sources of instructional strategies to an instructional framework, processing responses to reflective questions, using text-to-speech as an instructional reflective tool, and by understanding teachers' pedagogy.
5. Considering ethical considerations and following protocols to ensure participant consent is obtained and that the data tools do align with the research questions.
6. Proposing the evidence to set out the generalised findings related to the research questions.

There are some components or aspects which Lincoln et al. (2011) argue should be present in valid inquiry research. This research includes four, thus strengthening the validity of its findings. The first aspect concerns the choice of ethnographic methodology which lent itself to research interpretations. The second aspect of validity is that the findings are limited to those social experiences within the research which Denzin and Lincoln (2011, p. 120) suggest can be represented through an interpretation of the research questions. The third aspect relates to the interpretive findings of the research, which should represent faithfully what actually happened in the writing classrooms. The interpretation of data in this study considers descriptive accounts of the participants' experiences and all the challenges they encounter along their journey of teaching and learning with technology. Lastly, the findings of the study can be used to support the development of a practical teaching-of-writing framework as well as offering a theoretical model for future researchers. A framework can reflect the knowledge pooled from the teachers' developing understandings and can be informed by whether pedagogy had been enhanced or redefined at the control, process and resource levels of the Hayes (2012b) writing process model. It can also reflect to what extent the seven teachers were successful in developing TPACK (M. Koehler, 2014) procedures.

In summary, ethnographic research is an appropriate research methodology to inquire into social interactions, the social constructions of meaning and the context of the social activities taking place in a teacher's writing classroom. The reality of teachers' writing with technology experiences can be reflected through qualitative research which is suited to study what can be socially constructed, created, changed, sustained or influenced by the process of human interactions (Yin, 2009). The next section outlines the methodology used to address the research questions.

## **Methodology.**

The ethnographic design of this research looks for shared patterns of behaviour, perceptions, beliefs and language (Creswell, 2012c) that primary school teachers integrate into their pedagogy when teaching writing through the integration of technology. The design of this research was fashioned to explore how teacher pedagogy through the integration of text-to-speech could develop student writing. While the interpretive methods used in the study should give a deeper understanding of the phenomenon, we should recognise that qualitative research methods have limitations and the validity of the findings may be influenced by these limitations.

**The selection of teacher participants and schools.** Seven teachers were selected from three different government primary schools in Australia. The selection of the research participants was initiated by inviting teachers who were interested in being involved in research which focused on teacher pedagogy with technology. A letter of introduction and an initial group meeting provided information to the teachers about the research (see Appendix A. Research: Introductory teacher letter).

Common to all teachers was their belief that they could teach writing with technology. This also included a positive attitude towards using technology to benefit student learning. The seven teachers ranged from first year practitioners to very experienced classroom teachers. While all teachers indicated a common belief in the use of technology to teach writing, their teaching approaches were all different. The classroom culture of their writing lessons, their previous experiences of teaching writing with technology and personal use of technology, provided the foundation for integrating technology into their pedagogy.

To protect school confidentiality within the research I renamed the schools studied as Springbank Primary School, Redgum Primary School, and Wattle Creek School. The initial intention was to conduct the research in a single school. It was envisaged from the letters of invitation that one school would respond with a group of interested teachers. The research was finally conducted across three different schools. Redgum Primary School had one teacher participating in the research; Springbank Primary School had two teachers participating in the study, while Wattle Creek School had four. The schools, while drawing from a full range of socio-economic communities were not representative of any one community, as the students who attended each school came from a range of different backgrounds.

The following overview provides the context of each participating research school. The Index of Community Socio-Educational Advantage (ICSEA) for each of the participating research schools (<http://www.myschool.edu.au/>) is presented within the case findings of the individual teachers (see Chapters 4–10).

***Springbank Primary School.*** This school has a vision for developing life-long learners who can positively contribute to a globalised society and cope with the demands of their changing world. The students mainly come from a low socio-economic background with approximately 17% of students speaking a language other than English at home. The multicultural nature of the school is represented by over 15 different nationalities, with many having migrated to Australia from South-East Asian and African countries. Many of the students have come from countries where illiteracy in their mother tongue is significant. The school offers support for these students by using their mother tongue languages of Khmer, Lao and Vietnamese. Springbank Primary School has approximately 390 students from birth to Year 7. The school prides itself as an Apple School of Excellence and has extensive computing and ICT facilities. Jessica and Brandon were teachers at Springbank Primary School.

***Redgum Primary School.*** Redgum Primary School celebrates the cultural and linguistic diversity of the school community with over 40 different cultures represented at the school. The school had previously undergone an amalgamation with two smaller schools and at the time of the research had a school population of approximately 300 students. The school offers two special education classes, providing specialist teaching and learning for students with disabilities. There is an Intensive English Language Centre, which teaches an intensive English curriculum for students who have been in Australia for less than 12 months and who have a language and cultural background other than English. Redgum Primary School promotes a focus for high achievement in English, Mathematics and ICT and offers specialist programs in Italian as a second language, Physical Education and singing. Haydon was a participating teacher at Redgum Primary School.

***Wattle Creek School.*** Wattle Creek School has a vision for developing confident learners who can achieve their potential within a supportive school environment. At the time of the research, Wattle Creek School was in its third year of operation. The school promotes a flexible learning approach to education and care for 580 students. The students come from a diverse range of cultures, including 15% Indigenous

students. The school is structured on the concept of integrated learning hubs, offering separate childcare, pre-school and primary services. The school has an Early Years focus, incorporating care, education, health and wellbeing services for children and their families from birth to eight years. There is a strong learning technologies and Science focus operating from the pre-school years to Year 7. Paul, Olivia and Stephanie were teachers at Wattle Creek School. Nicole was the ICT Senior Leader at Wattle Creek School.

The research timetable at the schools ran from 2010 to 2012 (see Table 1 below). The research activity within a 20-week teaching period within each school was implemented over two school terms. During this period each teacher was observed twice weekly within two by 50 minute lessons, accounting for a total of 40 writing lessons each. There were 177 students who participated in the study.

Table 1 provides an overview of the schools' time frames and research activities carried out over the period of the research

Year	School	Teacher	Research Activities
2010	Redgum Primary School	Hayden	Introduction observations and troubleshooting Field work and collection of writing samples
2011	Springbank Primary School	Jessica Brandon	Student/teacher feedback and Technology use Observation of writing activities Collection of student and teacher surveys and school documents
2012	Wattle Creek School	Paul Olivia Stephanie Nicole	Coding of technology integration Reviewing writing activities Final reflective feedback and summary of teacher beliefs for writing with technology

Table 1 reflects the names of the three research schools and the study teachers at each school.

### **Data collection methods.**

The methods used for collecting data in this research are based on the following ethnographic data collection tools: field work notes, interviews and surveys, questionnaires, audio recordings, documents and observations and reports. Each tool is an important source of rich evidence, validity and reliability. This section is

presented in five parts: the data sets, the data collection tools, the selection of research participants and research schools, the selection of software and the collection and storage of the data.

**Data collection method: the data sets.** An ethnographical concepts framework, as referenced by Fetterman (2010), consists of ten concepts. These concepts act as ‘frames’ that can be used to analyse the data.

The first frame focuses on the cultural context of the research. This frame is directed at the gathering of data on the beliefs, understandings and ideas of the teachers and their technological and teaching knowledge, values and behaviours for teaching writing with technology. This frame allows for rich descriptive data to be collected infield and through interviews, and then be interpreted through the triangulation process.

The second frame focuses on the holistic approach of the research to gain a deep understanding of the social norms within the teaching and learning environment throughout the research period. Data examined through this frame emphasises the contextual knowledge of participants and the research environment.

The third frame focuses on the situated context of the study. The frame requires observing more broadly the school environment in which the research classrooms are located. The frame provides for the collection of data which can be used to describe insights about teacher pedagogy with reference to text-to-speech and provides information on the understandings and factors which may be important on teachers’ practice.

The fourth frame has two parts: the emic and etic perspectives. The emic perspective takes in the multiple realities of the natural world of teachers, meaning that the researcher can collect and use multiple data sets in documenting the phenomena. The emic perspective enables the researcher to describe many facets of the teaching and learning process of writing with technology. The etic perspective focuses on the social perspectives of the research; it enables student writing data, student feedback and reflections to be a valued aspect of the study. Eclectic participant feedback can be collected through surveys, questionnaires, personal communications and field notes in the study of teachers and students experiences with technology.

The fifth frame focuses on the non-judgemental orientations of the research process to ensure that research biases do not affect data collection and interpretation. The

researcher must make every attempt to avoid making value judgements throughout the research.

The sixth frame relates to the inter- and intra-cultural diversity of the research. This frame promotes a ‘crystallisation’ of the study’s data collection methods to determine trends or themes that emerge from the study.

The seventh frame focuses on the study’s social structure and functions, and the social relationships that emerge within the research environment and between research participants. This frame enables the researcher to inquire into and describe the relationships and influences that emerge through the research process.

The eighth frame focuses on the symbols, rituals or routines that assist research participants to express their feelings and thoughts during the research. These routines may result in the development of a cultural language that aligns to the research phenomenon. The symbols are representative of the technological resources, tools and classroom management processes and can provide insight into the culture of the writing classroom. The rituals or routines are operational, such as traditional lesson designs that may prevent teachers from creating innovative ideas.

The ninth frame focuses on the micro- or macro-level research concepts, which are determined by the theoretical approaches that drive the study. This includes the time span, number of teachers, schools selected and other resources used in the research.

The final frame focuses on the operations of the research to ensure that the data collection methods remain focused on evidence aligned to the research questions and not personal impressions. Triangulating the multiple sets of data with research participants’ beliefs validates and authenticates participant feedback through reflective methods.

**Data collection method: data collection tools.** The research data collection tools relating to each of the research questions are outlined in Tables 2-9 below.

Table 2 Question 1 What procedures did teachers adopt in introducing new text-to-speech technology into their writing lessons?

Question 1.	Teacher planning for the adoption of text-to-speech technology
Data tools	Focus on planning for adoption of the technology
Observations and records	Access to technology; discourse; roles and responsibilities; systemic supports and organisational procedures; time to become familiar with the software
Teacher questionnaire	Installation of software Teaching with text-to-speech
Interviews	Technicians; leaders; teachers
Field notes	Procedures to adopt technology; access to computers; log on and log off



Staff meetings	Wattle Creek School LDWT: organisation, saving & retrieving texts, pedagogy
Recorded feedback	School profile; personal experiences; computer access; teaching environment
Question 1.	Introductory technological activities teachers used
Data tools	Focus on adoption of technology
Observations and records	Customisation of the toolbar; teacher pedagogy; skill development integrated technology scaffolds; use of other technologies, devices or the Internet
Teacher questionnaire	Technology as a tool for writing; teacher perceptions of teaching style; writing strategies; teaching approaches
Interviews	Wattle Creek ICT leader; explicit teaching; teacher support in classrooms; mentoring
Field notes	What was the teaching approach and when used? technological skill development; challenges; level of technology use
Staff meetings	What was the skill focus adopted?
Recorded feedback	In-class support; adopting technology discussion; using technology as a tool; change in teacher knowledge
Question 1	Instructional activities teachers used
Data tools	Focus on instruction with technology
Observations and records	Pedagogy to integrate writing & technology; skill building practice; strategies to develop fluency of using the functionality of text-to-speech to focus on reader–writer relationship; development of vocab & complex sentences; instructional resources
Teacher questionnaire	Teacher perceptions of teaching style; writing strategies; teaching approaches
Interviews	Wattle Creek ICT leader: explicit teaching; teacher support in classrooms; mentoring
Field notes	When teacher promoted exploratory approaches, used explicit teaching and student-centred learning; when teacher used a combination of explicit & student-centred approaches; lesson structure; genre approach; effective teaching practices; scaffolding learning with limited choices, encouraging peer collaboration, re-reading & revising strategies. Use a blend of traditional teaching strategies with creation of new strategies; whole-class collaborative learning; teacher writing instruction workshops; student weekly feedback as provided on thoughts about using text-to-speech for writing. Different teaching practices & instructions when teaching with technology; Transferable strategies from writing without technology to writing with technology
Staff meetings	LDWT meetings: writing pedagogy, teaching resources, Working with text-to-speech — set up speech bar, back-track & rewind, instruction; tips for using text-to-speech
Recorded feedback	Discussion on working with technology in the classroom; pedagogy using text-to-speech; changes in teacher knowledge.

Table 3 Question 1 What procedures did students adopt in introducing new text-to-speech technology into their writing lessons?

Question 1	What procedures did students adopt in introducing new text-to-speech technology into their writing lessons
Data tools	Focus on adoption of technology
Observations and records	How students managed using the text-to-speech, roles and responsibilities of students; develop new vocabulary; enjoyment in writing

Student surveys	How students personalised the use of text-to-speech; My Ideas about Read&Write Gold™; Questions 1,3,5,7, 10, 11; Wattle Creek School text-to-speech feedback at middle & end of research; learning with ICT; using the software
Interviews	Creation of organisational procedures, enjoyment in writing
Field notes	How students solve technological problems
Student writing samples	Pre-writing exercises; writing improvement in length of story, number of stories written.

Table 4 Question 2 What procedures did teachers use in writing lessons using new text-to-speech technology?

Question 2.	Focus on systemic leadership; procedures to support students to use text-to-speech; the creation of new writing instructional procedures – focus on reader–writer relationship; editing, revision, narrative genre with technology
Data tools	Focus on use of technology
Observations and records	Integrated technology scaffolds; use of other technologies, devices or the Internet Pedagogy to integrate writing & technology skill building practice Strategies to develop fluency of using the functionality of text-to-speech to focus on reader–writer relationship Development of vocab & complex sentences Instructional resources (technological & non-technological) for individual writers & writers’ workshops
Teacher questionnaire	Writing strategies; student managing Read & Write Gold™; software as a tool for writing; changes in writing strategies; metacognitive knowledge
Interviews	Explicit teaching; humorous and interesting teacher personal observations when teaching writing with technology
Field notes	Effective teaching practices: scaffolding learning with limited choices, encouraging peer collaboration, re-reading & revising strategies Use a blend of traditional teaching strategies with creation of new strategies, whole-class collaborative learning Teacher writing instruction workshops Different teaching practices & instructions when teaching with technology Transferable strategies from writing without technology to writing with technology
Staff meetings	Wattle Creek School learning design meeting; story-grammar training; writer’s workshop; formative assessment & tips; narrative learning instruction; text-to-speech technology instruction & tips; typing & editing instructions, differentiation for novice writers; writer’s workshop feedback; the process students use when composing narratives & teacher instruction to facilitate or support that process
Recorded feedback	End of research: reflective teacher feedback.

Table 5 Question 2 What procedures did students use in writing lessons using new text-to-speech technology?

Question 2.	What procedures did students use in writing lessons using new text-to-speech technology? Focus on individual procedures with the skills of using the new technology, collaboration, adopting terminology and problem solving
Data tools	Focus on use of technology

Observations and records	Strategies to develop fluency in using the functionality of text-to-speech to focus on reader–writer relationship; development of vocab & complex sentences; instructional resources (technological & non-technological) for individual writers & writing workshops; problem-solving strategies; types of collaboration; interesting observations, time on task; reflective procedures promoted when collaborating with others
Student questionnaire	Student managing & using the software; learning with ICT
Interviews	Strategies of teaching with text-to-speech, comparison between writing with technology and writing without technology; role of the teacher during writing lessons
Field notes	Student weekly feedback provided on using text-to-speech for writing; writing samples; questions asked during writing lessons; difficulties; collaborations peer/peer and teacher/student.

Table 6 Question 3 What was the level of technology integration adopted by the teachers when teaching with technology?

Question 3	What was the level of technology integration adopted by the teachers? Focus on 4 SAMR levels of substitution, augmentation, modification and redefinition to enhance or redefine teacher pedagogy at the control, process and resource levels of the Hayes (2012) writing process model
Data Tools	Focus on technology integration
Observations and records	<p><b>Control level</b></p> <ul style="list-style-type: none"> <li>• Teachers planning narrative writing experience</li> <li>• Textual features focused on</li> <li>• Teaching approaches used</li> <li>• Instructional strategies</li> <li>• How teachers facilitated students learning to write</li> <li>• How teachers encouraged students to read &amp; reflect on texts individually and whole class</li> <li>• Instructional goal focus of plan-write-revise; author–reader relationship</li> </ul> <p><b>Process level</b></p> <p>How text-to-speech technology &amp;/or other technologies to revise texts Revision approaches for novice &amp; more experienced writers; how was a writing environment for peer collaboration established; instructional processes to develop students typing skills How learning was sequenced for individual writers when writing with technology; student comments</p> <p><b>Resource level</b></p> <p>What resources were integrated to support student’s working memory e.g. exploratory, corrective feedback, composing feedback &amp; narrative genre resources? Which resources used to prompt students’ long-term memory e.g. traditional, digital What resources sustained student attention for writing? e.g. classroom routines, screen focus, font size, speed &amp; speech of text-to-speech, reading or audio-visual resources</p> <p><b>Teachers developing a pedagogical approach</b> to teaching with text-to-speech technology: What technological knowledge needed to manage &amp; scaffold student learning? Did technological tools enhance or transform learning? Did teaching with</p>

	<p>technology enhance or transform teacher practice? What aspects of knowledge about technology were important for different writing activities?</p> <p>Teacher pedagogy for teaching with text-to-speech technology in every writing activity: Introduce technology; text organisation on a screen; textual features focus; Writing materials &amp; instructional strategies; how did they facilitate student learning? Collaboration while writing; collaboration in writer's workshop; process to guide revision of text.</p> <p>Instructional strategies: Strategies for the whole class; Strategies for individual writers; Strategies for collaboration; strategies for revision of texts; scaffolding of instructional strategies</p>
Teacher questionnaire	Background information on out-of-school experiences; writing strategies
Interviews	Wattle Creek School ICT leader: explicit teaching; why was text-to-speech chosen? All schools: role of a technician; software choice process
Field notes	TPACK: typing comprehension, revision & mastery of using the functional skill for text-to-speech for textual meaning How teachers managed the integration of technology at every level of the writing process. Did they sustain or abandon? Did teachers reflect cognitively on changes to their practice? If not why not? Did teachers create new instructional strategies? If not why not? Teacher awareness of possibilities of technology, access to technology, teacher requisite skills to sustain new practices Technology integrated to support existing practice, teachers developing new skills to enhance teaching and learning strategies Teachers using technology as a catalyst to create new instructions
Wattle Creek School whole school staff meeting	Customising the toolbar; integrating with narrative writing; saving work on the intranet.

Table 7 Question 3 What was the level of technology integration adopted by the students when learning with technology?

Question 3	What was the level of technology integration adopted by the students when learning with technology? Focus on 4 SAMR levels of substitution, augmentation, modification and redefinition
Data tools	Focus on technology integration
Observations and records	Student comments; revision procedures, management procedures, skill development over time; level of automaticity in using text-to-speech; collaboration and problem solving, time spent on writing instruction compared to time focused on the technology
Student questionnaire	Using the software; text-to-speech feedback at mid-point & end of research (Wattle Creek School); 'When I used Read&Write™' then questions 1–9
Weekly optional feedback	Choice of technologies for writing; choice of technologies summary for entire research
Field notes	Resources students chose to use; focus on how student constructed texts, revision procedures, editing procedures, attended to new learning goals Student awareness of possibilities of technology, access to technology, requisite skills to sustain new practices

	Technology integrated to support learning; students developing new skills to enhance their learning strategies Students using technology as a catalyst to create new instructions.
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Table 8 Question 4 What factors influenced teachers’ use of the new text-to-speech technology in writing lessons?

Question 4	What factors influenced teachers’ use of the new text-to-speech technology in writing lessons? Focus on teacher knowledge and instructional competency; teacher motivation; collegial support; technical support; administrative arrangements
Data tools	Focus on teacher knowledge and management of the technology
Observations and records	Teacher knowledge: retaining a literacy focus when teaching with technology; teacher resistance to changing traditional pedagogical style; teachers and students managing the features of functions of text-to-speech; opportunities to develop skills & competencies in using technology; impact of systemic school structures for integration success; time to overcome problems
Teacher questionnaire	Advice to colleagues
Interviews	Technician interviews; working with technicians; barriers to implementing ICT; needs of the school Wattle Creek School: technological issues faced; relationship with ICT leader; staff professional development; future possibilities
Field notes	Teacher–student relationship & problem solving through instruction with technology; pedagogical factors and instructional factors; collegial, mentoring, technical supports
Final reflective interview	Personal reflections on writing with technology in the classroom.

Table 9 Question 4 What factors influenced students’ use of the new text-to-speech technology in writing lessons?

Question 4	What factors influenced students’ use of the new text-to-speech technology in writing lessons? Focus on difficulties managing the software, motivation, collaboration
Data tools	Focus on student management of software
Observations and records	Student motivation as a result of teacher pedagogy; collaborative opportunities instructional factors: editing, differentiated learning, listening and thinking scaffolds, interplay factors between competing software
Interviews	Typing skills; managing the software; enjoyment in writing; understanding of how to improve writing
Field notes	Typing habits; availability of teacher or peer supports; knowing how to ask questions that combine literacy and technology; mentoring or support.

Tables 2-9 show the specific focus of the data collection tools for the four research questions over the time-frame of the research.

The research data collected over the twenty-week time-frame from each school site, is shown in Table 10 and summarised as follows:

Table 10 Data collection time frame

Time	Data collection tools
Pre-research	<ul style="list-style-type: none"> <li>• Install software, organise headsets</li> </ul>
Weeks 1–20	<ul style="list-style-type: none"> <li>• Interviews, surveys &amp; field work observations; records of student technology use</li> <li>• Observation, records &amp; audio recording of classroom workshops</li> <li>• Making field notes, observations &amp; records and personal student and teacher comments in the classroom</li> <li>• Collect record of student writing samples and reports</li> <li>• Document collection</li> </ul>
Weeks 5–20	<ul style="list-style-type: none"> <li>• Observations &amp; records, field notes, interviews &amp; discussions with students</li> </ul>
Weeks 6–19	<ul style="list-style-type: none"> <li>• Observation &amp; records of staff meetings</li> </ul>
Weeks 1,3,6,12	<ul style="list-style-type: none"> <li>• Observations of professional learning team meetings</li> </ul>
Weeks 18–20	<ul style="list-style-type: none"> <li>• Teacher questionnaires and student surveys</li> </ul>
Post research	<ul style="list-style-type: none"> <li>• Research participants’ reflective feedback and teacher beliefs re using technology.</li> </ul>

***Field notes.***

Observations in the school environment enabled the documentation of lived experiences by watching what was actually taking place in the writing classroom; they also allowed a developing understanding of school technology patterns, leadership issues and support structures for the activity of writing with technology. Data was collected from within the writing classroom and from discussions at teacher meetings that impacted on writing lessons. In-class observations focused on classroom management, the teaching environment and the technological resources as well as the writing and post-writing practices. Observational data was collected from teacher meetings, communications between students and teachers, and students and students in the writing classroom; communications and relationships between teachers themselves and also within the broader technological environment of the school. Professional teacher learning or collaborative activities were the preferred main types of teacher interactions studied, but teacher participants at each site had their individual ways of learning and relating that were included if relevant to the research.

Other field data was collected from teacher and student comments and workshops; this data provided useful feedback on the teaching of writing with technology and specific writing activities. The following four focus questions guided the research observations infield, to capture the management of the learning environment, teacher pedagogical methods and instructions, and for noting challenges:

1. How did the writing lesson begin?
2. How did the lesson proceed?
3. What were the teaching strategies/procedures used?
4. How was technology integrated in the writing lesson?

Out-of-class data collection focused on notes taken at staff meetings and teacher professional learning team meetings. The advantage of these direct observational techniques, although time consuming and selective, provided for data to be captured in real time within the operational processes of each school.

***Interviews, questionnaires and surveys including audio recordings.***

Interviews, questionnaires and surveys focused on the integration of technology, classroom teaching methods, instructions, teachers' beliefs about the value and integration of technology, and the transformation of teacher pedagogy from using traditional practices to adopting a different approach when teaching with technology. The interviews provided insightful and descriptive feedback on the integration of technology for writing. The student surveys and teacher questionnaires added to these descriptions and provided deeper insight into how text-to-speech was being integrated and managed as an instructional method for writing. The student surveys and checklists were consciously designed using a font, colour coding, format and texts that enabled all students to answer the questions with minimal input from a teacher.

The questionnaires were developed from a range of cognitive based research (Andrew, 2009; Astleitner, 2000, 2005; Haller, Child, & Walberg, 1988; M. Lee & Baylor, 2006; Randolph, Kangas, & Ruokamo, 2009; Wishart & Blease, 1999) and focused on the following:

Students:

1. Background information – students learning ability with ICT
2. Managing Read and Write Gold 9 software
3. Learning Environment when using technology
4. Collaboration
5. Student learning goals
6. Writing strategies
7. Metacognitive knowledge

## 8. Motivational beliefs

### Teacher Questionnaire:

1. Background information
2. Student managing using Read and Write Gold 9 software with focus on purpose for ‘quick wins’
3. Read and Write Gold 9 as a tool for writing
4. Motivation in learning – how the software has affected the teachers teaching styles, and students learning
5. Teacher / student perceptions on teaching style and learning goals – have changed since installation of software
6. Writing strategies – any changes in writing strategies.
7. Metacognitive Knowledge – strategies you teach within the plan, write, revise process.
8. Motivational beliefs – emphasis on FEASP strategies (fear, envy, anger, sympathy and pleasure) for emotional & social benefits (Astleitner, 2000).

The teacher and student questionnaires were also approved according to university Ethics Protocols (Andrew, 2009).

The interviews and audio recordings were transcribed to ensure an accurate recollection and then reflective feedback was provided to verify the researcher’s understandings. Researcher bias may be reflected through the particular questions asked and so every attempt was made to avoid this and to ensure the authenticity of the data collected. All teacher interviews used a consistent data collection process. Teachers’ and students’ written questionnaires allowed for participants to record their answers without interference. A separate student checklist was designed specifically for students from Wattle Creek School; this was because the participating teachers had decided at the start of their research that only the text-to-speech functions of the Read&Write Gold™ software were to be used by the students. The deeper understanding of the Wattle Creek teachers’ approach to teaching with technology is discussed in Chapters 7 to 10. The information collected from all of these data tools reflected participants’ opinions, experiences and knowledge, as well as teachers’ beliefs about teaching with technology (see Table 11: Teacher Questionnaire, Table 12: Student questionnaire and Table 13: Wattle Creek School student checklist).

The questions listed in Table 11 below are designed to capture a teacher’s understanding of the use of technology for the teaching of writing.



## Table 11 Teacher questionnaire

The questionnaire will seek your views and experiences about teaching and learning using ICT and Read&Write Gold™ software (R&W).

Please rate on a scale of 0–5 your preference with 0 being least and 5 being the most  
0 = 1 1 = ; 2 = ; 3 = ; 4 = ; 5 = .

### Teacher background information

*Please share your views, beliefs and experiences about your own teaching using ICT.*

1. How confident do you feel about using ICT in the classroom?
2. How much can ICT assist students to access learning?
3. How much can ICT be a valuable tool for learning?
4. How much do students improve their learning when using ICT for writing?

### Student management of Read&Write Gold 9™ software

*Please share your views on how well students have managed the Read&Write Gold™ software in their learning.*

1. How has the installation of R&W increased student motivation to write?
2. How has the installation of R&W increased students' ability to self-edit their writing?
3. How has the installation of R&W enabled students to achieve the goals required for the writing task?
4. How has the installation of R&W enabled you to embed your traditional writing strategies into the writing program?

### Read&Write Gold™ software as a tool for writing

*Please share your views on how effective Read&Write Gold™ has been as a tool for student writing.*

1. How has the installation of R&W affected the strategies you use to help students write?
2. How has the installation of R&W had a positive effect on developing student writing?
3. How has the installation of R&W enabled students to write more?
4. How has the installation of R&W made it easier for students to engage in writing?

### Teaching and learning with the Read&Write Gold™

*Please share your views on how Read&Write Gold™ has affected your teaching style.*

1. How has the installation of R&W software enabled you to differentiate lessons to cater for individual student needs?
2. How has the installation of R&W improved your preparation for a writing lesson?
3. How has the installation of R&W made teaching more difficult?

*Please share your views on how the installation of Read&Write Gold™ has affected the learning of your pupils.*

1. How has the installation of R&W increased the motivation of students to learn?

2. How has the installation of R&W enabled your students to become more focused on their writing?
3. How has the installation of R&W improved student confidence in writing?

#### Teacher perceptions on teaching style

*Please share your views on your perceptions of your teaching style following the installation of Read&Write Gold™.*

1. How has the installation of R&W changed the way you teach writing?
2. How has the installation of R&W had a negative effect on student writing?

#### Writing strategies

*Please share your views on writing strategies following the installation of Read&Write Gold™.*

1. How has the installation of R&W facilitated strategies for improving student writing?
2. How has the installation of R&W enabled students to create personalised learning supports to improve their writing?
3. How has the installation of R&W helped students to better plan their writing process?
4. How has the installation of R&W changed your approach to teaching writing instruction?

#### Teaching approaches

*Please share your views about strategies within the writing process.*

1. How has the installation of R&W enabled you to teach students to write to communicate to an audience?
2. How has the installation of R&W made it difficult for you to teach students to use self-regulation strategies when writing?
3. How has the installation of R&W changed the teaching strategies you use to teach writing?
4. How has R&W functions enabled you to create opportunities for shared classroom learning?

#### Teacher awareness of student attitudes to learning with Read&Write Gold™


*Please share your views about student attitudes to learning since the installation of Read&Write Gold™.*

1. How has the installation of R&W made writing more enjoyable for your students?
2. How has the installation of R&W encouraged co-operative learning during writing lessons?
3. How has the installation of R&W encouraged students to be creative when developing their writing skills?

As you can see Table 11 captures a teacher's understanding and use of technology for teaching writing.

Table 12 Student questionnaire

<b>Learning at School</b>		<b>Strongly disagree</b>	<b>Disagree</b>	<b>Can't say</b>	<b>Agree</b>	<b>Strongly agree</b>
1	I like school.					
2	I like maths.					
3	I like reading.					
4	I like writing.					
5	I like the topic of society and environment.					
<b>Learning with ICT</b>		<b>Strongly disagree</b>	<b>Disagree</b>	<b>Can't say</b>	<b>Agree</b>	<b>Strongly agree</b>
1	I feel confident about using ICT to help me learn.					
2	I believe ICT can improve my learning.					
3	I use ICT a lot for learning.					
4	ICT helps me to become aware of how I learn.					
5	I think ICT will help me to become a good writer.					
<b>Managing Read and Write Gold</b>		<b>Very difficult</b>	<b>Just a little difficult</b>	<b>Can't say</b>	<b>Quite easy</b>	<b>Very easy</b>
1	Since you have learnt to use R&W, is writing easier for you?					
2	Have you found it easy to learn to use the R&W tool bar for writing?					
		<b>Not at all helpful</b>	<b>Just a little helpful</b>	<b>Can't say</b>	<b>Quite helpful</b>	<b>Very helpful</b>
3	How helpful do you think the R&W icons are for improving your writing?					
		<b>Not at all important</b>	<b>Just a little bit important</b>	<b>Can't say</b>	<b>Quite important</b>	<b>Very important</b>
4	How important is it for you to use R&W when you are writing?					
<b>Using Read and Write Gold</b>		<b>Strongly disagree</b>	<b>Disagree</b>	<b>Can't say</b>	<b>Agree</b>	<b>Strongly agree</b>
<b>When I use Read and Write then:</b>						
1	I enjoy my writing.					
2	I can think about my writing.					

3	I know how to plan before I write.					
4	I know how to correct my mistakes.					
5	I know how to put extra words into sentences.					
6	I know how to edit what I write.					
7	I can think about the people who are going to read my stories.					
8	I know how to improve my writing.					
9	I feel I can be creative with my writing.					
10	I feel that my writing is improving all the time.					
11	I am enjoying writing more than I used to.					
12	I like being able to set up my learning environment.					
13	I like to share my ideas with others.					
<b>Thank you for completing the questions and sharing how you are learning to write with Read and Write.</b> 						

The student questionnaire presented in Table 12 was designed to capture a student’s understanding for how they managed, used and felt about writing with technology. Student feedback on the use of the software features while they were writing was also obtained through direct infield observations (see Table 13 below).


Table 13 Wattle Creek School student checklist on the use of software features.



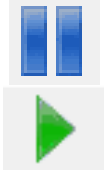


Name \_\_\_\_\_

Date \_\_\_\_\_

The questions are about you using text-to-speech when you are writing your story. Please answer all questions. Tick the box that best tells me what you did.

		Never	A little	A lot
1	 How often did you <b>LISTEN</b> to the whole story?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

 2	How often did you use the rewind icon to go <b>BACKWARDS</b> ?	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
 3	How often did you use the forward icon to go <b>FORWARDS</b> ?	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
 4	How often did you use the <b>PAUSE</b> and <u>then</u> <b>PLAY</b> icon?	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

How has text-to-speech helped your writing? Tick the box

1	I like using text-to-speech to listen to my story.  <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> never      a little bit      often      lots and lots
2	I am more confident with my writing when I used text-to-speech.  <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> never      a little bit      often      lots and lots
3	I use text-to-speech to go backwards to check my story makes sense.  <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> never      a little bit      often      lots and lots
4	Text-to-speech helps me to think what next to write.  <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> never      a little bit      often      lots and lots
5	My stories are interesting when I use text-to-speech.  <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> never      a little bit      often      lots and lots
6	I am able to write long stories when I use text-to-speech.  <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

	never	a little bit	often	lots and lots
7	I like listening to other students' stories when using text-to-speech.			
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	never	a little bit	often	lots and lots
8	Text-to-speech helps me with my spelling.			
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	never	a little bit	often	lots and lots
9	Text-to-speech helps me to use interesting words.			
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	never	a little bit	often	lots and lots
10	Text-to-speech helps me to think about my sentences and using full stops.			
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	never	a little bit	often	lots and lots
11	When I listen to my stories using text-to-speech, it helps me to write in paragraphs.			
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	never	a little bit	often	lots and lots

Thank you for helping with the Research

As noted, Table 13 captures how a student understands the integration of text-to-speech technology has helped them to write, edit and reflect on the construction of texts.

### ***Records of student writing.***

Records were collected from students' writing samples. The samples were collected at the completion of each narrative by students uploading the texts to their school intranet/ cloud or onto a university website designed to capture the data. The collection of students' writing samples, in Table 14 below, prompted by the Read&Write Gold™ toolbar image, offer a snap-shot of students' thoughts about using technology when writing.

Table 14 Collecting student writing samples

THINKING with READ AND WRITE GOLD™



This research is to understand what you think when you use Read&Write Gold™.

It is not a test of how good you are at using a computer or your writing ability. I want to know what you think, not what you have learnt at school or what the person sitting next to you thinks. You can tell me about the things you knew, the things you were thinking about or wanted to know. You need to write this down as quickly as you can.









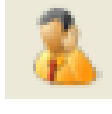



It is now time to think about the writing sample you did and the types of icons you used.

THINKING and USING Read&Write Gold™

Please tick the icons you used when you were doing your writing sample.

Tick all the icons you used, even if you didn't think they were helpful.

	Spell Checker			Speech Maker	
	Word Prediction			Daisy Book Reader	
	Dictionary			Pronunciation Tutor	
	Word Wizard			Scanning	
	Hear Homophones			Fact Folder	
	Calculator			Fact Finder	
	Read Previous			Fact Mapper	
	Play			Speech Input	

	Pause Speech			Translator	
	Read Next			Help Files	
	Stop Speech				
	Screen Shot Reader			Launch PDF Aloud Button	
	Sounds Like			Screen Masking	
	Speech Input			Summary	

How to help the Research:

1. Share a sample of your writing. Copy and paste the sample into the box below.
2. Answer the questions about 'Thinking and using Read and Write Gold 9™ software.'

My writing sample using Read and Write GOLD™

<p><b>NAME:</b></p> <p><b>Date:</b></p> <p>Copy and paste into this space on the website.</p>
---

Thank you for sharing your thinking about Read&Write Gold™.  
You are making a valuable contribution to research.

The collection of students' writing samples and the Read&Write Gold™ technology in Table 14, reflects the focus of students' thinking about using technology when writing.

***Documents.***

The documents collected in the study provided supportive evidence alongside the field notes and teacher communications. These included professional learning team meetings and staff meeting agendas, school context statements and school ICT policies. The documents provided a reference when reflecting on classroom practices



and teacher understandings to verify and provide specific detail through the triangulation process. Teacher communications were captured and collated to inform the emerging ‘Writing pedagogy with technology’ document (see Table 15). The table provides insight into the writing activities and also the instructional routines and procedures which developed in association with text-to-speech.

Table 15 Wattle Creek School. Writing pedagogy with technology.

<p>1. Keyboard skills</p> <ul style="list-style-type: none"> <li>• Learn Home and Shift Keys</li> <li>• Teach as a separate lesson</li> </ul> <p>2. Discourse &amp; assessment</p> <ul style="list-style-type: none"> <li>• Language for expressing ideas (field) , Language for interpersonal communication (tenor), Creating and structuring text (mode)</li> </ul> <p>3. Process of writing: Plan-Write-Revise</p> <ul style="list-style-type: none"> <li>• Page organisation: name, date, title and save work — standard organisation</li> <li>• Introduction — teacher guided <ul style="list-style-type: none"> <li>Story appraisal questions <ol style="list-style-type: none"> <li>1. How are you writing? — (to entertain)</li> <li>2. Who are you writing as? — (identity)</li> <li>3. How do you want to make them feel? (attitude)</li> </ol> </li> </ul> </li> <li>• Text-to-speech: plan a little, write a little, revise a little</li> <li>• Back-track/rewind and listen</li> <li>• Listen to final story before editing and before writer’s workshop and before completion.</li> </ul> <p>4. Text-to-Speech</p> <ul style="list-style-type: none"> <li>• Customise toolbar; explicit with Smart Board; picked up quickly</li> <li>• Speech voice and speed: Tim and Tina. 75% pitch and 35% speed (changed from 40 as determined by students). Choice of voices positively received</li> <li>• Type at sentence level</li> <li>• Weekly lesson structure and time frame — literacy block 45–50 minutes, 3 times per week</li> <li>• Where do students like to keep the RW toolbar on their worksheet when writing?</li> <li>• Editing process</li> <li>• Function of spell-checker when writing</li> <li>• What affordances not using and why? e.g. predictive text, mind map</li> </ul> <p>5. Writer’s workshop</p> <ul style="list-style-type: none"> <li>• Introduce your story as referenced to story appraisal questions</li> <li>• Listen to entire story</li> <li>• Story-grammar questions</li> <li>• Instructional feedback — font size; text-to-speech voice and speed. What is importance of voice choice in writer’s workshop?</li> </ul> <p>6. Whole-class writing conference</p>
---

- Use examples of student work. Give all students a chance to share their story on whiteboard over the period of the research.
7. Story completion — final edit. Save to weekly folder and answer questionnaire.

### **Writer's Workshop and story-grammar training**

- Who is the main character?
- Where and when did the story take place?
- What do the main characters do?
- How does the story end?

### **Laptop rules**

- No drinks on table
- Writing font — Arial or Times New Roman font size 14 or 16.
- How to save to school network by saving to desktop first and then signing into the school intranet
- Half-mast for listening and instructions
- classroom management and monitors
- Always ask if can update at start of lesson or check each Monday.

### **Technology vocab/discourse**

- Half-mast screens when teacher wants whole class attention
- Log on
- Scroll down
- Passwords — students have cards to help remember; how to access the cards
- Sleep mode
- Skim and scam
- Intranet page: Safari
- Server: to store information
- Cloud: school intranet is like a 'cloud' for you.

### **Technology behaviours**

- Personal behaviour: listen with eyes, brain, hands and bodies
- Routines: learn to log on, task bar, typing tutor (do and save)
- Study wiz routines: E-locker, class, writing folder, save as draft 1, 2 etc.

This summarises the instructional procedures implemented by the teachers at Wattle Creek School.

**Data collection method: selection of the software.** The software (selected by myself) for the purpose of this research was TextHelp Read&Write Gold™ (TextHelp Systems Ltd, 2012a). Read&Write Gold™ is a literacy support software package specifically designed to support students and adults in reading, writing, and research and study skills. The software has a customisable easy-to-use toolbar which floats alongside applications on Mac and PC computers. Software users can choose

particular features from suggested groups of features that appear on a floating toolbar, e.g. reading, writing, study skills and research. Users can also personally select features to meet their specific needs. The software can be installed using a CD or is downloaded from the Internet on stand-alone computers or across a network, with options for educational site licences. A portable USB version is also available. The software is available nationally and internationally. The features on the toolbar are accessible for students to manage from early years of schooling to adult years in the workplace. Children and older students can integrate the features of the software to self-manage their learning towards becoming autonomous learners. The text-to-speech features on the toolbar can be customised to read texts by word, sentences or by paragraphs, using a range of different voices, speeds and colour-highlighted texts. The software is increasingly being used in Australian schools.

The Read&Write Gold™ software was provided to the participating research schools and made available on every computer in the schools, as well as to the researcher and the teacher participants, at no cost to the schools or teachers. Negotiations with TextHelp™ enabled all research personnel to have access to the software throughout the duration of the research. Technical support and advice from TextHelp™ was also available if necessary, especially to facilitate the installation of the software onto school network systems and for troubleshooting technical issues. On completion of the research, TextHelp Systems™ provided a 12-month whole-school license at no charge to each school. As Wattle Creek School already had the software installed across their school network, TextHelp Systems™ provided an optional upgrade of their current software. The school decided not to take up this offer for the duration of the research, as they did not want to use their technician time to change what was already working efficiently on their school system.

The chain of evidence in the form of an audit trail documents how the study was conducted (see Table 16: Audit Trail of data collection and research stages), Yin (2009, p. 122). Dependability and confirmability of the research are provided by means of an audit trail. This validates the trustworthiness of the research by demonstrating that the methods used are reproducible and consistent. The audit trail describes the research strategy generally and procedurally. The procedural descriptions of how the strategy was executed illuminates the methodological choices and adds to the confirmability of the research methodology.

Table 16 Audit trail of data collection & research stages.

2009	
March–September	Background literature and software review search Research proposal and ethics approval
September–December	Literature review search continued Organising initial school and access to software
2010 Redgum Primary School	
January–May	Installing software, teacher software training, purchasing of earphones
June–November	Introductory observations and troubleshooting Field work and collection of writing samples Student/teacher feedback and discussion of technology use Observation of writing activities Researcher observations — at least every two weeks Reflective feedback at end of research
November–December	Collection of student and teacher surveys, questionnaires and school documents Coding of technology use and reviewing writing activities
2011 Springbank Primary School	
January–February	Coding writing activities feedback from Red Gum Primary School Installing software, teacher software training, purchasing of earphones
March–June	Introductory observations and troubleshooting Field work and collection of writing samples Student/teacher feedback on technology use Observation of writing activities Researcher observations — at least every two weeks Reflective feedback at end of research period  Collection of student and teacher surveys, questionnaires and school documents Coding of technology use and reviewing writing activities
November	Combined Springbank, and Redgum teacher reflective feedback workshop Collection of student and teacher surveys, questionnaires and school documents Coding of technology use and reviewing writing activities

December	Reviewing and coding of technology use and reviewing writing activities
2012	Wattle Creek School.
January–April	Coding of technology use and reviewing writing activities Analysing feedback and data from the first two research schools Teachers and writing activities to TPACK & SAMR
May	Inclusive technologies conference presentation
Early–mid-June	Installing software, teacher software training and formation of teacher contact meetings
Mid-June–early November	Field work and collection of writing samples, student/teacher feedback and technology use Observation of writing activities Researcher observations – at least every 2 weeks Four ICT Professional Learning Team meetings, weeks 3, 6, 9 Observe whole-school staff meeting presentation End research — reflective feedback
December	Collection of student and teacher surveys, questionnaires and school documents Coding of technology use and reviewing writing activities Analysing all teacher feedback and data to TPACK & SAMR
2013–2016	Data analysis and writing
January–October 2013	Data analysis continues; drafting of methodology chapters
November–June 2014	Writing first draft of thesis
June 2014–2016	Draft revision, editing and proofreading Submission of thesis for examination

The audit trail presented in Table 16 shows the different stages of field work, data collection and analysis that occurred within each of the research schools.

**Data collection method: the collection and storing of data.** The three principles of the data collection processes as advocated by Yin (2009) were applied in the study to ensure quality control and to construct study validity. These included the use of multiple sources of evidence, the creation of a study database and the maintaining of a chain of evidence.

***Multiple sources of evidence.*** The use of multiple sources of evidence allowed for what Yin (2009) termed the ‘development of converging lines of inquiry’ (p. 115) through a process of triangulation and collaboration around the phenomenon of role of text-to-speech in instructional strategies. Fetterman (2010) noted that triangulation is at the ‘heart of ethnographic validity’, and that the process of triangulation can improve the quality and accuracy of ethnographic data (pp. 94–96). The data can only be triangulated when one source of information is supported by more than one data collection method. The use of multiple measures for the research phenomenon strengthened the construct validity of the study.

***Creating a study database.*** Creating a study database increased the reliability of the study because the data could be organised and presented for an additional review if required. The study data was organised and categorised to allow a study report to be compiled. This assisted in validating the authenticity of the original data content. The data was collated and stored at the university, using both electronic and traditional means to facilitate the cross-analysis and pattern-mapping processes. The converging of the data through the development of matrices, theoretical modelling, frameworks and crystallisation procedures provided a means to develop new insights and identify emerging themes or trends within the research questions.

***Maintaining a chain of evidence.*** Maintaining a chain of evidence in the study increased the reliability of the information collected (Yin, 2009). Future researchers should be able to follow the step-by-step processes of this study as outlined in the ethnographic design approach of the research (see Table 17: Section 2 below) and be able to understand the links between the content of the data sets and the study proposition and questions.

While the research was a complex, multi-faceted process, the principles of creating a database, applying triangulation and maintaining a chain of evidence strengthened the quality control measures for analysing the data. The ethnographic study approach provided an opportunity to create a database from the very beginning of the research and to maintain the chain of evidence at multiple levels throughout the research. The ethnographic conceptual framework guided the data collection processes in the field and ensured that all data collection tools could be triangulated to create deeper understandings of the case studies.

In summary, Section 1 of this chapter has described how qualitative research, ethnographic data methodology and data collection methods were structured to

interpret the research questions. Section 2 will outline the analytical framework adopted for this research.

## Section 2. The Analytical Framework

This section outlines the analytical framework adopted for the ethnographic design of the research. In analysing of the data it was important to develop rich descriptions and to be aware of emerging themes and new interpretations (Creswell, 2012c). I pursued the research questions through developing an ethnographic design approach (see Table 17 below). The design encompassed the six different objectives, which were briefly introduced in Section 1 of this chapter.

Table 17: Ethnographic design of the research

	Structuring the research	Exploring and coding data	Collating data
1	To acquire knowledge about the organisational context of the classroom and school environment. To capture observations relevant to organisational contexts and school environment that align with the research questions	<ul style="list-style-type: none"> <li>Field data analysis matrix developed for each teacher (see Table 27)</li> </ul>	<ul style="list-style-type: none"> <li>Observations of organisational context of the classroom and school environment</li> </ul>
2	To capture the teaching and learning experiences of teachers and students when integrating teaching, learning and technology. Includes focus on text-to-speech technology.	<ul style="list-style-type: none"> <li>Rich descriptive data developed through themes</li> <li>study database</li> <li>Coded student data on use of technology</li> <li>Teacher &amp; student coded data from questionnaires</li> <li>Field data —writing process matrix (see Tables 11–15; 18; 19–25; 31; Figure 7 and Appendixes G, H, I, L1–L3)</li> </ul>	<ul style="list-style-type: none"> <li>Data capturing the teaching and learning experiences of teachers and students when integrating teaching, learning and technology</li> <li>Data relevant to adoption and use of text-to-speech technology</li> </ul>
3	To understand teacher pedagogies, beliefs and management of	<ul style="list-style-type: none"> <li>Individual descriptive teacher knowledge through the lens of TPACK &amp; SAMR</li> </ul>	<ul style="list-style-type: none"> <li>All teachers' data relevant to teacher pedagogies, beliefs and</li> </ul>



	the learning environment	<p>and instruction with text-to-speech</p> <ul style="list-style-type: none"> <li>• Writing activity framework</li> <li>• 10-point writing framework</li> </ul> <p>(see Tables 26, 28–30, 32–36; Figures 9 and 10 and Appendixes B1, B2 and C)</p>	management of the learning environment.
4	Pattern matching and triangulation	<ul style="list-style-type: none"> <li>• Coding individual teacher’s descriptive data to all teachers’ data to research questions</li> <li>• Coded data from inquiring into information processing reflections</li> </ul> <p>Instructional frameworks</p> <ul style="list-style-type: none"> <li>• teacher information processing framework</li> <li>• Instructional framework.</li> <li>• Reflective revision approaches with text-to-speech technology framework</li> <li>• Coded TPACK instructions to individual teachers and writing activities</li> <li>• TPACK &amp; SAMR of all teachers.</li> </ul> <p>(see Tables 37–43, Appendixes B1 and B2)</p>	<ul style="list-style-type: none"> <li>• Data relevant to triangulation of instructional strategies and understanding teacher pedagogy.</li> </ul>
5	Ethics and protocols	<ul style="list-style-type: none"> <li>• Data tools aligned to research questions</li> <li>• Consents: principals, teachers, parents and students</li> <li>• Read&amp;Write Gold™ software</li> </ul>	<ul style="list-style-type: none"> <li>• Date related to ethical approvals and concerns related to the study</li> </ul>

		(see Appendixes A, D, E, F)	
6	Proposing the evidence	<ul style="list-style-type: none"> <li>• Research questions</li> <li>• Writing model</li> <li>• Role of text-speech technology</li> <li>• Instructional procedures</li> <li>• Writing at control, process and resource level</li> <li>• Writing pedagogy to descriptive themes</li> </ul> (see Table 44 and Figures 18 and 19; Appendixes I, J and K)	<ul style="list-style-type: none"> <li>• Data related to representation of findings</li> </ul>

The table shows how the structuring of the research, the exploring, coding and collation of data are reflected within each of the objectives of the ethnographical design of this study.

### Preparation and organisation of the data for analysis.

The primary data-gathering methods captured data in the field and through a website linked to the university. The purpose of a dual approach was to ensure that the data obtained had minimal researcher bias and that students' weekly writing samples could be collected and uploaded onto a website for collation and analysis as students completed their writing tasks. Students were provided with a checklist/survey tool to comment on the software features they used when writing stories (see Table 18: Student checklist of software features used during writing).

Table 18 Student checklist of software features used during writing at Redgum and Springbank Primary Schools.

- THINKING and using READ&WRITE GOLD™ SOFTWARE
- Please tick the icons you used when you were doing your writing sample. Tick all the icons you used, even if you didn't think they were helpful.

	Spell Checker		Speech Maker	
---	---------------	---	--------------	--

	Word Prediction		Daisy Book Reader
	Dictionary		Pronunciation Tutor
	Word Wizard		Scanning
	Hear Homophones		Fact Folder
	Calculator		Fact Finder
	Read Previous		Fact Mapper
	Play		Speech Input
	Pause Speech		Translator
	Read Next		Help Files
	Stop Speech		Launch PDF Aloud Button
	Screen Shot Reader		Screen Masking
	Sounds Like		Summary
	Speech Input		

MY IDEAS about READ AND WRITE GOLD 9 SOFTWARE (Weeks 3 & 7)

What would you say was the most important R&W icon you used in your writing?

What was the most difficult icon to use?

Did you find there is a pattern of icons you like to use?

Are their difficulties you have with your writing and you think it would be good to have an icon you can use to help you?

Are there icons you think you will try to use for your next writing sample?

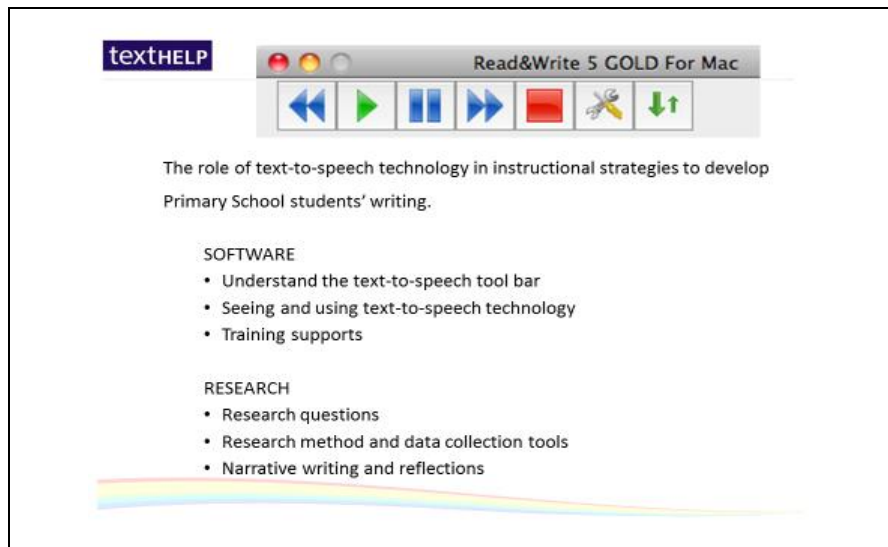
Thank you for sharing your thinking about Read and Write GOLD™.  
You are making a valuable contribution to the research.

As you can see in Table 18, the students provided feedback on two occasions on their use and ideas about writing with technology.

All participating teachers undertook the same training workshop prior to the commencement of the research to become familiar with the Read&Write Gold™ software. The workshops provided an introduction to the software, the research proposal and questions, the research method over the 20-week period, the teacher questionnaire topic headings and the Plan-Write-Revise conceptual approach to writing. The workshops concluded with a brief introduction to the supports available for using the software from the TextHelp Read&Write Gold™ website (TextHelp Systems Ltd, 2012a). (see Figure 6)

The overview of a teacher introductory workshop for teaching with technology outlined in Figure 6, below, shows how the workshops

Figure 6 Overview of research schools power point research workshop



The overview of teacher introductory workshop for teaching with technology outlined in the Figure above, shows how the workshops focused on understanding the technology and the research approach.

Each teacher was encouraged to aim for ten separate writing samples from each student, to be completed over the 20-week period using the Read&Write Gold™ software. The focus of the study was on students using computers ( not just laptops) to write their narratives with a minimum of two 45-minute lessons per week.

The weekly narrative topics were set at the discretion of the classroom teacher, as a natural progression of the wider classroom curriculum. The narrative writings were not set primarily to test students' writing ability but to collate information on the teacher pedagogy involved when integrating technology with student writing.

However, data was collected from Stephanie, who did choose to monitor her students' writing development using the themes from within the NAPLAN (Australian Curriculum Assessment and Reporting Authority, 2011) marking criteria as a normal process of her writing pedagogy (see Table 19 and Table 20).

Table 19 NAPLAN marking criteria.

Audience	Text Structure	Ideas	Character & Setting	Vocab	Cohesion	Paragraphing	Sentence Structure	Punctuation	Spelling
0-6	0-4	0-5	0-4	0-5	0-4	0-2	0-6	0-5	0-6

Table 20 Example of initial and final NAPLAN monitoring of students in Stephanie's class.

Name	Audience	Text Struct	Ideation	Charat & Set	Vocab	Cohesion	Paragraph	Sentence Struct	Punctuation	Spelling	Total Pre	Total post
Student 1	2	2	2	3	2	3	1	3	3	4	19 B4	25 B6
Student 2	3	2	3	3	3	3	1	4	3	4	14 B3	29 B7
Student 3											11 B2	
Student 4	3	3	3	3	3	3	1	3	4	4	25 B6	30B8
Student 5	2	2	2	2	2	2	0	2	2	3	13 B3	19B4
Student 6	3	3	3	3	3	3	1	4	4	4	20 B5	31B8
Student 7	3	2	2	1	2	2	0	1	2	2	13 B3	17B4
Student 8	2	2	2	1	2	2	0	2	2	2	10 B2	17 B4
Student 9	3	3	3	2	3	3	0	3	2	3	10 B2	25B6

The data captured in Tables 19 and 20, clearly show how each student's writing samples within Stephanie's classroom are reflected through the characteristics of the NAPLAN marking rubric.

The study looked for patterns of technology use by examining the features on the software toolbar that students were choosing to use when writing with Read&Write Gold™. To guard against any differences in ability to communicate ideas about software integration, the students were provided with an online and hard copy 'survey' checklist with the Read&Write Gold™ technological icons available for check-boxing. The hard copy ensured that even when Internet access problems arose, students could continue data gathering for the research. (see Table 13: Student checklist for Wattle Creek School and Table 18: Student checklist for Redgum, and Springbank Primary Schools).

All information collected through the website or hard copies was stored on an Excel spreadsheet™ on the study database, categorised by student name, teacher, gender, and narrative story number, year, writing sample, school, student comments and student selected use of software icons (see below, Table 21 and Table 22). A collated descriptive summary taken from student written feedback in Weeks 3 and 7 of the research on the Read&Write Gold™ icons they used while writing is also shown as examples in Table 21.

Table 21 Example of study database showing categorisation of collected data.

First Name	Teacher	Gender	Week	Year	Text	School Year	FK1	FK3	FK4	FK5	FK6	FK7	FK9	FK10
Zach	Olivia	M	1	2012	Crash Ir WCS	4	72	2	7	7	9.9	3.7	93.8	2.6
David	Olivia	M	1	2012	THE WI WCS	4	32	1	3	0	7	3.3	99	1.1
Jayden	Olivia	M	1	2012	Zombie, WCS	4	155	3	6	6	15.3	3.6	87.3	4.8
Shontai	Olivia	F	1	2012	Mona Li WCS	4	172	3	4	2	42.2	3.6	60.3	12
Ebony	Olivia	F	1	2012	Lollipop WCS	4	231	6	19	6.3	11.7	3.4	98.5	2.4
Alakiir	Olivia	F	1	2012	Alien W WCS	4	171	7	9	1.8	18.3	3.4	90.8	5.1

Examples of how each student’s writing sample were collected and categorised can clearly be seen in Table 21. The red triangle showing for student Zach indicates student feedback in the form of a comment.

Table 22 Example of study database showing selected student feedback on software features from Weeks 3 and 7 at Redgum and Springbank Primary Schools.

What would you say was the most important R&W icon you used in your writing?

- Play, pause & dictionary
- The spell checker because it was very good when I spelt words wrong. Helps with your mistakes – Nicole. Learn new words
- The play button because you would not be able to listen to your writing.
- I like to use it very much for improving my writing and story more
- I am not a big fan of R&W but the tool I liked the most was the Spell checker.
- The play back button
- The play and stop button are the main icons I used; reads it for us; everyone uses it too; helps to read your writing;
- Sounds like because R&W always gets the pronunciation wrong
- Dictionary because it tells you what it means when you don’t know the words; because I don’t know a lot of words so it’s really important to me.

Student feedback in Table 22 mentions their usage of the play, stop and spellchecker functions of the Read&Write™ software.

The coded software features from students at Redgum and Springbank primary schools were counted to understand how text-to-speech was being integrated into the writing process by students in those schools (see Figure 7 below).





kane	4	2011	December 4	HPS	11	412	##	7	15	3	26	4	73.0
keith	4	2011	Lost In the	HPS	10	621	##	15	58	4.8	10.5	4.1	8.0
keleigh	4	2011	Lost in the	HPS	11	1110	##	25	42	1.8	25.6	3.8	73.0
marco	4	2011	As Roma Vs	HPS	6	351	##	6	30	15	11.2	4.2	75.0
nicole	4	2011	Lost In the	HPS	8	623	##	15	58	4.8	10.5	4.1	8.0
oreste	4	2011	Lost in the	HPS	8	733	##	9	13	2.6	55.2	3.5	48.0
pax	4	2011	Lost in the	HPS	11	264	##	7	15	2.5	17.3	4.1	79.0
tielah	4	2011	Lost in the	HPS	11	566	##	13	23	2.3	24.1	3.8	72.0
am jessie	4	2011	Lost in the	HPS	9	511	##	4	30	10	16.8	3.6	87.0

**XP SOE 1.1:**  
It helps with picking up where you could insert or take out words to make it allot ore complex. The spell check and read as you speak helps you pick up spelling mistakes.

Week 1   Week 2   Week 3   **Week 4**   Week 5   Week 6   Week 7   Week 8   Week 9   Week 10

The student comments as seen in Table 23 are shown in the break-out text boxes. The comments provide insight into how the use of technology helped a student write the selected story. Other student comments, while not visible in this table can be viewed by clicking on the red triangles within the database.

At the end of the 20-week writing period, the teachers and students completed a final questionnaire. These were coded and stored on an Excel Spreadsheet™ in the study database (see Table 24 for sample of codes used for teacher questionnaire and Table 25 for sample of codes used for student questionnaire).

At the end of the 20-week writing period, the teachers and students completed a final questionnaire. These were coded and stored on an Excel Spreadsheet™ in the study database (see Table 24 for sample of codes used for teacher questionnaire and Table 25 for sample of codes used for student questionnaire).

Table 24 Sample of codes used for teacher questionnaire.

Name	TB:1	TB:2	TB:3	TB:4	TB:5	TB:6	TB:7	TB:8	TB:10
Paul	5	5	5	5	3	5	5	4	3
Hayden	4	5	5	4	3	3	5	3	4
Brandon	5	5	4	4	4	4	4	3	2
Jessica	4	4	5	4	4	3	4	4	4
Nicole	3	2	4	4	3	2	4	3	3
Stephanie	4	5	4	4	2	4	3	2	3
Olivia	4	3	3	3	4	3	3	4	4

Table 25 Sample of codes used for student questionnaire.

Name	L1	L2	L3	L4	L5	ICT 1	ICT 2	ICT 3	ICT 4
Student	3	2	1	3	3	2	2	3	2
Student	4	1	3	3	2	4	4	3	3
Student	4	4	4	4	5	4	5	4	3
Student	4	5	4	4	3	5	4	5	4
Student	2	3	4	3	3	4	4	3	5
Student	3	4	2	4	4	3	4	2	4

Tables 24 and 25 show how each question from individual teacher's and student's questionnaires were coded. The codes also indicated the different categories of each questionnaire.

The study teachers provided feedback and reflections in a final reflective interview at the completion of the research. The final reflections provided an opportunity for the teachers to share their personal reflections and beliefs, and to authenticate the data collected by the researcher. Each teacher was asked to reflect on the following issues prior to sharing their final reflections.

1. Role in the school or teaching year level
2. Experiences with technology in and out of school and within your class
3. Computer access and classroom environment
4. Teaching style and how your pedagogy may have been challenged or changed when teaching with technology
5. What you thought you wanted to achieve from participating in the research
6. Reflections on teaching with technology to improve writing
7. Beliefs about working with technology and integrating technology as an instructional tool for writing
8. Has your knowledge about teaching with technology in the classroom improved?

The final reflections were audio recorded, noted and transcribed for ease of categorising and further analysis (see Table 26). This source data is included in the electronically-stored data at the university.

Table 26 Sample transcripts of audio feedback from each teacher's final reflective interview.

Teacher beliefs about using technology when teaching writing?	Olivia	I do appreciate its relevance. Technology is the way forward and I know it is not going away so I do try really hard to embrace it. There is no love for me in it though ...
	Stephanie	I think it's a no brainer - it has to go that way. I don't think we will ever do away with pen and paper. I think 10 years ago people were trying to go paperless. It's still around but ...
	Paul	My belief is that it should be used as a tool and not as a lesson. It opens up fantastic opportunities to address the learning needs of the students, but not that using the technology ... I think ...
	Nicole	ICT needs to fit in, not accommodate, but enrich it and give students an opportunity to get the most out of their learning. I don't see ICT as a separate thing.
	Brandon	The students are often the experts in using the technology and there are times for instance where I am not good. The kids learn a lot quicker than me.
	Jessica	I have found the best way to learn is to play with it first. It is really important that a student knows that they can show what they can do and then they can run a session.
	Hayden	One of the things that was really important to me was teaching a particular genre. ICT is a part of the literacy block.

As you can see the audio teacher feedback as shown in Table 26 was transcribed and categorised according to each teacher's beliefs about teaching with technology. The feedback reflects on teachers' use of the technology over the research time frame and includes their feedback about how students used the technology.

**Relationship between observations and organisational contexts.** The ethnographic design approach underpinned the methodology for exploring and coding the data. The initial interpretations focused on exploring and capturing emerging themes on the relationship between what was observed when teachers were teaching with technology and the organisational context of the classroom and school environment. To capture this data, an initial field data analysis matrix (see Table 27 below) categorised the data under the subheadings of classroom management, technology, narrative genre and teaching episodes. The matrix provided an inductive process to begin narrowing the data to identify emerging themes. The data collected

in the field was prepared and organised for data analysis (see Table 28 below, for example from Hayden, Week 1, of themes developing from the field data analysis matrix). The matrix helped to record and map descriptive codes for each individual teacher’s pre-writing, during writing and post-writing approaches to teaching with technology; this also included any data relevant to the research questions. The codes set out in Table 27 were then combined to identify emerging themes from all teachers.

Table 27 Initial field data analysis matrix.

	Pre Writing	During Writing	Post Writing
Classroom Organisation			
School environment			
Technology			
Narrative Genre			
Teaching Episodes			
Teacher beliefs			
Management of learning environment			

Table 27, above, identifies the different writing activities that took place during the teaching of pre-writing, during writing and post-writing experiences.

From this initial data, four themes or descriptive labels emerged that encapsulated teachers’ approaches to teaching writing with technology. The themes provided the format for capturing data related to the second perspective of the research design.

Table 28 Example from Hayden Week 1 of themes developing from field data analysis matrix.

(NB: Several teaching and learning challenges emerged from the initial data observations; they are highlighted in pink.)

Hayden Week 1	Pre Writing	During Writing	Post Writing
Classroom Organisation	All pre writing discussions with whole class seated on floor. Teacher using a new Inter active White Board (IWB).	All students seated at stand-alone computers. Teacher did not use IWB but	Teacher returned to front of classroom for all post writing activities.

		monitored individual students as they were writing and attended to questions	
Management of Learning Environment	<p>Organise earphones for each student &amp; named plastic snap lock bags for storing individual earphones</p> <p>Organise computer log on codes</p> <p>Organise access to computer room 3 times each week</p> <p>Student question – “How long do I have to write”</p> <p>Teacher answer – “As long as it should be, as long as it takes to tell the story?”</p>	<p>Encourage students to share their work and problem solve with peers.</p> <p>Encouraged students to write in pairs if having difficulty with writing in English.</p> <p>Seating arrangements where students who had computer skills sat near students with less capable skills</p>	<p>Explicit modelling of saving work to access next lesson. Decided to set up a new whole class folder named Research Stories.</p> <p>Did not complete story writing and saving of work procedures in the lesson time</p>
Technology	<p>Encouraged students to spend time in personalising their screen</p> <p>Discussion of using RW Gold tool bar – especially experimenting with different text-to-speech voices</p> <p>Experiment with speed of play</p>	<p>Attended to any trouble shooting problems as they arose.</p> <p>Collaborated with students when unsure of how to solve a problem</p>	<p>Report list for technician completed for any problems encountered during lesson</p> <p>Developed a student back up system where students stored their earphone in classroom tray</p> <p>Shut down computer procedures</p> <p>Computer room monitors to ensure room was ready for next class</p>
Narrative Genre	Classroom discussions-external stimulus to think	Good story telling – think	Students and teachers discussed it was

	<p>about writing topic (Moon Landing)</p> <p>Weekly Spelling vocab list</p> <p>Narrative structures</p> <p>revision of complex sentences, descriptive use of adjectives, different word forms are focus of writing for the term.</p>	<p>about this when you are writing.</p> <p>Prompting students as they are writing - Does your story meet the narrative genre of orientation, complication and resolution?</p>	<p>more difficult to write a complete story in the time frame as would have happened with pen and paper because both were still learning how to integrate the technology use into the narrative genre structure</p>
Teaching Episodes	<p>Write a paragraph and then use text-to-speech to read it back and listen for making sense.</p>	<p>Style of writing needs to be readable so backtrack and listen to your story</p> <p>Explicit teaching of punctuation for direct speech</p>	<p>Whole class discussion to share either a story written or difficulties experienced in writing or with the technology</p> <p>Teacher discussed with students the difficulties students were having using the tool bar features.</p> <p>Especially the dictionary and spelling icon.</p> <p>Next lesson we will think about this.</p>
School Environment	<p>Students who had lost earphones</p> <p>Having to move from classroom to computer room.</p>	<p>Student not having access to narrative genre resources in the computer room</p> <p>Read&amp;Write Gold features slow to activate while writing</p> <p>Teacher limited knowledge of how teach students to use the tool bar</p>	<p>Having time to complete a writing outcome and learn about the technology and management of technology in the time frame provided.</p>

		features to become story tellers.	
Teacher Beliefs	Technology can assist students to access learning	Improve self-editing	Can use technology to monitor the editing process

The table above shows examples of teacher–student communications, with specific focus on student-initiated challenges to be resolved between the use of technology and the creation of texts.

**Criterion. Capturing the teaching and learning experiences.**

The second objective involved capturing descriptive learning experiences of teachers and students when integrating teaching, writing and technology, with a particular focus on text-to-speech. This included field work observations of the teaching and learning environment and noting any challenges experienced.

The descriptive data was coded as follows to capture emerging themes on the adoption and use of technology:

1. Teacher background information
2. ICT in the school
3. Narrative writing processes
  - a. Establishing the writing environment
  - b. The process of writing
  - c. How technology was used in the writing lessons
4. Teacher pedagogy
5. Teacher challenges

The study database, the students’ and teachers’ questionnaires and the students’ data on technology adoption and use were used to capture the descriptive data. The descriptive data were then collated for each teacher and then finally combined with all teachers (see Table 29).

Table 29 Combined teacher descriptive data to the emerging themes

Combined teacher background information
<ul style="list-style-type: none"> <li>• Personal philosophy about teaching and use it to establish a professional and strategic technological approach to teaching across a school (explicit teaching)</li> <li>• Experienced teacher, used ICT, attended training</li> <li>• Experienced teacher, minimal ICT knowledge and use, no training</li> <li>• Teacher peer support</li> <li>• Principal — leadership role in promoting ICT</li> </ul>

- ICT workshops for parents — cyber bullying and showcasing student work

#### Combined ICT in the school

- ICT educational leader, ICT policy and procedures, ICT leadership team with purpose for technical & educational outcomes & PD & equipment, resources, future planning
- R&R and who responsible for direction of technical needs and educational needs of system and learning
- Part-time technician to maintain computers, maintain computer system and network, install software, provide teacher access to intranet, trouble shooting processes, printer problems and student technological communication links within the school system
- Day-to-day management of central IT system and Helpdesk
- Induction processes to technology in the school
- Computer suite with stand-alone class set computers
- Individual laptops, iPads
- Computer trolleys
- Laptop computer covers
- Classroom computers x 4
- Windows and Mac computers
- Software – Kidspiration™, Inspiration™, Read & Write Gold™, Comic Life™, Clicker™, Art Rage™, Adobe™, Microsoft™ programs
- Online computer game access for students
- IWB in classrooms and computer suite, digital cameras
- No roster to use computer suite — access on needs basis
- Earphones
- Junior technicians
- Processes to establish student access, instructional time and time for personal use of computers across the school

#### Combined narrative writing processes

- (a) Establishing the writing environment
- A focus on writing transcription
- Authentic writing tasks
- Planning activities using whole-class brainstorming and collaborative sharing
- Kidspiration™ and Inspiration™ used for brainstorming ideas
- Writing with pen and paper
- Computers used for typing up finished stories
- Published work read by students to whole class
- Establish subject learning design team to adopt and use instructional procedures with technology
- Learning to use software — compare to learning to use a mobile phone, introduce individual features, play with software
- Focus on listening skills
- Presentation and organisation of text on a page on the screen; choosing fonts and sizes
- Individual introduction of software features — homophone checker to identify same-sounding words
- How to save and retrieve work, upload to a website
- Text-to-Speech



- Play around with text-to-speech voices and play-back
- Think about person who would be reading the stories and think of voice that would provide ease of listening and appropriate play-back voice
- Voice speeds — ranges of 47–64%
- Write in paragraphs or a page and listen to all when writing
- Listening skills to monitor effectiveness of TTS
- Roles & responsibilities of teachers, students and others
- How are you using ICT so students can show what they can do?
- Teacher as a promoter of technological use, students as discoverers of learning, teacher as facilitator of sharing new knowledge
- Provide equipment (earphones) and routines for students to access equipment  
Provide strategies if equipment not working
- Strategies to save and retrieve data, information and written texts
- Processes that enable students to establish the writing environment without teacher support
- Promote that it is the technological user that needs to make decisions for how technology can be used and that the user must be proactive to get the technology to work for you
- Technical discourse
- Skim and scanning text — when using highlighted text (RGPS)
- Play button or play pattern
- Technical learning environment provided by school
- In classroom and computer suite
- Classroom — introduction and completion
- Computer Suite — text construction
- Students working on desks, on floor for collaborative discussion using IWB
- Classroom rules
- Typing skills
- Practise copying sentences or short passages
- (b) The process of writing
- Transcription focus
- Text-to-speech technology
- Collaboration
- Strategies – instructional
- Supporting learners
- What was the teacher focus or approach to transcription and transcription technology? - Global, focused on, differentiated?
- How was text-to-speech used in the writing process?
- Did the students find using text-to-speech relevant?
- What was the teacher's role through the transition process? Did they remind and support students to use technology, scaffold, encourage peer collaboration, listen to stories?
- Was the teacher's technological teaching approach and use of technological tools appropriate for achieving writing success?
- How did the teacher encourage and enable student to use technological features to fulfil narrative writing standards?
- Collaborative classroom learning
- Was there collaborative classroom learning? How was classroom discussion about integrated technology promoted?

- How did teachers promote the use of technology (text-to-speech) to enable student to explore and develop their opinions on the development of their narratives? Was there student talk over teacher talk?
- To think more deeply about the type of language students were using in their texts and the strengths of their opinions for defending their language choices (IWB and group workshops)
- Think about spelling and grammatical skills
- Student writing performance — meaning and mechanics
- Individual student comments — English as an Additional Language
- Instructional procedures
- What instructional procedures were taught? e.g. What do students know about narrative writing and how would you use technology to write a story?
- Instructional strategy approach: How much time spent on explicit writing instruction during lesson?
- Explicit writing strategies
- Study of model
- Rubrics
- Vocab
- Structure and organisation
- Grammar or usage
- Spelling
- (c) How technology was used in the writing lessons
- How did the teacher use technology to reflect on student writing? Stephanie used a collaborative inquiry process of whole-class reflection
- Read the whole document using TTS
- Is there anything that you need to know about the story before we start editing?
- Analytical approach to evaluating
- Make relevant changes based on author's ownership
- Provides feedback based on narrative meaning and detail
- Used an organised approach to collaboration
- What was the teaching pattern observed for working with computers — students begin writing without computers, copying, in computer lab, at home or classroom?
- Affective or motivational aspect — including adding of emoticons and access to Internet.
- Students
- Editing tool to change mistakes, learn how to spell new words
- As a teacher and student editing session — text-to-speech read/student edits.
- Improved English skills and helpful with grammar and spelling
- Listening and not looking at screen when I type
- Listening to individual words and typing
- Highlighted texts set to pace that facilitates cognitive reasoning
- Students more engaged in writing process when using technology, became more independent in their writing
- To develop technological skills.
- Teacher
- Global Approach — combine tech+ writing + teaching. Explain purpose of each technological & teaching strategy. Create a supportive learning environment in both tech and non-tech learning environments. When students using ICT, facilitate a discovery approach to learning. Provide ICT PD to

ensure that teacher can use ICT with their pedagogy and content knowledge. PD must focus on how ICT can enable content and pedagogical knowledge to achieve writing success. Students rise to challenge and enjoy using ICT in partnership with teacher to problem solving how ICT could achieve writing success

- Standards approach with ICT skills — strong narrative focus to create engaging writing experiences, implement instructional strategies, technology as an editing tool, critical questioning to engage with technology & peer mentoring support to understand basics, flexibility to think differently. Build ICT skills.

#### Combined teacher pedagogy

- How did teachers support student adoption and use of technology?
- Teaching approaches:
- Teaching practice using an open-ended discovery approach to understand software features at the start the research to needing more time to play with software and become familiar with it. Looked for more explicit approach and wondered for what purpose students were using the technology (assistive, editing, or creating meaning?)
- Routine ‘draft’ approach when using pen and paper to facilitator for editing purposes when first started writing with computers — listen to whole story and experiment with voices/speeds/ listen to peers stories. Used a blend of traditional and new ICT strategies. ICT for typing, editing, listening for quality and quantity. Non-ICT for assessing progress and assessment purposes and peer editing.
- Assumed technology would fix problems — moved to realisation that I as a teacher need to be proactive to get technology to work for the [intended] purpose.

#### What approaches to teaching did teachers adopt and use?

- Be prepared to think differently
- Develop an approach to writing with technology, strategies to generalise ICT skills, lesson plan and generate a classroom learning environment that values the use of technology as a tool to facilitate meaningful text production
- Ensure learning is fun and engaging
- Establish processes to draw on technological, content or pedagogical knowledge (Learning Design Team) for the purpose of guiding student performance to use technology effectively to write
- Provide question prompts
- Model and scaffold learning
- Provide leadership in revision strategies
- Awareness of students changing how they review text from without using technology to when using technology (whole story to sentence-by-sentence or word-by-word)
- Strategies to embed learning into established daily routines
- Encourage peer discussions
- Be prepared to ask students for guidance
- Continually promote the user of technology as being responsible for how the technology works or is appropriate for the act of learning and learning improvement.

#### How teachers encouraged and enabled students to use technological features to achieve writing standard

- Asked students to compare technological features against more traditional features – spell-checker, dictionary (RGPS)

- Compared the interplay between the technological features and the traditional MS Word features and how students used them
- Ask students to think about whether the software features could take them to another level and which features could improve their writing
- Writing for readers — an audience wants to be interested in what you are writing
- Exemplar exercises on IWB — break down and build back up again.

#### Instructional strategies teachers used

- Developing a narrative structure
- Genre structure
- Story-grammar
- Style of writing needs to be readable
- Sentence formation
- How to form complex sentences using descriptive adjectives, similes, punctuation, conversations and different word forms
- Write and listen to sentences
- Be story tellers and think – ‘What is in your reader’s head?’
- Focus on developing meaning in text

*What story ideas do you have?*

What is going to happen in your story?

What icons will you try and use and why?

Hayden’s questions varied weekly in relation to the use of software and included:  
How has the software improved your work?

- What icons have you used?
- Are you finding more mistakes than you would normally?
- Is the software improving your sentence structure?
- Would you prefer to write without or with the software?
- Paragraphs – Linking for meaning
- Listening skills
- Added words of listened to words that aren’t there
- Develop homophone knowledge
- Listen to whole story when finished before making changes. Start by working in paragraphs or blocks of sentences.
- Revising
- Reflect on writing from a software and non-software point of view. Compare writing before and during ICT. “Which piece of writing do you like best?”
- Pair and Share (using TTS) and Listen to finished writing with a peer
- Assessment
- Are there features that would improve your writing?
- Think about the features you are using and how can you use them to take you to a different level with your writing?
- Be familiar with the NAPLAN Marking Guide so envisage how software could improve student’s writing performance

#### Collaborative approaches

- Chat with a friend to share story ideas.

#### Combined teacher challenges

- Technology: Software — Installing software & imaging across all school computers, interplay between using MS word features with software features;

setting TTS highlight combination at a speed that facilitates cognitive reasoning; no access to software at home to play around.

- Content: Narrative
- Pedagogy: Managing technology in writing process, establishing a writing environment that used technology for purpose of achievement
- School leadership
- Classroom structures — Time management — allow time to write as well as learning to manage and set up to use technology
- Technician — access to technician for problem solving, purchase of software, needs-based decision-making processes.

#### Combined teacher beliefs

##### Before

- Can be a valuable tool for learning, but requires time to become familiar
- Can encourage learners to change their learning behaviours and become independent
- Requires guided support to understand software features and capabilities
- Requires guided support
- Features can engage students in transcription, enables learned strategies
- Learning experiences can be designed but focus on content must be the reason for using the technological approach
- ICT as a tool across the curriculum; opens up opportunities to address learning needs of students.

##### After

- Did not change traditional teaching approach but became more explicit in teaching specific aspects of the writing process (how to pronounce words) and in working in partnership with students to problem solve technological approaches
- Need technician support to overcome and sustain installation of software, including updates and access to Internet across a network
- Valuable for English as an Additional Language students to have texts highlighted and read-back.

Future directions if teaching with technology continues:

##### Teacher

- Be prepared to continually think differently or innovatively about teaching approaches to writing by being proactive in getting the technology to work for you
- Need professional development in how ICT facilitates use of content and pedagogical outcomes
- Draw on ICT strengths of students for problem solving with ICT.

##### Technician

- + need to know what is new and might be useful, keep developing our infrastructure, have 'fail-safes' in place; prepare for the latest tech gadget and know how to maintain the server and backing everything up.

##### ICT Leader

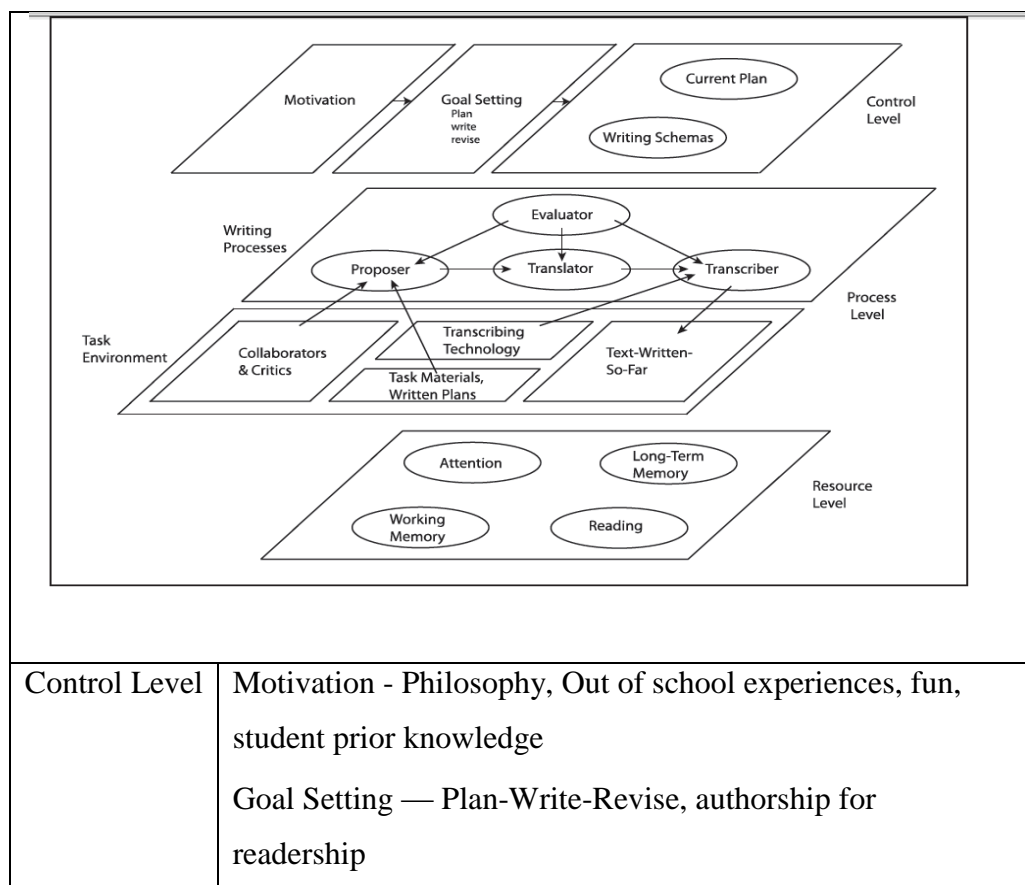
- Would like every child to be able to personalise the icons they like to use instead of having to set them each time with the technician having to pull apart the software; personalised learning comment by technician.
- Provide induction and supports for new teachers
- Provide a focused use of ICT.

The data reveals how all teachers' combined experiences in teaching with technology to the emerging themes. Data shows the instructional procedures teachers used, their pedagogical approaches, students use of technology, teachers' beliefs and the challenges they experienced.

To capture the teaching and learning experiences as related to the writing process model (Hayes, 2012b), a Field Data Writing Process Matrix was designed to collate writing process data at the control, process and resource level of the writing process (see Figure 8 below).

The Hayes (2012b) writing process model is used in this study to describe and develop a richer description of the narrative writing process when writing with technology. As individual teacher descriptions developed through the control, process and resource elements, the collated data provided a means to focus on the different contexts of each of the elements, the beliefs and challenges that impacted on how teachers approached teaching with technology, the identification of examples to highlight particular reasons for developing instructional approaches and the capturing of teacher and student comments.

Figure 8 Field data writing process matrix.



	Current Plan Writing Schemas Narrative
Process Level	Writing processes text-to-speech revision model based on knowledge-telling while writing and in Writer's Workshop Task Environment Collaborators & peers Transcription – Typing Task materials for expert and novice writers Text written so far – sequence levels for individual writers
Resources Level	Working memory, technological tools + Feedback thinking levels (explore, corrective feedback, process feedback, conceptual feedback) Long-term memory; traditional and digital Attention; Routines: screen, font, size, speed, speech Reading and listening and viewing
TPACK	Typing Comprehension Revision Text-to-speech skill mastery

The three writing process levels within the model above clearly show how the focus of the teachers' different writing activities begin to be represented in the writing process.

While the model captured the complexity of the writing process and continued to build on the development of the initial themes, the student writing samples, comments and survey checklists captured the outcomes of students integrating technology into the writing process (see Table 30 Examples of observations of relationship between student, teacher and technology when writing with text-to-speech technology and Table 31 for student positive and negative comments about writing with technology).

Table 30 Examples of researcher observations of relationship between student, teacher and technology when writing with text-to-speech technology.

Student	Samples of observations of how students began to adopt technology.	Feedback from students on when writing with text-to-speech technology.	Observations of pedagogy to scaffold student learning.
Hayden	Used a log in card to help log in with his name and password. Copies letter by letter with success but if copying two or more letters at once he needed to back space and correct. Can save his writing in the correct school folder. Worked in Arial, black font and size 16.	Listening to my writing something was wrong. I found I needed to use a full stop, think about word spacing and spelling. I spelt boat as boot. I did spell boat correct the first time so I was able to copy it. I don't like continuous reading. I like to use the go and stop icons.	Teacher was observed spending 30 minutes scaffolding how to write with text-to-speech technology. Focus on listening to correct mechanics of writing. Explicit instruction on how to set the text-to-speech tool bar to read each sentence.
Alakiir	Can open and save documents. Can type in name and passwords without cards. Gets frustrated when computers don't work.	When I write a paragraph I highlight my work and it reads my story. I liked listening to my stories. I know how to customise my tool bar. When it reads my sentence, when it doesn't sound right I stop it and reverse back and correct mistakes. It helps me with my spelling because it says the wrong word. If I write a sentence and doesn't stop it just keeps going to the next one. I then go back and re-read to put the full stop in.	During Writer's Workshop with extract from Alakiir's story of "I never did like carrots." The student played the extract to the class on the IWB. The teacher asked Alakiir for her comments. Alakiir responded – I listened to the story and it made sense, but there were 2 or 3 spelling mistakes. Teacher prompted Alakiir to develop her punctuation skills, capital letters and use of proper nouns. This was then followed by the explicit teaching of how to use paragraphs to separate ideas.

The table above represents some of the organisational, listening, scaffolded instruction, reflective writing, whole class reflective activities and challenges that students' experienced when writing with text-to-speech technology.

Table 31 Examples of students' positive and negative comments about writing with technology.



Student comments	Positives about writing with technology	Negatives about writing with technology
Jenny and Julia	The positive about Read& Write are it reads our stories itself so we can recognise mistakes without us reading it. It has a lot of icons that we need for writing so it is really useful for us. It also tell us some meanings of some words that we don't know.	The negatives about Read& Write are it takes too long to correct the words so it is really uncomfortable and annoying for us as a writer. When we highlight the words to make it read, it reads well but it's still highlighted when it finished reading the narratives. There are a lot of icons that are useful but there are also a lot of icons that are not useful and it is also confusing for use. For primary children like us, I think it is a bit difficult to use. It will be good if the icons were easier for us to use.
Gaurav and Keith	We like to use the dictionary and the spell checker. People do not know every single word in the dictionary so we use the dictionary to help write a narrative with the correct words. Not everyone is a good speller. We the spell check to correct our spelling. If we combine these two tools together they are of excellent use.	Read& write takes forever to load up. When we highlight some words to play after it being played it sometimes highlight it permanently. Whenever we try to type a scream it never says it properly, examples "AAAAAAAH."

Student feedback in Table 31 highlight some of the technical advantages and disadvantages students experienced when writing with the Read&Write Gold™ software.

Observations of teacher feedback on how students approached integrating text-to-speech technology (see Table 32 below) and extracts of teacher feedback from Wattle Creek School on how to write with text-to-speech technology (see Table 33 below), added to the ideas that were being developed from the interactions between the teachers and students.

Table 32 Samples of teacher feedback on how students were writing with text-to-speech technology.

Student	Teacher feedback on approach to integrating text-to-speech technology
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Jessica	Jessica likes writing on a computer rather than handwriting. Typing is easier. Jessica is starting to realise she can write for interest when writing with text-to-speech, then check her spelling, listen for length of sentence and vocab used and then look for full stops and capitals.
Tony	Since Tony has personalised text-to-speech he has improved in the length of his stories. There has been no effect on spelling. His vocab is improving and story ideation. He is beginning to integrate other icons such as the spell checker. He is also using the pronunciation icon to help with his spelling.
Tanisha	Is not revising at all while writing – just story-telling. I am encouraging her to check to see if her stories are developing in structure, cohesion and ideation. She is improving in the length of her stories and use of vocab. She is thinking in the present, not about revising or thinking ahead.
Jessica O	Only uses text-to-speech for editing. She goes back to the start of the story and only edits forward for where she thinks she needs editing. She wants to have text-to-speech on her home lap top. Her stories are developing but lacking in detail.

Teacher feedback in Table 32 shows an emphasis on composition and editing skills.

Table 33 Examples of teacher feedback from Wattle Creek School on how to write with text-to-speech technology.

Teacher	Feedback on customising and writing with text-to-speech technology
Nicole Introduction of text-to-speech technology	We talked to the kids ...you can't possibly use all the information to start with. What we have to do is break it down, put it into small pieces. You are going to do that really well first and then we can actually expand your learning and you can actually use different icons.
Paul Customising the tool bar.	We taught the students there were 2 ways you could customise the tool bar (to only use text-to-speech technology). First by double clicking the ones you don't want or single clicking and sending an icon to the other side. We spent a couple of lessons, just going through and teaching explicitly each of the text-to-speech icons, what they do and how possibly they could help with reading and writing.
Paul Setting the voices and speed.	There were lots of choices for voices and speed. We gave (students) choice but it was limited. We gave the students 2 options, Tim and Tina. We thought 35% was a good speed for them to be able to listen to their writing and 75% was a good pitch. The voices aren't exciting but the kids had some fun listening to those and choosing which one they wanted to use.
Stephanie Setting play back by speak each sentence.	We put (the speed) at 40 to start with and we got the text to play and the kids said "I can't concentrate on what is being said and actually take it in at that speed, so we had to adjust the speed again. We then realised you needed to change the speech settings.

	<p>You know your kids but ours is setting speak each sentence, otherwise they come up as letter or word and you would need to keep pushing play all the time. We set (text-to-speech) to read each sentence and continuous read as well. That will give students a couple of sentences to listen to if they are at that stage.</p> <p>The other thing we decided because most of the kids would waste 20 minutes deciding what colour and font they would use instead of writing. All our writing is set to Arial 16 and then we also realised we needed to put line spacing in there as well because the kids would have all this text that they are focusing on.</p>
Nicole Learning to type.	We needed to teach them also how to type so they weren't worried about where 'l' was and 'm' was so they could draft, look at the screen and write their stories.
Nicole Writing with technology.	There is actually a lot of scaffolding and explicit teaching that goes on before we have actually got to writing anything. The kids picked all the scaffolding and explicit teaching really easy. Some of the issues were more our (teacher) ' <i>hangups</i> ' [problems] rather than the kids.
Olivia Saving narrative stories.	<p>When we began we initially began storing the kids work in their own folders, but realised we should be keeping them on the school network. We scaffolded the students in how to save their work.</p> <p>We also had to teach (the students) to re-save where they were making changes to their story or they would lose all their previous story. If they do that every time they are editing, you have a really great record of where they started and then the changes they made along the way.</p>

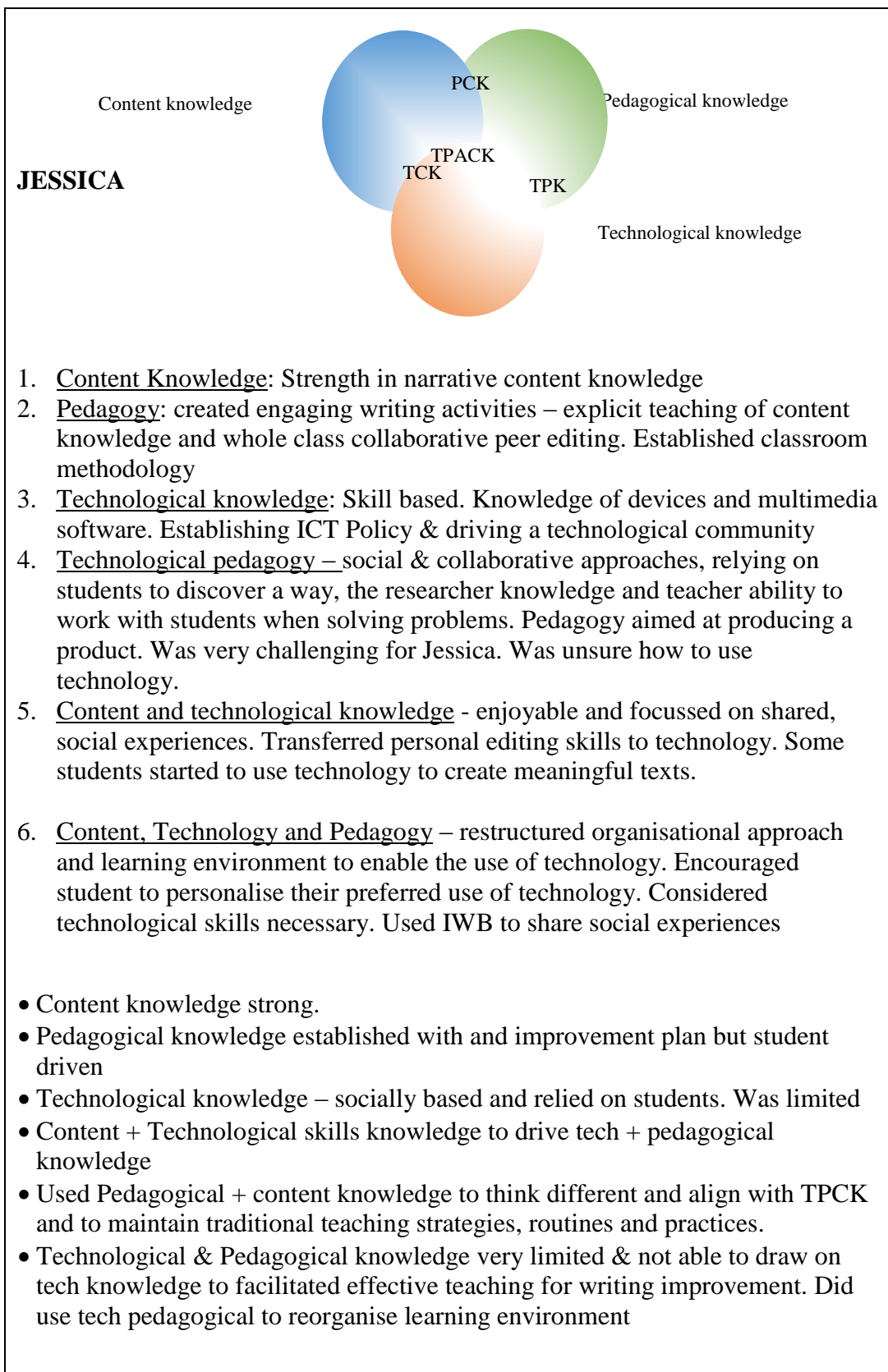
As Table 33 shows, teacher feedback on how to write with text-to-speech technology emphasises explicit teaching approaches for how students can personalise the technology.

### **Understanding teacher pedagogies, beliefs and management of the learning environment.**

Particular analysis at this stage focused on developing richer descriptions for each teacher. Figure 9 and Figure 10 below illustrate one example of understanding teacher pedagogy through the lens of TPACK, the research questions and the SAMR Model.

Figure 9 One example of the process of understanding teacher pedagogy through the lens of TPACK

NB Yellow shaded denotes how Jessica designed instruction with text-to-speech technology.



The influences of her students' use of technology brought her towards a TPACK understanding and for how she could make a difference to improve student writing. Realised that social collaboration required effective use of TPACK skills but needed something else when not using as a social tool. Needed confidence and direction to use differently, a restructured learning environment & personalised technological approaches for different students.

Background information

- Availability of access to computers not consistent - computer suite + classroom
- How often uses ICT in teaching –typing finished writing and social media and multi-media
- What hoped to gain from the research - improve student writing & new technological skills
- Had access to multiple technological devices at home
- School ICT Committee and ICT Leader and conference presenter
- Had access to regular multi-media PD

TPACK Themes and Examples

Content Knowledge

Key narrative writing concepts, facts and procedures

- Story-grammar
- Writers Toolbox

Pedagogical Knowledge

- principles and strategies of classroom management organisation
- lesson planning & implementation teaching methods
- assessment
- working collaboratively with peer teacher and student
- sharing personal experiences
- support students with technological problem solving
- Establish an environment that caters for technological use but retains focus on writing (Domain)
- Whole class discuss and plan
- Read before self-editing processes

Technological Knowledge

- what is the working knowledge and skills needed to use technologies
- Teacher encouraging students to explore technology use and advantage
- installing software on school intranet in collaboration with technician with educational knowledge
- How to set up folders, retrieve and save work
- Earphones & Webcams

- Computers available any time in classroom. 2 lessons a week in computer suites.

Pedagogical Content Knowledge

- how to teach writing to make it understandable
- Student focus
- Pre research write with pen and paper & using IWB to explore icons & practice listening skills
- Write in a creative way and for a purpose by listening
- Collaboration between students encouraged for editing according to strategies in writers tool box & listening
- Plan each lesson and have established routines and explicit teaching based on reflection of student learning experiences

Technological Pedagogy Knowledge

- Writing process stage
- how to use technology with pedagogical strategies
- Pedagogical strategies might use word processing for writing but not just aligned to narrative. Can be used in any domain

Focus on how the teacher drew on her technological experience to guide students.

- Worked with students to problem solve
- How to save work on intranet and upload writing
- Use TTS as a listening tool, editing tool and for some meaning
- Introduced software by explicit features through play and editing
- Promoted technology use
- Established processes to open and save student work and setting up learning environment
- Play with different voices and speed in and out of class
- Difficulty working between technology and traditional pedagogical approach as relied on student leadership

Technological Content Knowledge

- knowledge of technology uses that are specific for creating meaning through texts
- Used IWB to explain narrative content using TTS as the mediator
- Collaborative peer sharing using peer work
- Focus on listening to stories
- Play with TTS voices and play back
- Think about the reader & voices

Technological Pedagogical Content Knowledge

- Weekly Planning of lesson that focussed on content, listening to story and explicit teaching focus
- Write and listen and share – develop a collaborative classroom culture.
- Established collaborative writing practices that embedded technology.

- Writer Workshop on IWB at end of lesson
  - Teacher demonstrate to whole class and played around technological functions. Had fun with them
  - Student developed strategies for editing based on listening with TTS and scaffolded their approach to using technology
  - Typing & Thinking about creating stories at the same time – difficult for some students
  - Establish student self-editing processes
- Provide students with personal, peer and whole class writing time

#### Text-to-speech technology

- Listening for individual words making sense
- Choose to use spell checker with TTS
- Write a paragraph/listen/check spelling
- Too fast with English difficulties
- Like hearing others read my stories to me. Picks up mistakes
- Hard to know what to do but now know
- More tools still to learn
- Used as primary tool by most students

#### Beliefs, motivation and confidence

- Technology is a valuable tool for learning
- Confidence decreased about using new software when problems with installation and remained throughout the writing process. Not sure what to do.
- Motivated to learn by playing with software & experimenting
- Believed she could usually help students to solve computer problems
- Technology use can encourage students to change their learning approach to writing but realised students needed guided support for how to use the software.
- Important for her to use her traditional writing strategies.
- Believed the quality of student writing was enhanced using technology.

#### Evidence of pedagogical success with technology

- Have access to quality and effective PD and technician with educational knowledge
- Understand software capabilities and how to use technological features with effective teaching practice
- Understand that it is not technology that drive effective learning but the role of the teacher using effective teaching practices
- Understands the difference between technology for learning, the skill of technology and impact of typing capabilities on student writing performance
- Use feedback and reflections on student writing to provide instructional leadership
- Collaborate with students to gain a deeper meaning of their thinking and also understanding of how technology can be used.
- Introduce technology and writing outcome simultaneously
- Provide thinking time and practice opportunities for students to explore and share
- Create opportunities for students to imagine
- Develop technological strategies that will support subject domain knowledge

- Facilitate, prompt, support student learning & then scaffold new knowledge

The above figure clearly describes a teacher's instructional approaches to teaching with technology through each of the TPACK themes. Time allocation emerged as a significant factor in successfully capturing Jessica's instructional knowledge.

Figure 10 Understanding teacher pedagogy through the research questions and the SAMR Model.

NB. Yellow shading represents the SAMR Model where the technology integration acted to enhance teacher writing practice through substitution and augmentation. The blue shading represents the SAMR Model where the technology integration acted to transform teacher writing practice through SAMR levels of modification and redefinition. The green shading represents the integration of text-to-speech technology.

JESSICA

What procedures did teachers and students adopt in introducing new text-to-speech technology into their writing lessons?

- Revision Model in which to differentiate instruction according the developmental need of students based on what novice and expert writers do to achieve good writing. (Flexible for English as an Additional Language student, Fixed for some students.)
- Used to enhance instruction by using exploratory approaches and to transform learning by using as a cognitive and motivational tool when designing instruction for different writing activities when writing ( 1-10)
- Used as a comprehension tool to enable students to construct meaning by
  - Blending traditional writing methodologies and strategies, listening, viewing skills and comprehension knowledge
  - Designing different instructional approaches to facilitate learning – approaches that
    - Focus on specific problems that students experience when writing (goal free)
    - Focus on developing meaning in text – Elaborate for writers' workshop
    - Scaffolded student learning to focus on learning to write over knowledge of technology
    - Provided opportunities for students to share, explain and collaborate as authors with peers
  - Social construction tool that can be used by individual, small groups of whole class at different levels and work with multiple elements
  - Cognitive tool to set goals, problem solve using worked examples, collaborative practices

What procedures did teachers and students use in writing lessons using new text-to-speech technology?

- Technology as a tool for learning, including motivational tool to engage in learning-strategies to engage in learning process



- Procedures for blended learning & encourage learners to self-regulate their learning behaviours
- Design writing strategies and combined with skills necessary to become good writers – required scaffolding of technology (minimal) and capabilities and technology skills ( transcription) and organisational structures that support technology use
- Effective writing instruction by being able to design learning experience and enable a variety of effective strategies for all students

What was the level of technology integration adopted by the teachers and students when teaching with technology? (TPACK, SAMR understanding)

- **TPCK**: to know what is an approach to teaching students to write narratives using technology within a technological learning environment
- 2. **T**: Focus on understanding the specific aspects of technology tools that facilitate students learning to write and writing improvement
- 3. **P**: Knowledge to know what pedagogy approaches are the best to achieve narrative writing improvement
- 4. **C**: Facilitated teachers to focus on the narrative subject knowledge and what they needed to teach
- 5. **PCK**: To focus on what pedagogy they were using to teach narrative writing for different writing activities
- 6. **TPK**: Focus on how technology could be used in teacher pedagogy
- 7. **TCK**: Focus on how technology could be used to understand how narrative texts could work better of improve
- How teachers adopted technology and what types of technologies they used at each level that influenced student opportunities to achieve - SAMR
- Whether the use of technology **enhanced** or **transformed** teacher practice and student learning opportunities?
  - **S**- To know what tools & knowledge were required (**folder, save, retrieve**)
  - **A** - To use the tools and explore the possibilities
  - **M** - To draw students into the process of writing through the different writing activities (**using plan-write-revise**)
  - **R** – to develop instruction, **motivation**, social practices & organisational structures for students to become creative and effective writers who shared their ideas, knowledge, used thinking skills, participated in writers workshop, used writing skills, & contribute and interacted with each other’s writing as authors, valued authors voice & engaged with multiple interactions to **practice writing, editing, reflecting upon**, reworking and refining text to write better stories.

A combination of both models provides insight into **what tools a teacher used, what knowledge was required for how** to use that tool and how the tool interacted with different teaching approaches for students to write good narratives and improve their performance at the same time. for students to write good narratives and improve their performance at the same time.

What factors influenced teachers’ and students’ use of the new text-to-speech technology in writing lessons?

- Establishing an classroom writing environment that enable teachers to retain their strong literacy focus (TCK)
- Pedagogy and Instruction - manage technology in writing activities (TPK) (but not editing)
- Developing Writing TPCK for students at developmental levels – understand software, Use TTS as an instructional revising tool in every writing activity (Flexible and SAM level)
- Being able to adapt to recreate the learning environment – strong leadership, technical support and PD

The descriptive data in Figure 10 highlights how teacher levels of technology integration do not result from teacher knowledge alone. A range of factors and teacher beliefs also reflect whether technology integration acted to enhance or redefine teacher practice.

To gain deeper insight into teacher pedagogies when teaching with technology, a Writing activity framework captured the different writing activities within the writing process (see Table 34).

Table 34 Writing Framework used for identifying teacher writing activities in the classroom

Writing Framework	Teacher	Teacher
Transcription technology		
Motivation		
Writer's environment		
Sequence of the writing process		
Writing Activity – Introduction		
Writing Activity – Text organisation on a page		
Writing Activity – While writing textual features focussed on		
Writing Activity – Instructional strategies : novice/expert		
Writing Activity – Facilitate student learning		
Collaboration		
Process to guide revision of texts		
Instructional procedures		
Beliefs, motivation and confidence		
Challenges		
Resources		

As can be seen from the table above, writing activities include the development of organisational, motivational, composition and reflective writing skills, as well as instructional activities and activities associated with resourcing and emerging challenges.

Next, teacher pedagogy was coded through each teacher's integration experiences with technology by categorising their pedagogy according to ten characteristics of effective teaching and effective classrooms as identified from within the literature review (Applebee & Langer, 2011; Dunn & Finley, 2010; Graham & Perin, 2007;

Hattie, 2009; Hattie & Yates, 2014; Kolikant et al., 2006; Mason et al., 2011; Mohan, Lundeberg, & Reffitt, 2008a; Pressley et al., 2007; Rogers & Graham, 2008). See Table 35 for a framework I used to identify the characteristics of teaching with technology.

Table 35 A 10 point writing framework for teaching with technology.

Teaching with technology framework	
1	Variety of instructional procedures that use a range of skills and strategies throughout the writing process by addressing each writing activity as associated with effective practices.
2	Skills must be taught and practised for automaticity and strategies scaffolded, monitored and practised until an effective level of competency achieved.
3	Understanding the difference between novice and expert writers and how to transform a good novice writer into becoming a good expert writer.
4	Novice and expert writers receive the same instruction but differentiated by practice time and amount of scaffolding required to achieve student learning goals.
5	Positive classroom and school environment for writing, active listening, opportunities to play with software and use out of school knowledge.
6	Teachers spend time establishing instructional procedures that focus on achieving a writing outcome within the writing process.
7	Students encouraged to reflect on their writing in all writing activities and especially text comprehension.
8	Strong leadership and technical support at school and classroom level.
9	Opportunities for professional development over extended timeframe and to collaborate with peers.
10	Pedagogical practices – know when to use exploratory and explicit teaching in the context of the writing lesson and how this will influence student learning.

The table above shows how the characteristics of effective teaching and classrooms focused on the importance of time, a variety of instructional procedures, skill development experiences, strong leadership and professional learning opportunities to encourage collaboration amongst practitioners.

A sample of the collated data of literacy-based teaching practices collected in Jessica's writing classroom is shown in Table 36, below.

Table 36 An example from Jessica's case of pedagogy using the ten characteristics

NB The yellow shading represents Jessica's pedagogy within the 10 point writing framework. The green shading represents a deeper analysis of Jessica's pedagogy in reference to her collaboration with peers.

A 10 point framework for teaching with technology - Jessica

1. Variety of instructional activities throughout the writing process by addressing each writing activity as associated with effective practices
2. Use a range of skills and strategies. Skills must be taught and practised to automaticity and strategies scaffolded, monitored and practised until competency achieved
3. Understanding the difference between novice and expert writers and how to transform a good novice writer into becoming a good expert writer.
4. Novice and expert writers receive same instruction but differentiated by focusing attention and amount
5. Positive classroom and school environment for writing, active listening, opportunities to play with software and use out of school knowledge
6. Teachers spend time establishing instruction that focusses on achieving a writing outcome within the writing process
7. Students encouraged to reflect on their writing in all writing activities and especially text comprehension
8. Strong leadership and technical support at school and classroom level
9. Opportunities for professional development over extended timeframe and to collaborate with peers (but not motivation as software too complicated)
10. Pedagogical practices – know when to use exploratory and explicit teaching in the context of the writing lesson

The table above expresses effective practices of teaching and classroom management through the pedagogical approaches of one teacher.

### **Pattern matching and triangulation.**

The fourth ethnographic design approach, represented in Table 17, includes a triangulation process to study the study's data through pattern matching to bring together the teachers' responses and answer the research questions. Using the process of triangulation I cross-checked multiple data sources to see if there were consistent views emerging. While investigating the relationship between data sets provided a good picture of emerging outcomes and provided insights into differences among data, the findings from the triangulation process may not point conclusively to characteristics of high-quality teaching. Chapters 4 to 10 include examples of triangulation related to each teacher's integration of technology. The conclusion

about each teacher’s performance is supported by data from two different sources. Triangulation in this study was not done just to ‘obtain confirmation of findings’ (Yeasmin & Rahman, 2012, p. 154), but rather, as outlined in the teacher case studies, to deepen our understanding, through the convergence of data, about how a teacher integrates technology. The findings can show through cross-checking whether data sources ‘agree with or at least, do not contradict’ (p. 155). In this study the triangulation process was used to increase the validity of the findings through the convergence of different perspectives.

To gain a deeper understanding of the instructional strategies adopted and used by teachers, there were three processes that involved pattern matching of data for bringing together the findings on teachers’ adoption and use of instructional strategies when teaching with technology. The processes involved developing frameworks with which to link teachers’ descriptive data to the research questions; data included instructional procedures, and components of the TPACK (M. Koehler, 2014) Framework and SAMR (Puentedura, 2008) Model which, when applied, reflected how teachers redefined their pedagogy when integrating text-to-speech technology into every student writing activity.

**Developing frameworks to analyse descriptive data.** This first process involved coding all teachers’ individual descriptive data to the research questions to collate the emerging themes. This addressed the second research objective of capturing the teaching and learning experiences of teachers. The third process involved coding individual teacher’s instructional procedures using the TPACK (M. Koehler, 2014) Framework and SAMR (Puentedura, 2008) Model. Each teacher’s captured experiences were described collectively by means of the framework before interpretation of the research findings took place. This ensured that data not applicable to the study’s proposal or questions could be excluded (see Table 37).

Table 37 Summary of the teacher’s captured teaching and learning experiences for integrating writing, technology and pedagogy.

Teacher	Emerging themes for combining writing, technology and learning
	What procedures did teachers use in writing lessons to adopt new text-to-speech technology?
Jessica	Focused on the potential of text-to-speech technology to achieve writing goals. Developed student’s thinking skills.

Brandon	Focused on concepts, knowledge and skills important for learning to write.
Hayden	Focused on potential of text-to-speech technology to achieve writing goals. Focused student's thinking on being an author through developing knowledge of the reader/writer relationship. Developed collaborative and individual cognitive instructional strategies
Paul Olivia Stephanie	Focused on potential of text-to-speech technology as a tool to achieve writing goals, on students being an author through reader/writer relationship and on text-to-speech technology as a vehicle to enhance student engagement in writing. Created opportunities for students to develop automaticity in using text-to-speech technology when writing and focused on concepts, knowledge and skills important for learning to write.
Nicole	Organised the learning environment, new discourse and writing routines. Promoted explicit pedagogy and practice time. Focused on potential of text-to-speech technology as a tool to achieve writing goals, on students being an author through reader/writer relationship and on text-to-speech technology as a vehicle to enhance student engagement in writing. Created opportunities for students to develop automaticity in using text-to-speech technology when writing and focused on concepts, knowledge and skills important for learning to write.
What procedures did teachers use in writing lessons using new text-to-speech technology?	
Jessica	Use of exploratory and social practices engaged students, but not enough to support student cognitive development to achieve writing goals.
Brandon	Focused on narrative writing as a means to explore how to use text-to-speech technology. Designed instructional procedures to focus on typing listening and comprehension skills.
Hayden	Focused on narrative genre and then technology. Designed instructional procedures to facilitate students to reflect on texts. Used text-to-speech technology to support student cognitive development.
Paul, Olivia, Stephanie, Nicole	Focused on narrative genre and then technology for reader/writer relationship. Engaged students in individual and collaborative learning to write activities. Designed instructional strategies to facilitate differentiated writing experiences for students. Facilitated students to reflect on their texts. Used text-to-speech to support student cognitive development.
What factors influenced teachers' use of the new text-to-speech technology in writing lessons?	
Jessica	Viewed technology as a valuable tool for learning, but no opportunities to develop pedagogical practices with collegial support. Installation problems, limited opportunities to explore technology and redefine practices.
Brandon	Viewed technology as a valuable tool to edit texts. Experienced difficulties in adopting technology as a meaningful teaching tool using socially-orientated student-centred approaches. Installation problems, limited opportunities to explore technology and redefine practices, limited leadership and technical support

Hayden	Viewed technology as a valuable tool for learning and gained confidence in using technology as became familiar with the software. Installation problems, limited leadership and technical support, difficulties establishing a technological learning environment, limited opportunities to share in the design of writing experiences to redefine practice.
Paul	Engaged in mentoring and professional teaching opportunities to develop pedagogical practices and had prior knowledge of possible pedagogical and technological challenges. Had collegial support to attend to instruction and knowledge student's thinking behaviours to promote thinking scaffolds. Personal pedagogical belief in collaborative learning between teacher and students. In-balance in teachers TPACK with limited opportunities for in-class teaching support to realise teaching outcome
Olivia	Engaged in opportunities to become familiar with the software, access collegial support, mentoring and acquire knowledge for how to scaffold her pedagogy when using text-to-speech technology. Time to explore and develop technological skills as a result of in-balance in teacher TPACK. Some technical difficulties for establishing a technological friendly learning environment
Stephanie	Valued using text-to-speech as a vehicle to enhance engagement. Develop and attended to instruction by becoming familiar with the software, using collegial support and her promoting the reader/writer relationship. Developed pedagogical practices by engaging in mentoring, scaffolded pedagogical approaches, and gaining knowledge about possible challenges. Establishing a technological language to communicate effectively and in-balance in TPACK for engaging students effectively in collaborative learning opportunities
Nicole	Valued text-to-speech as an instructional writing tool and established opportunities for her teachers to collaborate and develop pedagogical practices and attend to instruction. Establishing a technological friendly teaching and learning environment for professional teaching teams, providing time for teachers to explore and develop pedagogical practices, making technology accessible to teachers and students and understanding how to integrate technology to redefine teacher practices.

Information captured in this table reveals how the study teachers focused on the potential use of technology, conceptual understandings about narrative writing and organisational skills and challenges to achieve writing goals with technology.

The second process involved developing a framework to inquire into the teachers' writing instruction with technology. There were three parts to this process: the first part involved developing an instructional framework to pattern-match each individual teacher's reflections on developing a goal-free worked example that included explicit teaching and collaborative instructions. The second part involved developing information processing reflective questions to interpret each individual teacher's instructional strategies as coded in the instructional framework. The final

part involved pattern matching each teacher's text-to-speech reflective instructions to the three text-to-speech 'knowledge-telling procedures' (Berninger et al., 2010; Hayes, 2012b; Sweller, Ayres, & Kalyuga, 2011c), as previously identified (Berninger et al., 2010; Hayes, 2012b; Sweller, Ayres, & Kalyuga, 2011b) and discussed in the literature review (see Table 41: Knowledge-telling reflective procedures with text-to-speech technology).

***Part 1. The instructional framework.*** The instructional framework was designed based on the five principles of the information processing system (Sweller et al., 2011a) as outlined in the literature review. The framework provides a means to identify the major patterns of instructional thinking that emerge from the descriptive labels and research findings about teacher pedagogy, integration experiences with text-to-speech technology, and the relationship between the organisational context of the classroom and the wider school environment for teaching writing with technology.

The framework is organised into two sections. The first section shows the teacher information processing reflections (see Table 38) while the second section shows teacher instructions (see Table 39).



Table 38 Analysis of teacher writing instruction with technology

NB. Yellow instruction denotes TPACK considerations. Teacher's text-to-speech revision processes are identified as fixed, flexible and elaborate. A ✓ represents instruction that supports reduction in working memory

Teacher	Designed instruction based on narrative writing with opportunities to practise. Technology instruct	Provided cues to trigger memory of previous learnt knowledge	Did new instruction have 3 items or less	Procedures teacher used. Model & demo Explicit & direct Listen use feedback	Encourage understanding by how for both novice & expert learners
Stephanie <i>Elaborate workshop</i>	instruction based on narrative writing with opportunities to practise Techno explicit	Narrative cues Techno cues Visual cues	Take, it, filter it.....; Watch & read need; Finger warming Look & think ahead ✓	Model & demo Explicit and direct Listen use feedback 3	Novice; listen, COPS, white spaces etc. Expert: Think-aloud, global author teaching moments
Paul <i>Flexible</i>	instruction based on narrative writing with opportunities to practice Techno explicit	Narrative cues Techno cues Visual cues <i>Novice</i>	Finger warming Have a go Knee to knee ✓	Model & demo Explicit and direct Listen use feedback 3	How for novice writers <i>Flexible Fixed</i>
Olivia <i>Fixed</i>	Instruction based on narrative writing with opportunities to practice. Explicit	COPS Narrative genre, charts.	Finger warming Listen with eyes & ears Have a go. ✓	Model & demo Explicit and direct Listen use feedback. 3	Encourage understanding by how for both novice & expert learners
Nicole	Techno explicit to link with writing		Finger warming Listen and tell. ✓	Model & demo Explicit and direct Listen use feedback. 3	
Jessica	Narrative and Practice at different stages of writing	Narrative  Exploratory	When using text-to-speech ✓		

	Exploratory Techno				
Brandon	Narrative and Practice at different stages of writing. Exploratory Techno	Motivation		Model - keyboard listening skills. Explicit & direct 1	
Hayden	Exploratory approach using writing concept. Exploratory Techno	For writing purpose introduce RWG when writing		Model TTS, Explicit for technol. Listen feedback 2	Text-to-speech play-back speed

The above framework reflects how teachers designed instruction and the triggers and cues they used to prompt students' prior learning.

Table 39 Teacher instructional framework

NB Yellow instruction denotes TPACK considerations. Teacher's text-to-speech *elaborate* revision processes are identified in red.

Teacher	Goal Free Used problem solving approaches that focuses on steps to achieve an individual outcomes	Worked Example Used text-to-speech, Work with distractor Split Mech./meaning Novice/expert <i>Elaborate</i>	Explicit Teaching Visual/listening Guidance fading Imagining Encouraged self-explanation Missing knowledge	Collaboration, cognitive rehearsal, text-to-speech with scaffolds, Peer to peer, Whole class
Stephanie	Watch & Read, Look & think Ahead A sentence is.....; When listening for meaning.....	Used text-to-speech, Work with distractors, Split Mechanics/mean Novice expert <i>Elaborate</i>	Visual/listening Guidance fading Imagining Missing knowledge	Cognitive Rehearsal, Text-to-speech with scaffolds, Peer to peer, Whole class.
Paul	Toolbar overwhelming so taught bit	Used text-to-speech, Work with distractors,	Visual/listening Guidance fading Imagining	Cognitive Rehearsal, Text-to-speech

	by bit; Listen and sense	Split Mechanic/mean Novice only <i>Elaborate</i>	Missing knowledge	with scaffolds, Peer to peer, Whole class
Olivia	Listening What are we looking for?	Use text-to-speech, Work with distractors, Split Mechanics/mean Novice expert <i>Elaborate</i>	Visual/listening Guidance fading Imagining Missing knowledge	Cognitive rehearsal, text-to-speech with scaffolds, Peer to peer, Whole class.
Nicole	Listen and tell		Visual/listening, Guidance fading, Imagining, Self – explanation, Missing knowledge	Cognitive. rehearsal strategies, Text-to-speech technology with scaffolds, Peer to peer, Whole class.
Jessica	In both narrative and technology. - Narrative, vocab, sentences, white spaces,	Used text-to-speech, Distractors ( Friends names) Split mechanics/mean, Novice/.expert	At different stages: Visual/listen. Guidance Fading Imagination Self-explanation Missing knowledge	Text-to-speech with scaffolds, Peer to peer, Whole class
Brandon	Listen for spelling, sentence or comma	Different stages: Use text-to-speech, Split,	Visual Listen, Guidance fading – typing, Imaging	Peer to peer
Hayden	Sentence focus Skim & scan	Split between print & screen	Written paragraph & listen. Image – What is in your readers head?	Peer to Peer, Whole class listen

The framework above summarises the teachers' goal free problem solving approaches, the worked examples they used and the explicit teaching approaches they modelled.

**Part 2. Information processing reflective questions.** The second step in analysing the teachers' major patterns of instructional thinking outlines the information processing reflective questioning used to interpret teachers' instructional procedures as coded in the Instructional Frameworks (see Table 40 below). The questions reflect the five principles of the information processing system as identified in the literature review (Berninger et al., 2010; Hattie & Yates, 2014; Retnowati et al., 2010; Sweller et al., 2011a, 2011b).

Table 40 Information processing reflective questioning.

Information Processing Reflective Questioning used to interpret teacher instructional procedures	
Information Processing Reflective Questioning	Purpose for interpreting the questions
<p>Did the teacher design instructional procedures based on integration of technology that focussed on developing writers' meaning and editing of text, and provide writers with opportunities to practise?</p> <p>Or did they teacher rely on discovery, inquiry, problem solving and constructivist approaches to write with technology</p>	<p><i>The aim is to build schema in long term memory that are specific to achieving TPACK and are effective for writing.</i></p>
<p>Did the teacher provide cues to trigger writer memory from previously learnt writing and technology knowledge strategies?</p>	<p><i>The aim is to link new information with effective strategies already retained in long term memory and be able to retrieve that knowledge</i></p>
<p>How was instruction structured to facilitate learning and for students to acquire new knowledge about writing with technology?</p> <p>Did the new instruction have a minimal cognitive load of three or less items?</p>	<p><i>The aim is not to have new instruction to carry a heavy cognitive load.</i></p> <p><i>The aim is to free student working memory to attain and retain new knowledge.</i></p>
<p>What were the procedures teachers used for students to acquire new knowledge?</p> <p>How effective was instruction to facilitate student understanding?</p> <ul style="list-style-type: none"> <li>▪ Procedures: show, model or demonstrate, assist by scaffold learning,</li> <li>▪ Teacher uses explicit or direct instruction or discovery/constructivist/problem solving learning</li> </ul>	<p><i>The aim is for writers to know the most effective ways to acquire and understand knowledge and be assisted to do so.</i></p>

<ul style="list-style-type: none"> <li>▪ Writers listen, observe, use resources and provide oral feedback.</li> </ul>	
<p>Did teachers encourage students to understand how and when to use their learnt knowledge effectively when engaging in the process to create new knowledge and ways of learning?</p> <p>Did the teachers create enhancing procedures that generate new ideas when writers were writing with text-to-speech technology?</p> <p>Did the procedures consider performance structures for novice and expert writers?</p>	<p><i>The aim is for writers to continually develop their knowledge and understanding and have different procedures they can use at different levels of understanding.</i></p> <p><i>The aim is for writers to develop competence to understand how and when to use or not use these procedures to become global authors.</i></p>

As can be seen, the table points out how the effect of teacher questioning through instructional procedures can actively support students to make meaning of the integration of technology and interpret new information with the use of their prior knowledge and experiences.

**Part 3. Text-to-speech technology as an instructional reflective tool.** The third analytical step was to interpret individual teacher’s integration of text-to-speech technology as an instructional reflective tool. This step involved pattern matching teacher’s reflective revision approaches when integrating text-to-speech technology to the Knowledge telling reflective revision procedures with text-to-speech technology framework (see Table 41).

Table 41 Knowledge telling reflective revision procedures with text-to-speech technology.

A framework of teacher knowledge telling reflective revision procedures with text-to-speech technology		
Type of Reflective Revision Approach	Description of Reflective Revision Approach	
Flexible	Model – high demand of working memory	
	<ul style="list-style-type: none"> <li>▪ Writer has no global approach to revising texts.</li> <li>▪ Edits with no fixed approach</li> <li>▪ Revises text as writing, generally editing mechanics of writing.</li> <li>▪ Rereads texts but generally no large changes to meaning of text</li> </ul>	<p>This approach increases demand on the writer’s working memory. Explicit instruction required to focus on developing writing skills and knowledge that are connected to what makes expert writers.</p>

	<p><b>Teacher</b></p> <ul style="list-style-type: none"> <li>▪ Develops strategies for meaning and provides explicit instruction that focuses writers' understanding of writing.</li> <li>▪ Pedagogy for develop writing skills and knowledge is connected to what makes good writing – plan-write-revise</li> </ul>	<p><b>Strategy</b></p> <p>'Develop thinking protocols for writing with text-to-speech.' Using text-to-speech technology in a linear strategy.</p>
	<p><b>Writer</b></p> <ul style="list-style-type: none"> <li>▪ Writer focuses on immediate words or sentences written</li> <li>▪ Editing processes related to immediate thinking ideas</li> </ul>	<p>Writer writes, pauses and listens to minimum of 2 sentences or more and may change or not change texts. The writer thinks and continues to write using this pattern, back-tracking as required through the writing process.</p>
Fixed	<b>Model - decreasing demand of working memory</b>	
	<ul style="list-style-type: none"> <li>▪ Writer has no global approach to revising texts.</li> <li>▪ Edits texts while writing using two different approaches – attends to spelling, capitals, periods, text structures and also attends to the meaning of what is being written</li> <li>▪ Revises text by choosing to write for meaning plus when and how to edit texts.</li> <li>▪ Rereads texts, may make some changes to text, but generally not to enhance the meaning of what has been written.</li> </ul>	<p>This approach decreases demand on working memory as text is being constructed. Instruction needs to focus on developing skills and knowledge that are connected to what makes expert writers (<i>plan-write-revise</i>) as well as processes to personalise integration of text-to-speech for purpose of revision.</p>
	<p><b>Teacher</b></p> <ul style="list-style-type: none"> <li>▪ Develops text-to-speech strategies for meaning and mechanics during different writing activities.</li> </ul>	<p><b>Strategy</b></p> <p>End: Writer integrates text-to-speech after text is competed. Meaning: Writer integrates text-to-speech during writing process with suppressed distractors for editing purposes. Meaning and Mechanics: Writer chooses when and how to use suppressed distractors for editing purposes at different stages of the writing process.</p>

		None: Writer decides to integrate or not integrated text-to-speech to reflect on meaning or for editing while writing. However, writer may choose to activate text-to-speech at any time.
<b>Writer</b>		
	<ul style="list-style-type: none"> <li>▪ Writer focuses on immediate words or sentences written but chooses when and how to edit the texts</li> <li>▪ Editing processes focus on developing meaning of text, by writer choosing how and when to use text-to-speech.</li> <li>▪ Revision processes determined by writer to suppress or activate distractors while writing.</li> </ul>	Writer writes, pauses and listens to minimum of 2 sentences or more and may change or not change texts. The writer thinks and continues to write using this pattern, back-tracking as required through the writing process.
<b>Elaborate</b>	<b>Model – uses writer’s working memory</b>	<b>to achieve revision of texts</b>
	<ul style="list-style-type: none"> <li>▪ Writer uses a global structured approach to revising texts</li> <li>▪ Writer uses writing skills and knowledge to enhance or improve meaning and mechanics of writing</li> <li>▪ Writer revises text with specific structures to enhance text</li> <li>▪ Writer rereads texts, and makes changes determined by writing goals that focus on the meaning of texts.</li> </ul>	The teacher can support writers’ revision of texts by using the writer’s working memory as a means to achieve revision of texts. The teachers can establish specific structures within the <i>plan-write-revise</i> approach to support novice writers and enhance more experienced writers.
<b>Teacher</b>		<b>Strategy</b>
	<ul style="list-style-type: none"> <li>▪ Uses worked examples or problem solving approaches</li> <li>▪ Examples may not focus on how to make connections between editing for meaning to enhance writing skills and knowledge</li> <li>▪ Teachers can scaffold integration of text-to-speech inclusive of distractors by explicitly modelling how to use a combination of technological and content strategies that address particular writing skills and knowledge.</li> </ul>	Teachers develop different strategies that focus on: Mechanics of writing Text organisation Genre structure Meaning
<b>Writer</b>		

	<ul style="list-style-type: none"> <li>▪ Writer chooses to focus on specific paragraphs or groups of sentences to enhance quality</li> <li>▪ Editing processes focus on editing texts for purpose of mechanics and back-tracking over texts to listen or re-listening to enhance meaning</li> <li>▪ Revision processes determined by writer to ensure revised text contributes to developing meaning across the whole text.</li> </ul>	<p>Writer focuses on specific paragraphs or sentences to enhance meaning and quality of text.</p>
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The table shows how the teachers integrated text-to-speech technology through the development of knowledge telling routines. The routines characterised students' writing development to achieve writing goals. It can be seen, that teachers did focus on writers' structural and language constraints and the specific meaning of texts.

Evidence of all teachers' writing instructions with text-to-speech technology is presented Table 42 below. The collated findings for all teachers' information processing reflections and all teachers' instructional framework with technology are in Appendix B1 and Appendix B2.

Table 42. A summary of writing instruction with text-to-speech technology.

<p>Writing instruction with technology for writers to become creative writers</p>
<p>Teachers scaffold writers to develop thinking skills with text-to-speech technology so students can use effective strategies to revise and edit their texts. Revision Strategies for processing words, sentences and paragraphs as novice or expert writers.</p>
<p>Teachers use cues and triggers to enable writers to develop meaning in their writing and to know what and how to integrate text-to-speech technology to facilitate the comprehension of texts.</p>
<p>Teachers design instructional procedures that are easy to remember and enable writers to learn and practice new writing and technological skills in combination with traditional writing procedures and learnt knowledge.</p>
<p>Teachers scaffold writers through learning new writing, listening and technological skills using text-to-speech technology by using student-centred approaches, explicit instruction and guided practice.</p>
<p>Teachers create opportunities for writers to be creative in their writing ideas and to learn how to become better writers when writing with text-to-speech technology. Teachers encourage writers to engage in writing with text-to-speech technology by providing enhancing procedures that enable the generation of new instructional procedures.</p>



As you can see teachers used a variety of instructional procedures, inclusive of triggers, cues, scaffolding strategies and enhancing procedures.

The third process involved using the TPACK Framework (M. Koehler, 2014) and the SAMR Model (Puentedura, 2008) to analyse each individual teacher’s pedagogy for developing instructional procedures. The pattern-matching process described within the research design was used to analyse teacher pedagogy at the conclusion of the research. The adopted Instructional Framework (see Table 41 and Table 42) and the Writing Activity Framework (see Table 34) underpin the process. Appendix C provides an overview of the collated teacher TPACK instructional writing procedures from all teachers. The individual teacher instructional procedures for different writing activities as analysed through the lens of the TPACK theoretical framework are described in Table 43. The table also highlights where teachers integrated text-to-speech technology using elaborate, flexible or fixed knowledge-telling reflective revision procedures.

Table 43 Teacher pedagogy for developing instructional procedures.

NB. Yellow represents teacher achieving TPACK. Green represents where teacher integrated text-to-speech technology using elaborate knowledge-telling reflective revision procedures. Pink represents where teacher integrated text-to-speech technology using fixed and/or flexible knowledge-telling reflective revision procedures.

<b>Teacher pedagogy for developing TPACK instructional procedures for different writing activities in the process of writing with technology.</b>
<p><b>Jessica</b> – Student scaffold themselves. <b>TPACK for text organisation with meaning</b></p> <p>Think and listen, let your imagination run wild, to generate ideas. Share how to use tech with peers. <u>Text to Speech</u>: Look and Listen Focus at sentence level for shorter or longer sentences. <b>Elaborate text-to-speech editing</b>: think about developing meaningful paragraphs and white spaces.</p> <p><b>Brandon</b> – To role of the teacher <b>Transcription technology TPACK for pre-writing</b></p> <p>Explored software uses Practice listening skills     Sound right, and misspelt     If sentence is too long or talking too much, check if need a new sentence or comma</p>

Pen and Paper to writing on computers – 10 writing examples  
Explicit teaching to gain comprehension and writing skills  
Use worked examples and whole class editing, modelling and sharing of ideas.  
Text to Speech: practices on a ranges of different texts – 10 times & listen.  
Use it for editing and listening for meaning.  
**Fixed text-to speech editing;text-to-speech revision procedures** no evidence of backtrack, fixed for editing and meaning separately.

**Hayden** – teacher needs to have a go to integrate technology in teaching **TPACK for generating ideas**

Be a story teller – what is your readers’ head?

Peer to peer collaboration to develop ideas

What story ideas do you have?

What is going to happen your story?

What icons will you try and use and why?

Using software = prompts to try and use

- How has the software improved your work?
- What icons have you used?
- Are you finding more mistakes than you would normally?
- Is the software improving your sentence structure?
- Would you prefer to write without or with the software?

To focus on meaning of text and not technology

- Critically reflect on software between tech and non-tech. “Which piece of writing do you like best and why?”

Text to Speech: Write a page and listen to what was written

**Elaborate knowledge telling revision procedures**, but not in a Writers Workshop. Only with individual students.

**Paul** – How to teach with technology. Strategies for every writing activity.

**TPACK within every writing activity for novice writers**

- Prewriting strategies
- Developing comprehension competency
- Read to self-strategies when finished writing to generally reflect on story
- Writers Workshopped strategies for novice writers that focusses on mechanics of writing at word and sentence level.
- Combine Read to Self + WWS questions + how to use TTS at word and sentence level to self-regulate writing

**Olivia** – Teachers need to be goal orientation- **Elaborate knowledge telling revision procedures**, **TPACK at every level with a specific goal**

- Assessment and how to save work
- Routines and technological rules so could focus on writing outcomes
- Prompts to draw student focus back to story meaning
- School Support Officer at Sentence level
- Small group work with a particular focus

- Writers Workshop – 3 step process (Edit for meaning and mechanics/conference between author and readers / Genre structure and final edit using tech and non-tech strategies.
- Goal-orientated in teaching progress, authors students wanted to be
- Mentoring

**Stephanie** to transform Learning **Elaborate knowledge telling revision procedures** **TPACK** in every activity with conscious thought for purpose and level of integration

- Touch typing for screen and finger warming.
- Font size 14 so can look ahead and think. Focus on meaning of text and typing of text.
- Technological discourse
- Word level – Check words written by thinking about “Look lie, sound like, how do you achieve that?”
- Sentence level – Workshopped examples with whole class. A sentence is more than one thought.
- Read for information by highlighting texts at a paragraph level and use self-reflection questioning approach and TTS set to continuous reading so it could be controlled by the student and double spacing so students could focus on meaning and not the print.
- Listening skill prompts – “When listening for stories, remember we don’t want to change the story and change the meaning. She used Instructional prompts when writing
  - Is this your Story?
  - Is this what you want
  - Do you want to change it
  - Does that sound right
  - Is this what your story should say
  - Is this what you meant
- Strategies to overcome distractors such as spelling
- Editing Text processes
  - Listen to whole text and then check story structure, sentences for spelling
  - Check capitals and full stops, organisation for white spaces to see if can make conjunctions.
- Writers Workshops publishing and editing process
  - Story-grammar training (Who is main character, where and when did story take place, main characters and how story ends) in combination + Who are you writing to, who are you writing as, How do you want to make the reader feel?
  - Developing Writing skills by using listening skills– “Listen and Tell” Strategy run on sentences for meaning
- Different levels of technological use for different writing activities, depending whether wanting a cognitive, explorative or skill development to facilitate learning and empower learners.
- Promoting Student Voice
- Teacher Mentoring opportunities

**Nicole** - Whole school approach and leadership to sustain changing practices  
TPACK for an approach to teaching with technology and enabling processes to achieve successful TPACK

- Vision for Writing; Write for meaning, not write to edit,. Not a program but assisting learning
- Decide on explicit teaching focus for relationship between tech/writing and pedagogy
- Time to practice skills and knowledge and develop personal approaches
- Tech discourse for all teachers
- Learning Design Team
- Established Active listening opportunities to explore and collaborate Listen and tell - Tips List
- Role of and link between technician and teachers
- Behavioural expectations: Observation and Praise
- Reflective Feedback and decision making processes from students, teachers and technicians.
- Developing infrastructure and problem solving processes
- Bugs, Glitches and Patchers for technical accessibility

The table highlights how the study teachers' used a range of instructional procedures and reflective revision approaches to achieve TPACK when integrating technology to teach writing.

### **Ethical Considerations and Protocols.**

This research adhered to strict ethical standards and protocols required by the University Research Committee and the National Statement on Ethical Conduct in Human Research (National Health and Medical Research Council, Australian Research Council, & Australian Vice-Chancellors' Committee, 2007). This requires that the researcher maintain a high standard of respect for the rights of the research participants, their research community and social environment, and for the integrity of the data. The researcher's approach to conducting the study had its own ethical considerations, which also brought challenges and constraints. As an ethnographer the researcher understood that being an instrument of the research would be difficult to maintain and therefore acknowledged this to the participants by confirming that the researcher's role was not to be an advocate or interventionist. The researcher also acknowledged and maintained the confidentiality of the research participants' identities.

There were three main ethical concerns that were addressed in designing and implementing this study. Firstly, prior approval was required by the university and

the schools. This involved receiving ethics approval from the university and the Department of Education and Child Development in South Australia prior to the commencement of the research study. This included receiving research consent from the participants in the research. Consent was obtained from all school principals (see Appendix D: Principal research consent letter), the participating teachers (see Appendix E: Participating teacher consent letter), and students and their parents or caregivers (see Appendix F: Student and parents research consent letter) prior to the start of the research in each school site.

The research consents were based on an understanding that:

- Teachers would attend a training workshop, share their teaching experiences as outlined through the study questions, provide feedback through the range of data collection tools and provide and consent and acknowledge the confidentiality of their participation.
- Students and teachers may not directly benefit by taking part in the research and that while information gained from the study may be published, individuals would not be identified, that they could withdraw from the study at any stage and have their data excluded, and that there would be no payment made or required for their participation in the study. A research information sheet was also included with the consent forms providing information about the software and how the study would be conducted within the natural learning environment of the writing classroom.

Secondly, ethical concerns were addressed when implementing the research with participants. This related to using the procedures and protocols approved by the University Ethics Committee and ensuring the participants understood that no payment was necessary on their part to be involved in the study and that the researcher would be an observer within the everyday teaching environment of the writing lesson. Other procedures addressed included describing how the study was to be conducted, the research design and methodology, the recruitment process for participants, the consent procedures, the confidentiality of participant data and the recording, reporting, storage and access to the research data and results. This also included an acknowledgement that the researcher owned the data and the results of the research.

Thirdly, the researcher addressed potential ethical issues by implementing a range of strategies. These included:

- Having access to the school environment and research classrooms over the 20-week time frame of the study in each school and have access to the school technicians, leaders, participating teachers and students
- Negotiating and ensuring the installation of the software, troubleshooting access to student writing samples and data and uploading of data onto the school intranets or the university website
- Ensuring that technology was being integrated for the purpose of the research study proposition and questions
- Ensuring there was no financial commitment on behalf of the school or teachers for using the Read&Write Gold™ software
- Ensuring that all participating teachers and students had equitable access to the Read&Write Gold™ software
- Providing an opportunity for research participants to gain a benefit from the research by means of introductory software training and reflective workshops (see Appendix G: Teaching with technology reflective workshop agenda)
- Acknowledging the researcher's vested interest in being aware of any constraints that may arise within the social setting of the schools during the course of the research; these may involve the use of technology or other problems that may impact on the research participants.

The strategies ensured there were no potential physical, emotional, social or legal risks to the wellbeing of participants beyond those normally encountered in everyday life as a result of involvement in the research. They also ensured that there were no potential safety implications for the research beyond those normally encountered in everyday life.

**Criterion: Proposing the Evidence.**

The final ethnographic design criterion brings together the shared patterns and themes that resulted from investigating and answering the research questions. Evidence to answer the research questions will be presented in each of the individual teacher cases in Chapters 4 to 10.

**Summary.**

This chapter has been presented in two sections. Section One outlines the adopted qualitative ethnographic conceptual framework for the research (Fetterman, 2010) which was used as a guide for the selection of multiple data collection tools. The reliability and validity of the study data collection process is based on the principles

of collecting multiple sources of evidence using infield data collection processes. Section Two outlines six objectives within the analytical framework of the ethnographic design approach of the research. The objectives are important for developing rich descriptions to interpret deeper meaning from emerging themes and for analysing and interpreting the meaning of the data.

## Chapter 4: Findings for the Case of Jessica

Jessica was initially positive about the use of technology for teaching writing and with her students had some initial playtime to explore the potential for using text-to-speech technology as an editing tool. Jessica's students liked using text-to-speech technology and Jessica collaborated with them during lessons, identifying a range of useful instructional activities. Jessica was successful in integrating some features of technology into her lessons which supported students to edit their texts. To some extent she also reported that the students thrived when listening to their stories using the '*play back*' feature on the new technology. The technology enabled the students to focus on the meaning of their stories and their editing skills. However, Jessica was frustrated by the lack of collegial and technical support and by administrative arrangements which in the end impacted on her enthusiasm to continue teaching with the technology. Jessica's case provides insight how different pedagogical strategies and school system supports are necessary if a teacher is to integrate text-to-speech technology into the writing process and retain the focus on teaching effective writing strategies, rather than the technology.

### **Background Information.**

Jessica was an experienced primary school teacher who was teaching a class of 28 Year 6 and 7 students at the time of the research. Springbank Primary School had a total student enrolment in the 365-375 range. The Index of Community Socio-Educational Advantage (ICSEA) is an index of the socio-economic background of students at an Australian school, with more advantaged schools having a higher ICSEA and schools with students from more disadvantaged backgrounds having a lower ICSEA. The average value is set at 1000. ICSEA Index, based on census data, was developed as part of the annual Australian national testing program for students, currently reported on the Australian My School Website (Australian Curriculum, 2014) from the years 2008-2014. The ICSEA value of Springbank Primary School in 2011 was in the range of 940-950, with approximately 42% of students in the lowest SES quartile and less than 5% in the upper SES quartile. The school had a total enrolment of 30% students with a language other than English.

The school had a suite of new computers in the library, which Jessica accessed. Jessica suggested that she is 'comfortable' using computers in her teaching practice.



## **What procedures did Jessica and students adopt in introducing new text-to-speech technology into writing lessons?**

### **Preparation by Jessica.**

Jessica introduced the new text-to-speech technology simultaneously with the ‘*Plan-Write-Revise*’ writing concept as a new instructional strategy into the writing process. She familiarised herself with the functionality of all features on the text-to-speech technology tool bar and other features in the Read&Write Gold™ software by collaborating with her teaching colleague Brandon in their out of classroom teaching hours on one afternoon, stating, ‘There are pros and cons for working together. We always support each other [...] we both have different skills in different areas’ (Interview, November, 2011).

**Introduction to the technology activities.** At the beginning of the research Jessica worked in collaboration with her students for approximately two weeks, becoming familiar with the functionality of all features of text-to-speech technology and the other Read&Write Gold™ software features. She worked with her students to help them to know how to manage the tool to create and edit narrative texts. During these early weeks of the research, Jessica also modelled to her students how they could create individual folders on the school intranet to save and retrieve the texts they were creating. Jessica stated, ‘The best way to learn a program together is to play with it first... the students get a kick out of that’. (Interview 1, Springbank Primary School, 2011)

When students began composing narrative texts with the new text-to-speech technology, Jessica provided them with a ten-minute planning time period, encouraging students during this time to think about their story plot as well as the Read&Write Gold™ toolbar features they could use to support their individual writing needs. Jessica commented, that it was important that she encouraged students to think about the technological tools they could use for editing their texts, especially as each student had their own particular editing plan (Classroom, October, 2011). For example, in one lesson she commented to her students:

You know the narrative framework about your story. What will it be about? Think about the characters and what happens on the way. You can change your ideas on the way. Reference the movie Shrek in creating characters. You can have 10 minutes to plan you own story and think about using as many tools as possible. (Observation, Week 8, 2011)

**Instructional literacy activities.** Jessica created activities with a literacy focus, where she worked with her students to understand how to integrate text-to-speech technology into the same writing instructions she had used before introducing technology and the ‘*Plan-Write-Revise*’ strategy. This included providing differentiated instruction for individual students, by prompting them to correct spelling and grammar errors and the use of capital letters and full stops as they were writing, as well as how to structure texts according to the narrative genre.

When differentiating instruction for individual students, Jessica focused on the functional use of text-to-speech technology, encouraging students to develop an author’s voice by thinking about the reader while they were composing. She prompted students to use text-to-speech technology using the strategy of ‘*Plan-Write-Revise*’, to go back over their texts, planning how they could listen to the story for meaning and revise for errors.

Jessica created instruction which was designed to help students think how they could use the narrative genre structure to develop their stories through the creation of paragraphs. She focused her instruction on students’ attention to view the texts they were composing on a screen by using separate paragraphs for each of the narrative genre structures. She did this by suggesting to students to create one paragraph for the orientation, two or more paragraphs to develop the narrative complication and the final paragraph for the story resolution. Jessica asked students to leave a space between each paragraph as it would help them to focus on how their story structure was developing.

**Organisational approaches.** In an attempt to overcome the challenges associated with teaching in two different places, Jessica changed her organisational approaches by designing pre-writing experiences for use in the classroom, and using the computer suite for personal and writer’s workshop (Graves, 1985) activities. As Jessica did not have enough computers in the classroom for students to have one-to-one access, she used the IWB for whole-class explicit instruction suggesting she ‘would type instructions on the board and have Read&Write™ set up to press the ‘Play’ button’ (Field work observations, 2011). She also reported that instead of focusing on, ‘pen to retype’ without technology, she changed her pedagogy to ‘talk and plan’ (Field work observations, Weeks 1-3, 2011) for writing with technology. She encouraged students to think how they would plan their stories and how characters would develop. She worked with students on whole class construction of

short passages on the IWB, using text-to-speech technology to develop students' listening comprehension skills for improving the meaning of texts, and developing students' narrative comprehension knowledge by having students designing blurbs and book covers.

### **Preparation by the students.**

The students learnt different ways to use text-to-speech technology for writing during their initial explorations of the technology, which highlighted how they managed the use of text-to-speech technology when writing. One student reported,

The very first thing I do when I use Read&Write Gold™ is write my name, date. After I would turn my [Read&Write Gold™] spell checker on and start to type my story. (Personal communication, 2011)

Through the exploration process, students became conscious of developing their own pattern for using the functions of text-to-speech technology when writing, 'I like to use a pattern of icons because I like using the spelling check, voice control and read aloud' (Students Questionnaire on 'My ideas about Read&Write Gold™ Software – Week 7). Another student suggested,

I write a paragraph, then play it to myself and check spelling mistakes. It is easy to do that because in the end you don't need to check spelling mistakes or if it makes sense. (Personal communication, 2011).

## **What procedures did Jessica and her students use in writing lessons using new text-to-speech technology?**

### **Procedures used by Jessica.**

When students were writing throughout the twenty-week research period, Jessica was frequently observed prompting students to listen to what they had written. She would offer support to individual students while they were writing, suggesting the Read&Write Gold™ toolbar features that could support their specific learning needs. She also supported students at their computers to discuss possibilities of how to use a combination of text-to-speech technology and the Read&Write Gold™ spell checker features at the same time while writing.

Jessica also created a variety of instructional activities that reflected the characteristics of effective literacy based and engagement practices. These included collaborative peer-to-peer and whole class approaches. Jessica provided differentiated instruction for individual students during their personal writing time to revise their texts and she promoted a focus on editing skills for writers during

Writer's Workshop sessions. She prompted students to develop their listening and comprehension skills and encouraged them to use their imagination to enhance their stories. She encouraged students to develop an author's voice by focusing her instruction at the start of every writing lesson to remind student to think about the reader while composing.

These instructional activities enabled her to integrate the functional use of text-to-speech technology to teach students how to focus on the reader writer relationship while at the same time attending to mechanical writing errors and narrative organisational skills. Different revision processes, representative of the distinctive ways students used text-to-speech technology emerged from the collaborative conversations Jessica had with individual students as they were writing.

One revision process related to how a student used text-to-speech technology for editing and repairing the length of sentences, spelling errors, or story meaning at a paragraph level when listening to texts. Jessica encouraged the student to listen to, and then correct individual sentences one at a time while typing, or to go back to the beginning of the paragraph and then listen to edit the paragraph for spelling errors.

Another revision process related to how Jessica encouraged other students to use the Read&Write Gold™ spell checker when text-so-speech technology was paused for editing. After listening to the text and then correcting the error, she suggested that the student could then continue writing with the technology until the student heard, or the computer indicated, the next error.

The final revision process was more elaborate and focused on reflective revision instruction. Jessica encouraged students who were revising the whole of their texts, to use the technology to read the whole text and to revise for errors and meaning at the same time. During this process she instructed students to 'collaborate and share' their stories with each other (Field work observation, 2011). Jessica modelled the approach to the whole class on the IWB during Writer's Workshop sessions. She also scaffolded the instruction for individual students who had difficulty adopting this revision process.

This week we are going to have a listening focus when writing. Jake's listening strategy is to focus on his paragraphs. Look and listen to your sentences for shorter or longer to see if they make sense. Remember to use punctuation.  
(Observation – Introduction to lesson, Week 10, 2011)

Jessica indicated that she relied on what she referred to as her 'normal' (traditional) writing strategies, but was motivated by how her students' used text-to-speech

technology as a valuable tool for writing (Field work observation, 2011). Across the research period her collaboration with students became more intense and she encouraged students to discuss with her how they were scaffolding their own learning through the sharing of new ideas and ways of working with the different features on the text-to-speech technology tool bar. She suggested that this aspect of her pedagogical approach to teaching with technology was to consult, 'just with the kids' (Interview, November, 2011). 'The students never just sit there on the computer, there is always a lot of chatter' (Interview, November, 2011). She indicated that she was 'always thinking and trying to solve problems' (Interview, November, 2011). When Jessica combined her traditional writing strategies with how text-to-speech technology could be used to listen to texts, rather than students reading texts without technology, she suggested that students were thinking more about the quality of their writing (Feedback on student use of Read&Write Gold™, Field work October, 2011).

When operating in the computer suite, Jessica changed from the explicit instructional planning focus she used in her classroom, to become a facilitator of learning, attending to the individual questions students asked and monitoring students' as they were writing. She noted that when students were using headphones they were in their 'own world and therefore focused on editing in their own world'. She suggested that the use of headphones did not ensure that some students could 'edit very well' (Field work Feedback, October, 2011). In the last ten minutes of the writing lesson, Jessica would ask students to stop composing and focus on one student's text for a Writer's Workshop session on the IWB in the computer suite. Students would listen to approximately ten lines using text-to-speech technology, suggesting text-to-speech technology highlighting colours, voices and speed of reading for ease of viewing and listening on a screen before attending to spelling errors and lengths of sentences. At this time in the research Jessica was comfortable knowing that she could maintain her traditional pedagogical focus. She could continue to work collaboratively with students as an 'interventionist' who supported their writing development, knowing the technology would focus students' attention on the editing and revision of their texts.

Students who were able to understand the inconsistencies of the software were able to point it out and seek my feedback as well, e.g. when they knew there were spelling mistakes they would still come and ask me for assistance as well. They liked to have the teacher intervention. (Interview, November, 2011)

### **Procedures used by the students during writing lessons.**

The students were observed listening and rereading their texts to edit spelling, text organisation on the screen and to check for white spaces at the same time as they were listening to the meaning of their texts. Students developed different ways of working with text-to-speech technology as suggested by the following students.

I think that the icon you press to hear your story is the most important icon because without it there could be more mistakes in your story than if you use it and also the ABC spelling check. (Student comment, 2011)

I like to use a pattern of icons because I like using the spelling check, voice control and read aloud. (Student comment, 2011)

My pattern was writing, then reading, then checking –listening, what word was wrong. (Student comment, 2011)

The procedures the students adopted when using text-to-speech technology during the writing process, enabled them to think about how they could attend to their writing goals. One student explained how he preferred to first attend to editing sentences for spelling errors and then go back over the sentence to attend to the meaning of what had been written. Another student discovered that it was easier to write a paragraph and then go back over the whole paragraph to check for spelling errors, rather than correcting the spelling as she typed. She indicated that she could check for meaning at the same time as she was attending to her spelling errors. Students who preferred to use a more flexible approach while writing with text-to-speech technology attended to their writing errors in a linear fashion as they wrote. These students demonstrated to Jessica, that as the computer highlighted an error when reading a text, they would pause the ‘*Play*’ function of text-to-speech technology to correct the error, or for improving the meaning of the story. A student who used this approach found the technology enabled him to think as an author and as a reader.

Well my most used icons would have to be the ‘*Play*,’ ‘*Pause*’ and ‘*Stop*’ buttons. I like hearing other people read my stories to me and Read and Write allows that to happen. It picks up mistakes in my writing too. At first I didn’t understand Read&Write Gold™. But I now know what to do and it helps me. This program has been a great help. (Student comment Week 15, 2011)

### **What was the level of technology integration in this case?**

When Jessica asked her students to think about the story they were going to write and to listen to what was written as if they were the reader, Jessica had promoted the

adoption of technology into her teaching practice at a *modification* level on the SAMR Model. She had allowed for the functional use of text-to-speech technology to redesign the writing experience for students. Not only did the text-to-speech technology act as a direct substitution tool whereby students could listen to what they would have previously read before the use of text-to-speech technology, but when Jessica encouraged students to use text-to-speech technology to think about writing to develop an author's voice, she had *transformed* the teaching and learning experience. The use of technology had allowed for the creation of a new way of thinking, enabling the student author to compose texts and reflect while listening, as a reader of the text being created.

Jessica did not provide other evidence that she was envisaging a way to design new learning opportunities which could shape how novice and more expert writers could gain meaning from the texts they were composing when writing with text-to-speech technology. However, use of the SAMR Model also highlights that it was Jessica's students that saw new ways in which text-to-speech technology could be used to *transform* how they planned to attend to their writing goals when composing, in their individual writing time and when revising their texts. Jessica and her students adopted text-to-speech technology at the SAMR *redefinition* level during Writer's Workshop sessions, exemplified by the elaborate processes Jessica and the students collaboratively adopted to backtrack over sentences, to stop and attend to individual words, and how they used the technology to listen and re-listen to their stories by paragraphs and at a whole text level. The students in particular, were observed listening and rereading their texts to correct spelling errors, changing the text organisation on the screen at the same time as they were listening to the meaning of their texts. The collaborative practices which Jessica had engaged in with her students, had motivated and enabled them to integrate technology to share, enjoy and understand each other's texts in a way they could not have done without technology. The SAMR Model also highlights how Jessica's traditional teaching practices were enhanced through the integration of technology, especially when she encouraged students to explore possibilities for how to use the technological tools. This is taken as evidence of action at the *augmentation* level of the model, action that added functional improvement to the student writing.

However, use of the SAMR Model to examine only the teacher's actions, did not facilitate a focus on the instructional design techniques that had been created by her

students. Jessica reported that she saw such development in her students: ‘Student’s thinking about the quality of their writing had become enhanced’ (Feedback on student use of Read&Write Gold™, Field work October, 2011). She also commented, that writing with technology had encouraged her students to become more confident as writers, ‘Since the installation of software, student self-confidence about themselves as writers has enhanced’ (Feedback on student use of Read&Write Gold™, Field work October, 2011). The contrast between the teacher’s and students’ levels of adoption was highlighted by Jessica herself when she realised her pedagogical procedures were spent on using the technology to make functional improvement to the writing experience, rather than text-to-speech technology being integrated as exemplified by some students to redefine their writing experience through the creation of the new organisational, editing and writing for meaning procedures.

We had to accommodate using the program, rather than the program accommodating us (Final Interview, November, 2011).

### **What factors influenced Jessica and her students’ use of the new text-to-speech technology in the writing lessons?**

#### **Factors influencing Jessica’s use of the technology.**

**Teacher knowledge.** Jessica began the research using an exploratory approach with her students to understand how the different functions within the text-to-speech technology tool bar could be used to write narrative texts. Jessica was observed during field work observations to have a depth of pedagogical knowledge and pedagogical content knowledge for teaching narrative writing and she did establish narrative writing procedures for students to compose their texts. However, it was not Jessica’s knowledge for teaching narrative writing and her technical knowledge about how the software could be used for editing texts that was the strength of her pedagogy. It was how she initially envisaged a way to have the technology add strength to her traditional teaching of writing, by introducing text-to-speech technology and the ‘*Plan-Write-Revise*’ writing strategy together as a new approach to teach writing. This demonstrated how her motivation combined with her knowledge for teaching with technology, provided opportunities for students to engage and think differently about composing texts with technology. As one student suggested when using text-to-speech technology to listen to his text for writing, ‘You



can listen to what you have written so you can fix your own mistakes' (Student questionnaire on 'My ideas about Read&Write Gold™, Week 7, 2011).

Jessica's procedures for using text-to-speech technology to teach writing ensured that the teaching and learning of narrative texts remained the foundation for how she could continue to develop student's writing through collaborative practices. When Jessica became conscious and frustrated that writing with this technology was not going to support her to create new pedagogical procedures, she focused on promoting her traditional procedures as an interventionist for promoting student to focus on their writing errors in lessons that did not involve writing with technology.

After the end of her involvement in the research, Jessica realised that collaborative and software-determined exploratory approaches to integrating technology required different instructional strategies. These strategies required knowledge about using technology when teaching students to write. Jessica reported that she hadn't developed a depth of knowledge about the functional capability of text-to-speech technology and how a student could manage the software as an editing tool as they were writing.

If I went again [with this technology], having listened to the positive outcomes of others [Brandon from Springbank Primary School and Hayden from Redgum Primary School], I would use Read&Write™ as part of the natural selection process for kids and not make it mandatory for all. I would give them choice about tools they could have used as there are other tools they can use. (Final Reflective Interview on using Read&Write Gold™ software, November, 2011).

Jessica's instructional competency for learning and skill development with technology demonstrates that she had professional competency at the *entry* stage and for some aspects at the *adaptation* stage on the competency continuum (Russell et al., 2006). At the *entry* stage, Jessica had an awareness of the possibilities that text-to-speech technology could hold for improving learning using her traditional teaching procedures. At the *adaptation* stage Jessica integrated the functional use of text-to-speech technology in support of her existing practice focusing students to attend to mechanical writing errors, narrative organisational skills and the meaning of texts. When Jessica began teaching with text-to-speech technology, her ability to design new instructional strategies was influenced by the lack of access to technology in her classroom, collegial support and administrative constraints in accessing the computer suite.

While Jessica collaborated with her students to integrate text-to-speech technology into her traditional editing procedures, it was her students who demonstrated how they had developed further skills to write using the technology. This provides evidence of students' technological skill development at the adaptation stage of the instructional competency continuum, where the use of text-to-speech technology added functional improvement to enhance student learning. The focus in this study, is of course of the teacher, but here we see an example of the students pushing themselves forward as they develop their own technological knowledge.

**Teacher motivation.** As indicated below, working in collaboration with other colleagues was integral for Jessica's motivation and confidence to assist students. While Jessica indicated a 4 on the teacher question (on a scale from 0-5 with 0 being the least and 5 being the most), for technology being a valuable tool for learning, her confidence (as we see in the following quote) to attend to new instruction which could cognitively engage students to acquire narrative writing knowledge with technology decreased. Jessica was not observed to develop a new language for teaching with technology and she became increasingly frustrated about not having access to the collegial support.

Jessica's motivation for designing new approaches to teach writing with technology was also influenced by the administrative difficulties she experienced. While her feedback from the teacher questionnaire indicated a 4 on a scale from 0-5 (with 0 being the least and 5 being the most) for the potential of what she believed technology could do for improving the opportunities for her to prepare her writing lessons, she became frustrated due to the administrative constraints placed on her teaching for not being able to access computers in her classroom.

Working in collaboration with other colleagues was integral for Jessica's confidence to assist students. The school technician had previously had a positive effect on Jessica because his support ensured that she could remain focused on her teaching practice, rather than installing software, accessing computers and troubleshooting technical problems when they arose. Jessica experienced difficulties when the school technician was unsuccessful in installing the software onto her classroom computers and as a result of him going on leave during the research, she was unable to have the collegial support and time required from the technician that she thought she would have had at the start of the research. This impacted on her willingness to continue to engage using text-to-speech technology to teach writing. 'There was no one else in

the school’, she stated, ‘that could assist and it made it very difficult’ (Final Reflective Interview on using Read&Write Gold™ software, November, 2011).

There was no one else in the school’, she stated, ‘that could assist and it made it very difficult’ (Final Reflective Interview on using Read&Write Gold™ software, November, 2011).

I probably didn’t feel as confident as using this. Usually when I work with software I spend a lot of time, experimenting and playing around myself and I usually feel pretty confident. And I do let the kids play around with it. I always do when we are using technology. I feel pretty confident if they come to a problem. I could help them solve it, but I didn’t feel confident with this because of the technical issues we faced and a lot of the tools didn’t actually work for us. I felt like I lacked confidence when I was using it. (Final Reflective Interview on using Read&Write Gold™ software, November, 2011)

**Technical support.** Jessica had intended for her students to write using the twelve classroom computers during the research period, however due to difficulties installing the software onto the school network, she had to conduct part of her writing lessons in the computer suite. This meant that her writing lessons were split across locations and her lesson time was restricted from forty-five minutes to thirty minute periods. She explained that, ‘this wasn’t an effective way of working, but it was the only way that it could work’ (Final Reflective Interview on using Read&Write Gold™ software, November, 2011).

**Collegial support.** Jessica indicated that she did have access to regular technological professional development (Final Reflective Interview, 2011), including attending the initial research training for knowing how to use Read&Write Gold™ software. However, in the period of the research she had minimal time and opportunities for consulting with her colleague Brandon to become familiar with all the Read&Write Gold™ software features. This seemed to be associated with the absence of discussion that could motivate her to design instructional approaches beyond the editing of mechanical writing errors and listening to texts.

Jessica indicated in the teacher questionnaire, a 3 (on a scale from 0-5) for how she believed teaching with technology had become more difficult. This was interesting given the feedback on whether she thought her students had changed their attitudes to learning since using the software. On the scale of 0-5, Jessica gave a 4 for indicating that the use of technology for writing had enhanced her student’s self-confidence about themselves as writers and enabled her students to engage more as independent writers. This finding complements feedback from the student questionnaire where only 2 students in her class indicated that they disagreed with the statement that they

were enjoying writing with technology, more than they had when writing without technology.

Jessica came to realise that teaching writing with technology was more complex than the technology being the driver or determinant for teaching students how to write. She liked to build opportunities into her practice, but suggested that the software was complex to use and she was not able to fully draw on the technological knowledge and strengths of her students through the collaboration process, or have access to the expertise of colleagues to overcome her own challenges when teaching with technology.

Not being negative, but we didn't run it how we would have liked. We like to use opportunities when they arise, this would really fit in. This would really help us. (Final Reflective Interview on using Read&Write Gold™ software, November, 2011)

**Administrative arrangements.** Knowing how to use and manage technology in the writing process was not enough for Jessica to continue teaching writing using text-to-speech technology. She indicated that despite their preparatory time, she and her students to an extent 'went in blind using the software. It can be a good thing, but also problematic' (Interview, November, 2011). She suggested that, 'time definitely plays a huge part' when writing stories. In her use of technology prior to this research, students were free to use the computers in their classroom as needed, whereas when writing with the text-to-speech technology they needed to write in the computer suite within a timetabled lesson and this restricted the time available for computer use in writing lessons.

**Factors influencing the students' use of the technology.**

**Motivation.** The collaborative writing experiences which Jessica promoted, had motivated and enabled students to find a way to integrate technology into the writing of texts where they could share, enjoy and understand each other's texts in a way they could not have done without the technology. As one student suggested, 'I think when you press the icon to hear your story, it is the most important because without it there could be more mistakes in your story', (Student questionnaire on My ideas about Read&Write Gold™, Week 7, 2011).

The teaching of writing with text-to-speech technology did not change Jessica's commitment to using technology as a motivator for student learning. She indicated that 'the kids really did love listening to their stories, they loved the accents, things they wrote the story about [...] aliens, they would find a voice that was appropriate

for it' (Final Reflective Interview on using Read&Write Gold™ software, November, 2011). Students created new revision processes by focusing on how the different functions of text-to-speech technology could be used to scaffold and redefine their own revision plans, as noted earlier in this report.

As noted above, Jessica believed the use of technology for writing had enhanced her student's self-confidence about themselves as writers and enabled her students to engage more as independent writers despite her own difficulties in teaching with technology.

**Student difficulties in managing the software.** At the start of the research Jessica mentioned how her students preferred to compose and edit their stories using pen and paper and then complete a final story for publication purposes by copying the story onto a computer. She explained how teaching with technology was a challenge because it was 'a longer process before the story got typed up'.

What we had before was a writing folder that students could use. They would spend some time planning, they would write their story, edit their work, there were check lists they could go through. Then they would book a conference with somebody and they would go through and make sure it was edited. Then the students would go through and type rather than typing straight onto the computer. (Final Reflective Interview on using Read&Write Gold™ software, November, 2011)

She described how her students had difficulty typing and thinking about the stories they wanted to write at the same time. She knew her students were not able to type quickly when copying and that it was often difficult for them to get their words down when thinking about what they wanted to write. Many students, she suggested would be concentrating on the letters to be typed and therefore could not get their stories to flow (Interview, November 2011).

**Exploration.** Jessica indicated how without prior experience in using the program, access to a technician and because of installation problems, it was difficult for students to have an opportunity to really play with the program, 'The best way to learn a program together, is to play with it first. It is really important that a student knows that they can show what they can do and then they can run a session', (Final Reflective Interview on using Read&Write Gold™ software, November, 2011).

### **Case Summary**

Jessica's case highlights how a teacher promoted the use of technology as a prompt to determine the learning process and particularly for the purpose of editing texts. The cross checking between data sources through the process of triangulation

however showed there were inconsistencies between the data sources of Jessica and those of her students. Jessica understood text-to-speech technology was being used by writers as a prompt for editing texts. Student data showed it was the students who determined how the technology could be used, developing a process of using text-to-speech technology while writing to attend to their writing goals as well as editing texts. The cross checking of data also highlighted inconsistencies for envisaging a way for how novice or more expert writers could gain meaning from texts being composed. While Jessica reported she found this difficult, student data indicated the opposite. There were students who could use text-to-speech technology to edit their work, change text organisation on the screen and listen to the meaning of their texts at the same time.

Playing around with software until one knows how to use the software and having to cope with a range of factors that impact negatively on integration procedures, does not necessarily motivate a teacher to focus on the potential that technology could have for redefining writing pedagogy.

Jessica enhanced the strength of her traditional teaching approaches when she aligned the adoption of technology to enable students to engage and think differently about how they could attend to the construction and editing of their texts. However, she did not continue to use the Read&Write Gold™ software for teaching writing once the research had finished. The fact that she had to contend with a range of difficulties both teacher-related and situation-related when using the software, impacted on the level of its integration into her writing lessons.

## **Chapter 5: Findings for the Case of Brandon**

Brandon was initially positive about teaching writing with technology in his socially-orientated writing classroom (Nail & Townsend, 2010; Silió & Barbetta, 2010). His explorative practices and pre-writing exercises to adopt the technology to transition his students from writing with pen and paper to writing using a computer screen, provided a foundation for students to think how they could use text-to-speech technology to support their individual writing needs. However, Brandon did not explicitly show students how to apply the new foundational skills learnt through the pre-writing exercises to attend to individual writing goals during students' individual writing time when composing narratives. Brandon was frustrated by a lack of technical and collegial support, which in the end impacted on his motivation to continue teaching with text-to-speech technology, despite having established a rich technological pre-writing experience for all students.

Brandon's case illustrates that teachers require time, technical support and collegial mentoring to understand the complex relationship between teaching, learning and technology. Brandon's case also shows that teachers need to explicitly focus individual students' attention and then facilitate those students to apply newly learnt competency skills into the writing process to attend to writing goals during their individual writing time. Doing so may also promote and sustain a teacher's ongoing learning and skill development with technology throughout the whole learning to write process. A one size approach does not fit all teachers. Knowing how to effectively design instructional procedures to transition individual students' newly learned skills of writing with technology into the process of writing can be more complex than creating instructional procedures for all students to learn how the software could be used.

### **Background Information.**

Brandon was an experienced primary school teacher who was teaching a class of 30 Year 6 and 7 students at the time of the research. Springbank Primary School had a total student enrolment in the 365-375 range. The ICSEA value of Springbank Primary School in 2011 was in the range of 940-950, with approximately 42% of students in the lowest SES quartile and less than 5% in the upper SES quartile. The school had a total enrolment of 30% students with a language other than English.

Springbank Primary School had an IWB in each classroom, which Brandon used for teaching. Brandon suggested that he was competent user of technology and enjoyed sharing his ICT knowledge with colleagues.

### **What procedures did Brandon and students adopt in introducing new text-to-speech technology into writing lessons?**

#### **Preparation by Brandon.**

Brandon approached the teaching of writing using an exploratory approach to become familiar with text-to-speech technology. He wanted to look for instructional opportunities to integrate the functionality of text-to-speech technology into his traditional teaching of writing. He collaborated with his teaching colleague Jessica after school on one afternoon, to become familiar with the software and to understand how he could introduce text-to-speech technology simultaneously with the ‘*Plan-Write-Revise*’ strategy (Flower & Hayes, 1981). He had enjoyed working collaboratively with Jessica in the past when learning how to use technology for student learning.

We both feel really comfortable using ICT and have integrated it into programs over the years ... collaborating and then demonstrating to other teachers how to use software in different ways. (Field work feedback, Week 1, 2011).

**Introduction to the technological activities.** Brandon introduced his students to the Read&Write Gold™ software by explaining the individual icon features on the classroom IWB. He then encouraged his students to play with text-to-speech technology for approximately three lessons to develop functional competency in using the technology. He did this by encouraging students to practise listening to their writing using text-to-speech technology across a range of different texts outside of writing lessons for the purpose of becoming familiar with the software for improving sentence construction and spelling errors (Fieldwork observation, 2011). Brandon used different approaches to develop students’ functional competencies for listening to texts they had written when using text-to-speech technology. First, he prompted his students to listen to the sound of what they had written,

If it doesn’t sound right, then check if [it is] misspelt. You can correct as you go along or later (Field work observation, Lesson 4, 2011).

Next, Brandon focused students’ attention on the length of the sentences they had written: ‘Listen if a sentence is too long, or talking takes too long’ (Fieldwork



observation, Lesson 4, 2011). Finally, Brandon provided guidance on how to listen to edit a long sentence, ‘Check if you need a new sentence or comma’ (Field work observation, Lesson 4, 2011).

**Instructional literacy activities.** Brandon changed from using his traditional teaching of writing procedures when he realised he needed to engage in different pedagogical methods to develop students’ listening comprehension skills, competencies to apply the use of text-to-speech technology in the writing process and editing procedures. He designed a new pre-writing instructional strategy where students could focus on using the functional capabilities of text-to-speech technology, simultaneously with the ‘*Plan-Write-Revise*’ writing concept within short writing exercises. The new pre-writing instructional strategy involved students writing for 10 minutes using text-to-speech technology on a topic of interest. While writing, the students were to focus on listening to the texts they were writing, develop reading procedures to monitor the development of their texts, become familiar with the keyboard and adopt personalised procedures for editing texts using a combination of listening and reading comprehension skills. When editing their texts, students were encouraged to focus on the length of sentences, spelling, punctuation and full stops. At the end of each exercise, students were to share with a peer their short story and the procedures they adopted when writing with text-to-speech technology.

The kids are excited about stories. When they read to [their stories] the class they realise they need to change the story as it is not what they meant. When using the technology I want the students to listen and analyse what is happening. I want to engage reluctant writers, write for meaning ... extend certain kids. (Field work feedback Week 2, 2011)

Brandon developed students’ listening comprehension skills through the pre- writing exercises by asking his students to take notes with pen and paper while listening to the chapters he was reading from a class novel, *Misery Guts* by Morris Gleitzman (Gleitzman, 2002). He suggested to his students that, ‘writing from a chapter perspective puts a book into words to improve your comprehension’ (Field work observations, August, 2011). Brandon then encouraged the students to keep their notes and refer to them when writing with text-to-speech technology to add meaning to the narratives they would be creating (Field work observation, August, 2011).

Brandon also created instructional procedures with a focus on procedures for improving comprehension by listening for meaning when writing. He encouraged students to focus on the narrative structure by listening to the development of multiple complications building up to support a large

complication and to focus on character development by students listening to how a new character is introduced into their stories and why that character is important (Field work observations, Research Weeks 6-8, 2011).

Brandon focused students' attention to think about writing to entertain a reader, by exploring and sharing with each other the different text-to-speech technology voices, voice playback speeds and sentence highlighters that would support them to write during their pre-writing exercises. When students were composing during the pre-writing exercises using text-to-speech technology, he prompted them to listen to their texts for editing purposes, by focusing on the length of sentences, spelling, punctuation errors and full stops (Field work observations, August to September, 2011).

Brandon explained that when his students had completed ten short bursts of writing using text-to-speech technology to develop functional competency he had seen improvement in students' being able to write. 'The students are getting quicker and quicker to write their ideas down' (Field work observation, September, 2011).

Brandon encouraged his students to use their new text-to-speech editing procedures when they were to write their narratives on the computers in the computer suite. He used his classroom instructional time to draw students' attention to think about the new procedures they were developing by providing time for students to work collaboratively and to 'share and listen' to each other's texts. Brandon also uploaded a student's pre-writing text onto the IWB for collaborative feedback from the whole class, prompting students to listen and then explain to him what they were listening for. 'What are you doing Heidi when you are listening'? If [the] sentence goes too long, talking takes too long, put in a comma' (Field work observation September, Lesson 5, 2011).

**Organisational approaches.** Brandon focused on establishing a new writing environment that transitioned all his students from writing with pen and paper or from using computers as a word processing tool into what he termed new 'pre-writing exercises' (Field work Observation, 2011). He indicated that he wanted to use the exercises as a new instruction that would encourage his students to become familiar with the keyboard and to think about writing and typing at the same time while they were situated within the familiarity of the classroom environment (Final Interview, 2011). The pre-writing exercises consisted of short bursts of writing for 10 minutes, twice weekly with students writing at their desks with pen and paper. He then adopted the procedure for students to writing on computers. Brandon motivated

his students to think about the ideas they wanted to create through the chapter readings from the novel, with a focus on listening and reading comprehension and then discussing the use of vocabulary and text structure from the readings. For example, he explained how, ‘reading a story as a class novel focuses on how a chapter ends, leaving you [the students] to think about developing ideas for the next chapter’ (Field work observation, August, 2011).

### **Preparation by the students.**

While Brandon used his new pre-writing exercises to enable his students to become familiar with the software, his students were observed sharing their ideas and talking about the new functions they discovered or trouble shooting each other’s technological problems. During the first three weeks of the research students shared how they preferred to write when using text-to-speech technology; as suggested by one student;

I looked at Read&Write Gold™ [text-to-speech technology] and found new highlighting colours. I write, ‘Play’, change it and when [it] sounds good, keep ten lines or a paragraph. (Field work observation, Week 3, 2011).

When two students were sharing with each other how they used text-to-speech technology one student commented, ‘I use headphones for spelling and if the story sounds right’, while the other student commented, ‘I changed the voice because it was weird. I was listening for full stops, commas and spelling’ (Field work observation, Week 2, 2011).

## **What procedures did Brandon and his students use in writing lessons using new text-to-speech technology?**

### **Procedures used by Brandon.**

Prior to the research Brandon had well established teaching approaches for teaching writing using a variety of strategies for different writing activities. When helping students to compose texts with technology in the computer suite, he drew attention to the exploratory approaches he had originally adopted for himself. He wanted students to explore how they could integrate the new skills and knowledge they had learnt from their pre-writing exercises in the classroom, into the writing of their narratives in the computer suite. Brandon suggested that students would find a way to change and learn how they could write with technology, as well as being guided

by his intervention. 'The kids learn a lot quicker than me. I get the kids to show different ways'. (Final Reflective Interview, 2011).

I think there were some kids, who actually when listening to it could hear and pick up their mistakes. I also found that there was no substitute for the teacher to intervene, e.g. hear that again! Oh, you still haven't got it! Check this part! I did that, put in my personal input. Some students did read or listen to what they thought or wanted to hear. (Final Reflective Interview, November, 2011)

Brandon understood how to teach writing to students who were transitioning from being novice writers towards developing writing expertise, by using samples of students' writings, as promoted by Retnowati et al. (2010) as worked-examples in the context of Writer's Workshops. At the end of each lesson in the computer suite, Brandon was observed to spend about ten minutes on the IWB conducting a Writer's Workshop with all students. Brandon's focus was on editing stories for spelling mistakes, punctuation and sentence length at a paragraph level. He used Writer's Workshop sessions to show and discuss examples of how different students had implemented the new ideas or skills he promoted for writing with text-to-speech technology (Field work observations, September – November, 2011).

In one of the Writer's Workshop sessions a student discussed how she used text-to-speech technology to listen to her spelling errors at a sentence level as she wrote. Brandon drew the attention of the whole class to focus on the student's sentence construction for using capital letters and full stops as well as spelling errors (Field work observation, September, 2011). When a more experienced writer discussed how she edited her work by focusing on the paragraphs she had written, Brandon modelled to the class how they could first edit the paragraph for spelling, punctuation and sentence length and then focus on improving the meaning of the text (Field work observation, August, 2011).

### **Procedures used by the students during writing lessons.**

Student feedback after composing their individual texts towards the end of Week 7, highlighted the extent to which Brandon's teaching strategies impacted on how his students used text-to-speech technology in a range of different ways (Student Checklist of Software Features used during Writing – see Table 18).

Highlight what I want it to read rather than set continual reading. I read, stop, correct my spelling and then read. (Student feedback, Week 7, 2011)

Write – 'Play' – if sounds good – change it – keep going. I like to read 10 lines at a time or by paragraphs. (Student feedback, Week 7, 2011)

First time I listening and made corrections at the end. Now ‘*Stop*’ in between to fix capital letters. Too long sentences as well, not really meaning. (Student feedback, Week 7, 2011)

I like to use the spell check to see if I didn’t make any mistakes. Then I listen to my story and if it doesn’t sound right, then I use the dictionary to find other words I can use. (Student feedback, Week 7, 2011).

During one Writer’s Workshop session, Brandon played a student’s whole story and then asked the student author in collaboration with the whole class to talk through how he wished to edit his text. The student responded;

I write a paragraph, then play it to myself and then check spelling mistakes. It is easy to do that because in the end you don’t need to check spelling mistakes or if it makes sense. (Field work observations, November, 2011).

### **What was the level of technology integration in this case?**

Brandon introduced Read&Write Gold™ software as technological tools that could support students to think about using a keyboard, a screen and the functions of text-to-speech technology at the same time as thinking about developing a story plot. In doing this he had allowed the technologies to *transform* his writing practice at the *modification* level of the SAMR Model. When he designed pre-writing instructional exercises to encourage students to think about writing and reading from a computer screen instead of paper, to focus on listening comprehension as well as reading comprehension and to adopt text-to-speech technology as a tool which could prompt students’ thinking through the editing process, he had adopted technology to create new pre-writing experiences at the *redefinition* level of the SAMR Model. His students could think as authors and readers not only in the confines of their classroom but also within a digital environment where ideas could be shared within a digital environment.

During Writer’s Workshop sessions Brandon adopted text-to-speech technology at the *augmentation* level of the SAMR Model, when he promoted the use of text-to-speech technology as a direct tool to add functional improvement to the editing of spelling. However, when he promoted the use of text-to-speech technology to facilitate students’ listening comprehension and editing procedures according to the differentiated writing plans that students presented, the SAMR Model provides insight into how the use of technology *redefined* Brandon’s instruction. Brandon had to think differently about his traditional teaching with technology and use different

instructional procedures for novice and more experienced writers as they reflected collaboratively with colleagues on their texts.

When drawing students into the process of writing during their personal writing time, Brandon encouraged individual students to write using text-to-speech technology and to think deeply about the meaning of the stories they were creating. The SAMR Model highlights how Brandon used text-to-speech technology at the *augmentation* level of the model as a direct listening tool to enhance the editing process. When he encouraged students to explore how they could integrate the new knowledge and skills learnt through pre-writing exercises into the construction of their texts, the SAMR Model provides insight into how the students allowed the technology to be combined with their new writing procedures to transform their learning to write process at the *modification* and *redefinition* level. Incorporating instructional strategies specifically for the group process for writing enabled collaborative opportunities for authors and readers to provide feedback on their analysis and thinking related to text production.

Brandon did not have an initial understanding for how to use text-to-speech technology at the *modification* level of the SAMR Model to differentiate individual instruction for students learning to write. While he developed students' skills related to the use of text-to-speech technology, he did not develop goal-orientated instructional procedures with the technology for individual students to specifically apply those skills when composing texts. His work with individual students was not characterised by consistent higher levels of integration. At a modification level Brandon would have needed to specifically create goal-orientated instructional procedures with technology differentiated to individual student writing needs. Goal-orientated instructional procedures would have transformed how individual students attended to their writing goals when reflecting on their own written texts.

It was Brandon's students who had integrated text-to-speech technology into their writing at the *modification* and *redefinition* level of the SAMR Model. When the students adopted text-to-speech technology at a word, sentence, paragraph and whole text level to reflect on the development and creativity of their texts, they had integrated the technology to redefine how they created narrative texts. The use of the technology had allowed for the creation of writing procedures where students could listen to their texts for personalised authoring or editing purposes which would not have been possible without the adoption of the tool.

Brandon realised that he needed to think differently about how technology could be integrated to develop his student's creative writing and self-reflection skills and comprehension knowledge when writing.

There are some students that always need a kick-start with whatever they are doing. They often need a one-on-one just to get going. They can be highly motivated, but you must have to push the button every so often. Other kids, they will just expand, take to it and enjoy it. I don't know if it is for all. (Final Reflective Interview, November, 2011).

The SAMR Model highlights the positive effect that technology can have for transforming the learning environment when teaching with technology. A combination of developing technological transcription skills, the functional skill of using Read&Write Gold™ software and the skills necessary to write and save work on a computer can redefine and transform the learning process for students. The SAMR Model provides insight into the complexity of the relationship between teaching, learning and technology and for how Brandon created pre-writing instruction that enabled his students to become familiar with technology as well as having the skills and knowledge necessary to motivate them to adopt technology into the writing process.

Brandon's questioning and instructional procedures provide insight into how text-to-speech technology as understood through the SAMR Model, can be used to begin the process of reshaping teachers' traditional writing practices. Brandon's levels of technology integration provided a rich technological learning experience and instructional supports that combined writing, teaching and technological skills as interpreted through different levels of the SAMR Model.

### **What factors influenced Brandon and his students' use of the new text-to-speech technology in the writing lessons?**

#### **Factors influencing Brandon's use of the technology.**

**Teacher knowledge.** Brandon understood that all students needed to develop their technological transcription, editing and listening skills and that he could do this by developing an instructional procedure using text-to-speech technology. The TPACK Framework (M. Koehler, 2014) provides insight into how Brandon combined his prior teaching knowledge and that of his students' writing knowledge for teaching his students the skills necessary to write a narrative through short bursts of pre-writing exercises and how Brandon and his students could develop skills for writing

with technology and reading from a screen at the same time. Brandon suggested that when students;

Ruled off or saved their work each day to maintain each idea [in the pre-writing exercises] they were getting quicker at writing and getting their ideas down. The computer was not a novelty to use but to check work, strategies to access, especially group strategies. Students are developing knowledge of computers to write for meaning. (Field work reflections, August, 2011).

Brandon was motivated to adopt the Read&Write Gold™ software to assist students' composition and editing skills. When asked in the teacher questionnaire how much he believed technology could assist students to access learning, Brandon indicated a 4 on a scale of 1-5, where 5 represents 'very high'. His exploratory approach towards understanding the potential of integrating text-to-speech technology into the teaching of writing provided him with the knowledge to change from using his traditional writing procedures to focus on new instruction to develop students' listening comprehension and editing skills. Brandon understood that all students needed to develop their technological transcription, editing and listening skills by learning how to use the functionality of text-to-speech technology when writing. This provided him with an opportunity to think differently about how he could integrate his prior teaching of writing knowledge with that of learning how to use technology while writing at the same time.

Brandon's instructional competency for learning and skill development with technology demonstrates that he was at the *entry* and *adaptation* stage on the competency continuum when students were composing texts and at the *transformation* stage when preparing students to plan how to compose their narratives (Russell et al., 2006).

At the *entry* stage, Brandon had an awareness of the possibilities that technology holds for improving learning, especially for making functional improvement to enhance student learning. His own instructional competence developed from the entry stage through the *adaptation* stage and finally *transformation* stage when he integrated technology into pre-writing experiences. During this process Brandon's students began to develop a combination of writing and technological skills at the *adaptation* stage, which enabled them to further enhance their own learning strategies while composing texts.

Brandon was influenced by a lack of technical and collegial support to think how he could use technology as a catalyst for significant change when students were



composing texts in their individual writing time. Although he developed new learning opportunities with technology that redefined the use of technology to transform students' written plans prior to writing narrative texts, he did not use these skills to make a significant change to his own teaching procedures when students were writing. Brandon focused students' attention on listening and comprehension skills but not how the students could apply those skills to attend to their individual writing goals.

While the focus is on Brandon and how he adopted new technology to both support his traditional teaching and also to create new learning instructions, it is to be noted that his students also used text-to-speech technology as a catalyst to think differently about how to compose texts. The pre-writing exercises that Brandon created, provided an opportunity to redefine the teaching and learning roles between the students and the teacher as students were composing texts. Brandon's students adopted exploration approaches while writing, based on how Brandon had creatively adopted technology into the classroom writing environment.

**Teacher motivation.** Brandon was motivated to combine his prior knowledge about teaching his students skills for writing narratives through short bursts of writing, to how they could develop skills for writing with technology and reading from a screen. Brandon changed from using exploratory procedures to become familiar with the software and explicit teaching procedures for writing from pen and paper to using a computer screen by developing pre-writing experiences where all students could create texts through short bursts of writing with technology.

The success that Brandon experienced when he was focusing on how text-to-speech technology could be used by all students, through a combination of listening and reading comprehension, typing and revision editing skills at the same time, did not however motivate him to create new instructional procedures when students were actually composing texts in the computer suite. Brandon suggested, when students were using the technology as they were composing texts it had made his teaching more difficult. He had to rely on student feedback to understand what students were thinking when they were writing with technology. Brandon indicated that 'previously his students used computers in a very social way', where there is 'always a lot of chatter' (Field work feedback, Week 3 2011). When his students composed texts with the use of earphones the classroom conversations between students became

reduced as they were focusing on developing their own writing procedures using text-to-speech technology (Field work observations, 2011).

Brandon also experienced difficulties installing the software on the classroom computers and in the computer suite and this had a very negative effect on Brandon's motivation to design new instructional procedures.

It was problematic from a logistical point of view, especially in a classroom that was socially-orientated. The students didn't have an opportunity to play with the program. We also had problems with the imaging of the software on each computer in the computer room. We had to install the software individually on each computer (Final Reflective Interview, 2011).

Feedback on the teacher questionnaire supports this finding, as Brandon indicated a 2 on a rating scale of 0-5 (where 0 is being least and 5 being the most) for believing that technology had enabled him to improve how he prepared for writing lessons, and that he believed the use of technology had made teaching more difficult for him (indicating a 4 on the rating scale outlined above, Teacher questionnaire, 2011).

Brandon did design instruction for how students could adopt text-to-speech technology to support their listening, reading, typing and revision skills. He also promoted the adoption of technology as an editing tool, which he understood would enable students to self-monitor the construction of their texts as they were writing. Brandon did not use the potential benefits that explicit teaching about sound could promote from the integration of text-to-speech technology when incorporated into writing instruction to promote the relationship between reading and writing when students were composing texts. Brandon could have worked collaboratively with individual students, demonstrating how the functionality of text-to-speech technology could be used to develop meaning from the revision of their texts when writing. While Brandon indicated a 3 (where 0 is being least and 5 being the most) on the teacher questionnaire for how he believed technology could encourage students to take a risk to change how they learn, he also indicated a 4 (where 0 is being least and 5 being the most) for believing that his student's self-confidence about themselves as writers had likely changed since writing with technology (Teacher questionnaire, 2011).

Although Brandon initially believed that technology could be a valuable tool for learning (Teacher Questionnaire feedback, Week 7, 2011), he understood his teaching had changed since using text-to-speech technology because he was not as effective in cognitively engaging his students in writing as he thought he should have

been. He explained that he ‘pulled back and took a look at the whole thing and use of it and if it was going to work’. He was unsure if text-to-speech technology was the most effective tool for his students to use while composing texts, especially as he had noted that ‘some kids were flicking back onto Word™, what they know’, and others were only at the stage of learning to type. ‘I keep thinking about the boy who is just learning to type [...] he is not ready to do something like this.’ (Final Reflective Interview, 2011).

Brandon was challenged when working with new technological tools as compared to use of his traditional writing tools. He was unsure how effectively he could sustain what he believed was an effective pedagogy to develop students’ comprehension of texts and to think about writing as authors while composing with technology. Brandon’s instructional competency with using technology, brought him to an understanding, how as a teacher he needed to ‘be the computer instructor’ (Final Reflective Interview, 2011).

**Technical support.** The technician was responsible for managing the school network, trouble-shooting technological problems and ensuring that students adhered to computer room rules, access procedures and setting up student personal folders onto the school intranet. The technician was on leave for the duration of the research and Brandon was unable to draw on his expertise when he had difficulties installing the software. The computers, could not run the software because of the Intel chips. ‘We [Brandon and Jessica] thought we could use the software on all computers but it would only work on four’ (Final Reflective Interview, 2011).

**Collegial support.** Brandon did not have access to the expertise of a mentor teacher to support him in understanding how to integrate technology into the teaching of writing. He experienced difficulties integrating text-to-speech technology into his pedagogy to support students to use the functionality of text-to-speech according to their differentiated writing needs. This impacted on his confidence to persevere with the technology while students were composing texts.

It would have made a difference if I could have been provided with some direction in spite of the students’ determination [to persevere with the software] (Field work feedback, 2011).

Brandon explained that he believed using text-to-speech technology had made his teaching more difficult, ‘thinking, it became more of a chore’, and that some of his students could use it and others not, suggesting ‘they are all different’. (Final Reflective Interview, November, 2011).

**Administrative arrangements.** The administrative arrangements for Brandon having to teach writing in split locations so students could access the software in the computer suite made it more difficult for Brandon to teach writing. Teaching between two locations impacted on how Brandon understood he was able to establish an effective learning environment and his confidence to have time to explore and develop the pedagogical practices when writing with technology. Brandon suggested, ‘time was restrictive and I didn’t have control over that’ (Field work feedback, 2011).

Brandon’s students had previously been the experts in the skill of knowing how to use technology, ‘If it’s in the software, then I ask the kids as they know how to do that’ (Field work observations, 2011). Brandon realised his exploratory pedagogical approaches were not an effective approach to integrate technology. When Brandon was asked at the end of the research how he thought students felt about writing when using text-to-speech technology, he offered the following comments.

It was fun, even though the voices may have driven me mad.  
The technology doesn’t edit the students work very well.  
I needed to tell the students, you are the computer instructor.  
The data of student writing when using technology, did not really tell the story of student learning.  
I let the students go more to it on their own.  
I looked for opportunities, but the Writer’s Toolbox already had different tools. (November, 2011)’

Factors influencing the students’ use of the technology.

**Motivation.** Student feedback illustrated how they enjoyed writing with technology (Questionnaire feedback on ‘Thinking with Read and Write Software, November, 2011).

Thank you for making Read and Write Gold because it helps you with your writing.  
I love the software and definitely like using it.  
I like the program, it helped me a lot with my writing skills.  
I hope next time we get to learn how to use the other icons.

**Student difficulties in managing the software.** While one student suggested that ‘listening and making sure I am right with all of my writing [...] and there is a nough [enough] icons to use to help you with writing’ (Questionnaire feedback on ‘Thinking with Read and Write Software, November, 2011) there were other students who had difficulties in learning how to manage the different software icons. These included specific icons such as the Read&Write Gold™ dictionary and Read&Write

Gold™ spell checker. One student suggested how he had difficulty with completing words when writing with technology, ‘If you write a word and you know what it is, but can’t type it when writing’ (Questionnaire feedback on ‘Thinking with Read and Write Software, November, 2011).

Another student suggested how he did not have difficulties managing the software because, ‘I only used a little bit of the icons, and all of them are basically easy... and I only write what my brain tells me what to write’ (Questionnaire feedback on ‘Thinking with Read and Write Software, November, 2011).

There were two students in Brandon’s class who had major difficulty in using the functionality of text-to-speech technology. The first student found the ‘speech confusing.’ She realised that although she liked using the highlighting of texts when listening to text-to-speech read her stories, she was still getting the words wrong and needed to use a spell checker to help her (Questionnaire feedback on ‘Thinking with Read and Write Software, November, 2011). The other student found the ‘*Stop*’ and ‘*Play*’ buttons difficult to use because ‘sometimes it would not stop or play’ (Questionnaire feedback on ‘Thinking with Read and Write Software, November, 2011).

### **Case Summary**

When Brandon was asked if he had continued to integrate technology in his teaching of writing he responded, ‘What really is interesting, is that we are all still using pen and paper’ (Final Reflective Interview, November, 2011). He shared how he preferred to teach writing by giving his students an opportunity to ‘talk and plan’ and get their ideas down on paper. He explained how his students ‘were not quick at getting their words down on a computer’, despite the exploratory approach he used to become familiar with the software and the pre-writing instructional exercises he had created. He suggested it was more effective and less time restrictive using pen and paper (Final Reflective Interview, November, 2011).

The findings emerging from a cross checking between data sources to see if students and Brandon gave the same conclusion in regards to the level of technology integration are inconsistent. Brandon focused his teaching to ensure his practice was effective for students to learn how to manage technology when writing. However, there were students who could use text-to-speech technology in a range of different ways to develop their writing ideas. Students not only focused on practicing Brandon’s pre-writing skill development with technology, they also integrated text-

to-speech technology to construct texts in their individual writing time by creating instructional procedures at a word, sentence, paragraph and whole text level. These students integrated the technology to reflect on the creativity of their texts.

After the research period was completed Brandon abandoned the technology and returned to his traditional instructional procedures, where he did not have to be influenced by technical, administrative or collegial supports to teach writing. Some of his students showed they could effectively design instructional procedures. They were successful in writing with technology through the composition process.

The fact that Brandon didn't continue to use technology suggests that he experienced difficulties aligning the use of technology to writing experiences. This was not the case, as there was a high level of integration on some tasks, indicating the level of redefinition of his teaching was quite varied. Brandon was successful when he created pre-writing experiences for students to adopt how to write with the technology. He capitalised on the time he had to ensure the changes he made to his own teaching were effective for students to learn how to manage technology when writing. However, while the level of integration was high for adopting the use of the technology, the administrative, technical and collegial difficulties he faced, suggests there needs to be an effective alignment of teacher-related and situation-related factors in all writing activities, for teachers to effectively teach with technology.

## **Chapter 6: Findings for the Case of Hayden**

Hayden was initially apprehensive about teaching with technology and spent time using his out-of-school technological experiences and knowledge to understand the software. He was successful in establishing a supportive technological environment which enabled him and his students to learn how to write using technology. He also designed instruction where students could use the functional capabilities of text-to-speech technology to revise texts. However, Hayden was frustrated by the lack of collegial and technical support and an imbalance in his own technological knowledge. This impacted on his confidence to continue teaching with technology. Hayden's case provides insight into how a range of instructional strategies and prompts are necessary if Hayden and his students are to adopt text-to-speech technology to enhance the writing experience. The case also highlights how collaborative learning design opportunities can be influential if teachers are to be successful in adopting technology to transform their practice.

### **Background Information.**

Hayden was an experienced primary school teacher, who had been teaching for over 20 years. At the time of the research he was teaching a class of twenty-four Year 6 and 7 students. Redgum Primary School had a total enrolment in the range of 320-330 students. The ICSEA value of Redgum Primary School in 2010 was in the range of 1080-1090, with approximately 19% of students in the lowest SES quartile and less than 48% in the upper SES quartile. Eighty-four per cent of the school's students spoke a language other than English at home.

There was a suite of 30 computers which Hayden accessed throughout the period of the research. Hayden's principal suggested that Hayden was recognised by his colleagues as an innovative leader who was respected for his enthusiasm for improving student learning.

### **What procedures did Hayden and students adopt in introducing new text-to-speech technology into writing lessons?**

#### **Preparation by Hayden.**

Hayden's previous experiences in teaching with technology had focused on using technology as an enabler, to assist individual students learning needs. He had focused

on how technology determined how a specific learning outcome could be achieved (Jordan, 2011). Hayden commented;

Computers are not used to change classroom practice in this school. We use software ... to assist with writing, research and literacy lessons and we use the web for researching and accessing online literacy and maths game. (Field work feedback, Research Week 1, 2010)

Hayden anticipated it could be problematic to adopt the new Read&Write Gold™ software into his teaching without knowing how to motivate his students to use the technology or to have a structure to assist him to understand the characteristics of the software features.

I can try and get the kids excited about doing the research because I can see the advantages from the cognitive development and the potential for writing. But the kids, if they think they are not going to manage it before they start, then they stop. (Final Reflective Interview, 2011).

It was also important for Hayden to acquire a depth of understanding about the software before he could begin to teach writing with it. While Hayden attended an initial one day training workshop and spent three evenings at home becoming familiar with the different features and how to overcome problems when using it, he felt this was not enough time for him to fully understand the complexity of the software.

I need to have a good thorough understanding at the beginning. I need to play around with technology in a certain framework. (Final Reflective Interview 2010).

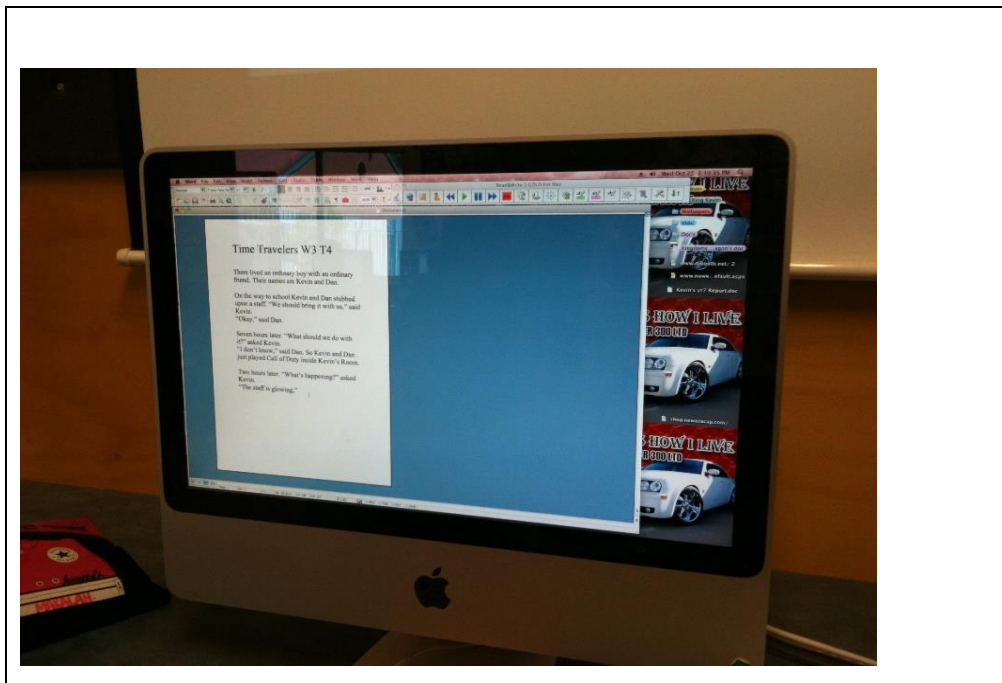
**Introduction to the technology activities.** To support students' writing development using the new technology, Hayden used an exploratory approach to engage his students in understanding how to manage the functionality of text-to-speech technology. The focus was on knowing how to select voices, screen reading, highlighting colours and a speed for listening to and reading text from a screen. Hayden introduced the technology to his students by linking students' prior technological knowledge to the ways of thinking about writing with technology. Hayden explained to his students, how learning to write with technology is like learning to use a mobile phone for the first time. He outlined how it is important to understand and know how to use the functions of the software (Week 1 Field work Observations, 2010). During the first three weeks of the research Hayden explicitly introduced every icon on the Read&Write Gold™ toolbar to his students and he provided time for students to play and become familiar with all of the software



features. As the students began to adopt the software he observed how they combined their technical and writing skills at the same time.

I found they [students] played with the tool to help with their spelling. The floating tool bar can be used to individualise learning. It is not a specialist program, but has specialised supports for the students. I also gave the students topic vocab words to assist their writing. I found some students like to pretty their text [using different fonts] and personalise their screen saver. I think if students are to think about writing for a reader then they will need to write quite a paragraph or page and then backtrack to read it all first before editing. (Fieldwork feedback, Research Week 1, 2010)

Figure 11 Student personalised screen saver and floating tool bar (2010).



As you can see the student has personalised his writing environment, inclusive of the floating tool bar, screen background and size of font.

Hayden promoted instructional opportunities for how students could personalise their writing environment using the new text-to-speech technology. He particularly focused on how students could personalise their computer screens, along with the size of font and the text-to-speech technology play-back speed (see Figure 12). Student feedback indicated that they used a range of voice speeds from 47-64% (Field work observation, Writing Research Week 4, 2010).

Hayden explicitly discussed with students the technical skills that he understood students would need to think about while writing.

I observed that the software features had little impact for enabling the students to think about the quality of their writing, to achieve their personal writing goals or to complete a writing task in the lesson time. (Field work reflective feedback, 2010)

He modelled to students how they could backtrack over their texts and listen as a reader to their stories. He suggested that students could ‘listen and reread’ what they had written, including thinking about the ‘speed of play and same sounding words’ they had used. If students were unsure how to spell same sounding words, he also modelled how they could use the same sounding icon on the Read&Write Gold™ toolbar to check their spelling (Field work observation writing Lesson 4, 2010).

**Instructional literacy activities.** Hayden explained that he had already established classroom writing practices and motivational strategies that he regularly used in his writing lessons and how he was hoping he could continue to use these traditional procedures when teaching with technology. These procedures included brainstorming and the provision of weekly vocabulary lists and word meanings to support students when writing. At the start of every writing lesson Hayden would have the focus words listed on the IWB. As many students were still learning to speak in English, Hayden asked the students to only respond to the whole class in English. Students were often observed sharing ideas amongst themselves in their mother tongue before sharing their ideas with the whole class in English (Field work observations, 2010). Hayden remarked that it was very difficult for some students to gain deep knowledge about writing without thinking and sharing their ideas in their mother tongue so he found it was necessary to repeat back or model to the whole class how to express the students’ shared ideas orally.

Hayden created instructional strategies where text-to-speech technology was integrated into writing instruction for students to reflect on how they could differentiate the use of the technology according to their individual writing needs. He did this by supporting students to learn for themselves how and when they could use the Read&Write Gold™ features on the toolbar, especially to improve their writing (Field work observations, 2010).

I want you to think about this when you are writing. Think about your style of writing and that your texts need to be readable. Use the spell checker to edit your spelling. If you use certain features it may take you from a D to a C grade. What features would improve your writing? (Field work observations, 2010).

When Hayden suggested that his students that they could write a narrative using the writing topic, ‘Time-lords’, he asked his students to ‘chat with a friend about the

ideas you have and how you plan to use text-to-speech' (Field work observations, research Week 2, 2010).

Hayden provided pre-writing instructional activities using the IWB to spark a whole class discussion about how students could use the play-back feature of text-to-speech technology to help them compose their texts.

Storytellers give information. Think about good family storytellers and remember, a hero catches a big fish, not a little one! Also, remember to save your work and think about the speed you prefer to listen to when you are writing. (Field work observations, Week 4, 2010).

Pre-writing instructional activities exemplify a deliberate use and means to structure practice, which Hattie and Yates (2014) suggest can build knowledge and develop skills.

**Organisational approaches.** Hayden introduced technological instructions by explicitly teaching students how to organise their writing environment both in the classroom and in the computer suite. This included how to save and retrieve written texts from the school intranet, how to personalise a writing font and size and how place the text-to-speech technology toolbar onto a computer screen to facilitate the ease of writing and reading on a screen.

Hayden did not have a set access time to the computer suite, as teachers negotiated with their colleagues on a needs basis. Hayden reported that after consultation with his teacher colleagues, the teachers gave him 3 x 50 minute access to the computer suite for the 20 weeks of the research (Field work feedback, 2010). His classroom was also one of two in the school where an IWB had been installed, along with another IWB in the computer suite. Hayden used the IWB in his classroom at the start of every lesson to introduce the weekly writing topics. The topics focussed on events that were happening in the students' local environment or the world at large and were often revisited during the week in their Society and Environment lessons or on the television at home.

The topics included:

1. Space Travel — in response to the anniversary of man walking on the moon
2. Time Travel — in response to a new Dr Who in the television series
3. Pop Star — in response to the Pink concert at the Adelaide Entertainment Centre
4. Lost in the Desert — in response to a tourist becoming lost in the Australian desert

5. Underwater — in response to an excursion to a water theme park
6. Free Choice — after the school holidays
7. First Day Back at School — transition to high school
8. Cars — local car rallies coming up. One was of vintage cars and the other of V8 super cars
9. Bicycles - The Tour Down Under promotions were released in Australia
10. Springtime — seasonal response

### **Preparation by the students.**

When Hayden provided time for students to personalise the text-to-speech play-back speed to support their comprehension of spoken texts the students reported that they used a range of voice speeds from 47% to 64% (Field work observation, Writing research Week 4, 2010).

In preparing students to think about the positives and negatives for writing with technology, Hayden asked the students, ‘What arguments would you have to keep the software in the school? Students responded:

1. I can hear when I make mistakes. I read as I type and hear my mistakes better. It helps my spelling. I mostly get words wrong so I go to the spell-checker [in Read&Write Gold™] and can always learn how to correct it.
2. It definitely helps me, I don’t know how, but it does.
3. It helps me find words, helps me remember.
4. I don’t like it [Read&Write Gold™] because it makes me work.
5. I don’t like the software spell-checker so I deactivated it. (Field work observations, 2010)

The positive views reflected in the above comments were more common than negative views held by a few students.

What procedures did Hayden and his students use in writing lessons using new text-to-speech technology?

### **What procedures did Hayden and his students use in writing lessons using new text-to-speech technology?**

#### **Procedures used by Hayden.**

In terms of narrative genre instruction, Hayden encouraged his students to focus on being good storytellers; ‘Good storytelling, think about this when you are writing’

(Field work observations, Research Week 2, 2010). Using the writing model of ‘*Plan-Write-Revise*’, Hayden explained the narrative genre structure of orientation, complication and resolution (Australian Curriculum Assessment and Reporting Authority, 2011) and he encouraged students to write in separate paragraphs for each part of the structure. He also provided explicit writing instruction on the use of similes, grammatical conventions, how to quote direct speech within texts and the use of punctuation. Hayden also promoted students to continually think about their spelling, encouraging them to get their story ideas written before focusing on correcting spelling errors (Field work observations, 2010).

Hayden encouraged students to form complex sentences while they were writing, by modelling to individual students as they were writing how they could use descriptive adjectives, similes, punctuation, dialogue and different forms of words to develop their stories. He prompted students to write and then to listen to groups of sentences they had written. He also asked students to think about, ‘What is in your reader’s head?’ (Field work observations, Week 4, 2010), emphasising that storytellers provide a listener or reader with a picture in their head. Hayden used students’ individual writing time as a teaching opportunity for students to think how the style of their writing needed to be readable.

One of the things that was really important to me was I was able to actually be really specific with teaching points. The kids really knew that was what you were supposed to be doing. IT [technology] therefore became part of the literacy moment. (Final Reflective Feedback, 2011)

Hayden promoted collaboration and peer sharing amongst students, while they were composing texts with text-to-speech technology. He suggested they could question each other’s writing ideas by asking some of the following questions:

How has text-to-speech improved your work?  
What icons have you used with text-to-speech?  
Are you finding more mistakes than you would normally?  
Is the text-to-speech software improving your sentence structure?  
Would you prefer to write without or with text-to-speech?  
(Field work observations, 2010).

Hayden encouraged students to think how text-to-speech could enable them to attend to their individual writing goals. Specifically, he promoted the ‘read-back’ feature of the technology as a revision tool to support individual student writing development and to facilitate their listening and reading comprehension of texts. As a revision tool for both novice and his more experienced writers, Hayden used a structured

approach. He began focusing students' attention on improving their editing skills by using the Read&Write Gold™ spell checker and grammar tools, as well as asking students to look for white spaces in the text and full stops (Field work observations, 2010).

There were two distinct approaches Hayden used to encourage students to reflect on the meaning of their texts.

First approach: How many words have you written or how long is your story? Read aloud your text to a partner for peer review feedback. You can use the software to read it for you. When you have written a paragraph or a page, use the technology to back-track to the start and reread your writing to hear if it makes sense. You can change the speed of play. [Pause] Listen for some sounding words and check if you have the right word. (Field work observations, 2010)

Hayden adopted a second approach, asking students to reflect on the difference between writing with technology and writing without technology, to see if the use of technology was having a positive influence on students' storytelling.

Second approach: Why don't you reflect on a piece of writing before the research and a piece of writing during the research? Which piece of writing do you like best and why?

Finally, Hayden encouraged students to peer review their stories by listening to each other's texts using text-speech technology. As students developed confidence in using these strategies, Hayden suggested that students could choose how they wished to use the read-back feature of text-to-speech to revise their stories. They could either begin by editing their stories or focus on the meaning of texts. Whichever approach students chose to use, Hayden suggested they, 'still need to have texts edited by peers' (Field work observations, 2010).

### **Procedures used by the students during writing lessons.**

Feedback from students was varied about the procedures they used for writing with text-to-speech technology. The terminology of 'skim and scanning texts' emerged as students discussed how the highlighted text enabled them to read ahead of the spoken word or how the slow loading of some icons gave them an opportunity to read ahead because they were too impatient to wait for the feature to activate. Feedback from one student provides insight into how the terminology of play pattern emerged for using text-to-speech technology, 'The play pattern [ *'Play'/'Stop'/'Rewind'/'Fast forward'/'Pause'* ] reads the story for you, and all you need is to sit down, listen and think' (Student feedback checklist, Week 7, 2010).

Other student comments included;

I think it helped me changing the mistakes. When I read all over again with the Read&Write Gold™, there were couple of mistakes that I could find and I learnt how to spell the words that I did not know before.

It is good for listening and not looking at the screen as I type. (Student feedback checklist, Week 7, 2010).

The Read&Write Gold™ is quite important for students to exercise or improve our writing. I used it as a dictionary. I think the most important thing is the play pattern. It helps you to read your writing (Student feedback checklist, Week7, 2010).

When Hayden asked his students to listen to each other's stories using text-to-speech the students were observed enjoying sharing their stories and comments such as, 'Listen to this', could be heard around the computer room (Field work observation, 2010). One student asked if the whole class could listen to his story by using the IWB in the computer suite. This turned out to be extremely popular with the students, as one student suggested, 'It is just like my teacher reading it to me, we can all hear'. (Student feedback checklist, Week 7 2010)

### **What was the level of technology integration in this case?**

If we look at the SAMR Model for teaching with technology, it becomes clear that Hayden had adopted the use of technology at the *augmentation* level of the model to enhance his teaching when he used text-to-speech technology with the additional functionality of the spell checker feature, the organisational strategies for saving and retrieving texts and the setting out of texts on a page. The technology provided functional improvement to assist students to overcome writing difficulties such as spelling and sentence construction, as well the provision for storing writing samples on the school intranet. Hayden also enhanced his teaching practice and his students' learning opportunities when his students explored the functionalities of the software to improve the mechanics of their writing and to listen for meaning in the stories they were creating. At this level, the adoption of technology had allowed Hayden to build students' functional competencies in using technology so they could effectively develop listening comprehension skills to focus on the meaning of texts. However, Hayden did not significantly or consistently adopt the technology as evidenced at the *modification* level of the SAMR Model; in other words, to change how he traditionally taught the peer-reviewing of texts. He continued to encourage students to focus on storytelling, but to do so through listening and reading comprehension

skills using the technology instead of students reading out loud when peer-reviewing texts. The instructional process was the same, with the use of technology acting as a direct tool providing functional improvement.

At one stage Hayden demonstrated how students could skim and scan their texts while using the read-back feature of text-to-speech; they could effectively listen to texts at the same time to assist in the comprehension and revision of texts. At this point he was promoting the adoption of technology to transform his teaching at the *modification* level on the SAMR Model. At this level Hayden asked his to adopt the technology to focus on the highlighting of texts being read, and then to read ahead or behind the text being read for a few words or sentences, skimming and scanning for errors, spaces between words, sentence length, capital letters and full stops to ensure that corrections could be identified for developing the meaning of texts.

The use of technology at the SAMR Model *modification* level, had allowed for a significant redesign of how Hayden taught students to write. Previously, he had encouraged students to write simply as story tellers. He had asked them to back-track over their texts or to skim and scan ahead of texts while reading texts for meaning at the same time. Hayden also developed instruction with technology, by encouraging his students to collaborate and share how the use of text-to-speech technology could assist them to think about the reader and the author while constructing texts. He suggested how one student now, ‘engages herself as a writer, sees herself as an author. Her language construction is more storybook and not retelling’ (Field work feedback, October, 2010).

Designing instruction for planning, writing and revising texts in Hayden’s classroom required the effective integration of technology at both the *augmentation* and *modification* levels of the SAMR Model. Integrating technology using exploratory practices enabled Hayden to use both his out of school technological experiences and those of his students to think differently about how to adopt technology to enhance the learning to write process. However, when Hayden focused on the conceptual writing model of ‘*Plan-Write-Revise*’ by providing students with planning cues, prompts, instructional strategies and opportunities to collaborate and share in the use of technology, the technology use *transformed* how students began to think about the construction of their texts by focusing at a sentence, paragraph and whole text level.



## **What factors influenced Hayden and his students' use of the new text-to-speech technology in the writing lessons?**

### **Factors influencing Hayden's use of the technology.**

**Teacher knowledge.** Hayden began the research using a combination of his traditional teaching approaches to teach writing in combination with an exploratory approach to understand how the functionality of the Read&Write Gold™ could be used to write narrative texts. Hayden's traditional approach focused on students' brainstorming their writing ideas and discussing word meanings as a whole class, having individual student writing time, providing peer feedback on texts and then publishing by typing stories for marking. When using technology to write narratives he encouraged students to explore how the software could support them to be story tellers and how different software features could help the editing process.

Hayden shaped the writing environment with technology by creating a positive learning environment for students to write with technology and he provided opportunities for students to reflect through the technology on the meaning of their written texts while composing and collaborating with peers.

However, Hayden was not actively engaging with his students during their individual writing time. He didn't use this time in the way that Jessica used it to monitor how individual students were adopting the software to think about the meaning of their texts while writing. Hayden was unsure if exploratory and collaborative approaches were effective approaches to support his students to develop their ideas as storytellers when writing with text-to-speech technology. He was continually reminding the students as a group to think about storytelling when they were writing, 'I want you to think about this when you are writing' and then he promoted a focus on technology use for editing strategies of spelling, paragraph structure, full stops, capital letters and speech marks (Field work observations, 2010). He had adopted technology as a tool for writing and had connected text-to-speech technology and other technological tools on the Read&Write Gold™ toolbar to the writing process, by focusing the class' attention on the relationship between the reader and the writer to promote storytelling and then the editing of texts.

Hayden combined his previous writing instructions with new instruction using the new text-to-speech technology to motivate his students to explore how text-to-speech technology could be adopted to assist their individual writing goals and preferences for how to use the read-back feature of the technology to revise texts. This included,

as he suggested on one occasion, asking a student to think differently about other Read&Write Gold™ tools that she would need to support her writing goals, ‘Why don’t you use the dictionary icons on the tool bar instead of bringing a dictionary from the classroom?’ (Field work observation, 2010)

Hayden also thought teaching with technology had made him become more explicit in teaching students how to pronounce words, as observed when using the read-back feature of text-to-speech technology as a tool to promote listening comprehension, ‘hear the sound, this is the sound, this is where your tongue goes’ (Final Reflective Interview, November, 2010).

Feedback from Hayden in the teacher questionnaire on how much he believed teaching with technology had enabled him to differentiate lessons for individual students, indicated a 3 on a scale of 0-5 (with 0 being the least and 5 being the most). This was significant because while Hayden was observed to have promoted a writing environment where the use of technology had enabled his students to differentiate how they used technology to create narrative texts, Hayden himself was not aware of the impact his teaching was having on individual student’s use of the technology. He admitted

I didn’t feel comfortable [teaching with technology] because I was looking for something I could do to the students [a specific strategy] so I could measure it [the outcome of using a specific strategy] (Interview, 2010).

Consequently, at the end of the research, Hayden’s beliefs about differentiating instruction for individual students had not changed. Hayden indicate a 3 on a scale of 0-5 (with 0 being the least and 5 being the most) for how much the installation of the software had enabled him to differentiate writing lessons to cater for individual student’s needs. He was unsure of the purpose for what his students were using text-to- speech technology when composing texts.

I wonder if kids were using it as a supportive tool but making a cognitive step to use it as a supportive tool. I’ve made a conscious decision. I know I want to listen if my story makes sense. I want to spell this word, I don’t know how to spell this word and I’ll type it up and see if it sounds right. Therefore they are using the adaptiveness of the tool but making a cognitive reasoning behind it. I think the kids saw it as a chore, which is a pity for me, because I do like to get them excited about learning and maintaining learning. (Final Reflective Interview 2010)

At the end of the research Hayden’s experiences in teaching writing with the new text-to-speech technology did not align positively with Hayden’s approach for how

text-to-speech could be integrated into writing instruction to facilitate editing and development of meaning in narrative texts.

If I had the software on my classroom computers I know I would have operated much, much differently. The software was only on the computers in the suite as I only had 4 computers in my classroom. The students also typed up their story, but did not go to the next level of editing when reading the story back. We listened to the stories as a whole class by having text to-speech read to them on the IWB. It was great but different, as I saw that as only responding to the text. (Final Reflective Feedback, 2011)

Hayden's instructional competency for learning and skill development with technology demonstrates that he grew within his own professional competency from the *entry*, to the *adaptation* and then *transformation* stage on the competency continuum (Russell et al., 2006). At the *entry* stage Hayden demonstrated an awareness of the possibilities that technology could have for enabling students to improve their editing skills by adopting the use of technology to enhance the learning to write process. However, he experienced administrative difficulties in accessing computers for every student in his classroom and lacked collegial support to create new instructional experiences. This impacted negatively on how he could sustain and/or redefine his teaching practice.

At the *adaptation* stage of the competency continuum, Hayden integrated the new text-to-speech technology as a tool into his traditional writing practice, for students to reflect how they could edit texts with the use of technology. His instructional processes at this level enhanced the teaching of writing practices. He noted, 'The writing process I use – do some published work, read it out, get feedback [...] before I mark it' (Teacher interview, November, 2010). Hayden had provided learning experiences with technology that enabled his students to develop editing skills related to the functional use of technology to enhance their already – established skills in that area.

However, Hayden also used the new text-to-speech technology as a catalyst for significant change in how his students could revise their texts while composing and when collaboratively sharing their writing ideas with peers. Hayden's students found that writing with text-to-speech created new revision opportunities where they could creatively apply the functionality of the technology to the revision and editing procedures that they adopted to attend to their individual writing needs at a word, sentence or paragraph level of their texts. Change was occurring in Hayden's classroom, but his teaching didn't change in a substantial way. The difficulties he

experienced for sustaining the integration of technology into his teaching, did not assist him to understand how he could change his traditional teaching, nor was he aware of the new learning procedures that his students were beginning to adopt when using text-to-speech technology.

**Teacher motivational concerns.** The other teachers in this study were strongly motivated by the time they had to become familiar with the software, opportunities to collaborate with peers and students, and positive pedagogical experiences when teaching with technology. Hayden however, was influenced by his initial state of motivation to adopt technology, even though he understood it could be a challenge for him to get his students to understand how to manage the technology, 'It can't look too difficult', (Teacher Interview 1, 2010).

To address this motivational concern, Hayden gave himself time at home to become familiar with the software and to learn how he could trouble-shoot problems as they arose in the writing classroom. Hayden understood if his students were to be motivated to learn a new software tool and then apply that tool to assist their writing at Redgum Primary School, he would need to continue the focus, as suggested earlier in this case, that computers not be used to change classroom practice (Field work feedback, Research Week 1, 2010).

At the end of the research Hayden affirmed that the experience of teaching with technology had not significantly changed the way he always taught writing.

I don't think my approach to teaching changed too much because I had spent a fair bit of time dappling with it privately and I had already done the work of an intensive one day workshop on the software training. So I had a fair idea and I was able to trouble shoot kids along the way and we demonstrated, introduced the software to the kids about how it was operating and how you could use it and how it was different from the other technology they had practiced with or were using. (Final Reflective Feedback, 2010)

Hayden's motivation to adopt technology into his writing pedagogy was also influenced by the amount of time he and his students had to spend to become familiar with the functionality of the Read&Write Gold™ software. He spent four weeks exploring the functional advantages and disadvantages of the software as his students were writing, becoming challenged by the functional interplay between the technological features of the software and MSWord™, and his own knowledge about teaching writing with technology. As he suggested, 'It is difficult for me to do open-discovery learning' (Final Reflective Interview, 2010) and he suggested he would have liked more time to understand the software capabilities.

Time factor is a big indicator. I need a really good structure. There are some people who can cope with chaos. I am one of those people who like to be provided with...information, structures and then I will create my own chaos. (Final Reflective Interview 2010)

**Technical support.** Hayden experienced technical challenges that impacted on his confidence to teach writing with technology. He had intended for his students to use the computers in the computer suite for all writing lessons during the research. However, installing the software onto the school network was not as simple as Hayden had originally planned. He lost valuable instructional writing time during the three weeks it took to overcome software installation problems. A new part time ICT technician had started working at Redgum Primary School for 2 ½ days a week. Hayden suggested,

We could load it [the software], we had imaging problems, we had a new technician who came in and he was difficult to work with because he had to stop what he was doing to help me. This created problems with getting access to put software on the school network. The ICT provider makes decisions about what we can do in the school. (Final Reflective Interview, 2010)

**Collegial support.** Hayden's concerns about his level of confidence to engage his students to write with technology, gradually impacted negatively on his capacity to design writing experiences with technology for his students. While he understood that technology could assist students to access learning and enable them to become independent learners (indicating a 5 on a scale of 0-5, where the 5 was for most likely believing) he was challenged when he could not access collegial support. As stated in the initial discussion of Hayden's case, he understood there could be challenges for him without collegial support. 'I need to have a good thorough understanding at the beginning. I was frustrated because I would ask for help and couldn't get it', (Final Reflective Interview 2010). Hayden did not have an opportunity to reflect with colleagues on how he was integrating his literacy, technology and learning ideas into his writing pedagogy. When Hayden was asked during reflective feedback if he had continued to integrate technology in his writing lessons, he responded,

I haven't used Read and Write since. Read and Write is too complex in our school with the techy so I haven't touched it since. (Final Reflective Interview, 2010)

**Administrative arrangements.** Hayden's writing lessons were split between the students' classroom and the computer suite. Hayden used the IWB in his classroom to initiate writing discussions and for explicit teaching purposes, before his students

moved to the computer suite to commence composing their texts. Hayden explained how learning to write between two locations was restrictive as it inhibited the students' motivation to write. He had encouraged them to share ideas in the classroom but the students were unable to develop these conversations effectively into writing ideas due to having to move between different writing environments.

I had four computers in my classroom but Read and Write was only on the computers in the suite. If I had it on my classroom computers I know I would have operated much, much differently. I am one of those people who can cope with kids going off to language groups, SSOS taking kids and I could have a group of kids working on the computers, a group of kids working the IWB. (Final Reflective Interview, 2010)

### **Factors influencing the students' use of the technology.**

**Motivational concerns.** Many students reported a positive experience when writing with technology. The following four comments are representative.

I think it is very helpful.  
While I was using this software, my English skills are better now.  
I learned a lot of English using this program.  
It was really helpful with my grammar and spelling.  
(Student feedback from questionnaire, Week 3 on My Ideas about Read and Write Gold Software, 2010)

When student's texts were uploaded onto the IWB, the students not only enjoyed listening to each other stories using the read-back feature of new text-to-speech technology, but the technology also provided an opportunity for students to focus on how all features on the text-to-speech technology tool bar could be used to promote thinking processes between the reader and the writer.

The students really enjoyed having their stories put up there on the IWB and having it read to the whole class. Peter (pseudonym) got excited about that. The students changed the voices. That is part of the play stuff – twelve year olds need to play. The pronunciation got them a little bit. (Final Reflective Feedback, 2010)

However, there were a small number of students who were not motivated to continue writing with the technology in their individual writing time, due to a range of reasons associated with adopting the software.

When I used the icons [...] sometimes I got confused and changed the words when they were right. I will try to use icons to help me find any mistakes in my work.

I am not a big fan of Read&Write Gold™ for the reason being that RWG takes too long to load. It also underlines things that I know are right and it's annoying. My writing is good enough from my perspective so Read and Write

doesn't help it. I don't need to use it, cause [because] my writing can't improve with this software.

I'm not really good at checking and marking my work. I need help. I don't know how to use most of the icons.

I use the *Play* button and the *Stop* button because it reads it for me. I don't know how to use all the icons because I think that I don't need to use them and I think that younger kids need to more than I do. I am already good at writing and I can get better till my next writing sample.

Read and write slows down the computer and that irritates me. I don't have difficultys [difficulties] with my wrihting [writing]. I don't use Read and Write because it's a waste of good computer time. (Student's feedback from questionnaire, Week 7 on My Ideas about Read and Write Gold Software, 2010)

**Student difficulties in managing the software.** Hayden's students had difficulty managing the software features that relied on being connected to the Internet and with the interplay between the software spell checker and the spell checker in MSWord™. Some of the more experienced writers reverted to a word-by-word and sentence-by-sentence level for reviewing texts as they began to integrate the new technology into their writing. While Hayden suggested that, 'the students were writing and thinking about the errors they were making, instead of focusing on developing their writing ideas' (Field work observation, 2010), some student feedback suggested they were beginning to manage the functions of text-to-speech technology to think about the meaning of their texts.

The Read & Write, it's quite important for students to exercise or improve our writing and I used it as a dictionary. I think it helps you to read your writing. I like to use the play pattern [the new text-to-speech technology icons]. It will read your story for you, so, I listen and enjoy the story.

It is just like my teacher reading it and me changing the mistakes.

I understood how they worked [icons] by using the tours of them [from the website (TextHelp Systems Ltd, 2012a)]. The Play, Pause and Stop icons help me to fix my mistakes. I can then use the dictionary or spell-checker. (Students' feedback on 'My Ideas about Read&Write Gold software, Week 7, 2010).

When students adopted the use of text-to-speech technology, the tool sometimes highlighted more than the students' writing knowledge. Student feedback provides insight into the difficulties one student had for understanding how to manage the playback speed and highlighting of texts, 'the *Play*' and *Stop*' button are the main

icons that I use. I enjoyed changing the voices, but I want to know how to use highlighting to help me listen (Student Feedback on 'My Ideas about Read and Write Gold Software, Week 7, 2010).

### **Case Summary**

At the end of the research, Hayden's experiences in teaching writing with the new text-to-speech technology, did not align positively with his views of how the technology could be integrated into writing instruction. Hayden envisaged that the technology could be used as a functional enabler, providing direction and prompts to assist individual students editing skills and to promote students to focus on the meaning of their texts by adopting the read-back feature of the technology as a revision tool. However despite having established a supportive writing environment to use the functional capabilities of the technology, Hayden found that the technology did not support him to achieve the reflective writing outcomes he wanted his students to achieve.

The findings emerging from the cross checking between data sources shows there were consistent views between Hayden and some students for how a supportive technological environment is effective for learning how to write with technology. The convergence of data through the triangulation process confirms how a reshaping of the writing environment by using explorative and collaborative approaches was also effective for motivating and supporting some students to reflect on texts. There were students who were successful in using the read-back feature of text-to-speech to think about the meaning of their texts, confirming Hayden's understanding for adopting the functional capabilities of the technology to enhance the writing experience.

Hayden began the research by reshaping the writing environment so his students could compose texts, determined by the use of text-to-speech technology. He designed writing instruction with technology by focusing students' attention on the relationship between the reader and the writer and asking students to think about being the reader of texts while they were writing. However at the end of the research he was unsure if the explorative and collaborative pedagogical approaches he used were effective for enabling his students to reflect on the meaning of their texts while composing.

The case of Hayden highlights how students can be motivated to write with technology when a teacher establishes a positive technological environment and



designs instruction which facilitates students to collaborate and share in the revision of texts. However, for a teacher to redefine their practice and integrate technology into every writing activity, requires opportunities for both students and teachers to acquire deep knowledge about how to connect the functional capabilities of text-to-speech technology to the learning to write process.

Hayden was initially enthusiastic about teaching writing with technology and he provided playtime for himself and the students to learn about the software. He made some useful changes to his teaching of writing when he integrated the Read&Write Gold™ technology with his model of writing. Some of his students also found the technology advantageous for their writing, but Hayden was frustrated by the technical and administrative difficulties. The fact that Hayden didn't continue to use technology, suggests that the experience was overall not positive for him – this may not have been a fault of the technology, but seems to have been associated with the difficulties arising in the environment in which the new technology was used. So the level of integration of technology that results in a specific classroom, needs the effective alignment of a set of factors, teacher-related and situation-related.

## **Chapter 7: Findings for the Case of Paul**

Paul was successful in creating a technological environment and instructional writing strategies with technology. He explicitly taught students how to manage the functionality of text-to-speech technology to attend to individual writing goals and then designed instruction that enabled students to critically evaluate the effectiveness of how they used the read-back feature of text-to-speech technology as a tool for learning to write. The pedagogical challenges Paul experienced when integrating the functions of text-to-speech technology into student writing and for knowing how to develop students' writing comprehension and editing skills, did not impact negatively on his enthusiasm to teach with technology. He was confident that the collegial support he accessed, would provide him with opportunities to overcome these challenges. Paul's case provides insight into how a teacher can develop students' technological skills to a fluency level, and remain engaged in designing learning activities to teach writing with technology. The case also highlights that it is necessary for both teachers and students to know how to manage technology, if they are to use technology as an effective instructional tool for learning how to write.

### **Background Information.**

Paul was in his first year of teaching and was teaching a class of 24 Year 3 students. Wattle Creek School had a total student enrolment in the 500-510 range. The ICSEA value of Wattle Creek School in 2012 was in the range of 890-1000, with approximately 44% of students in the lowest SES quartile and less than 6% in the upper SES quartile. The school had a total enrolment of 11% students with a language other than English.

Wattle Creek School had an ICT Leader, Nicole, who had established a Learning Design Writing Team (LDWT) specifically for the purpose of the research. Paul was a member of this team. Paul had extensive knowledge about multi-media design, suggesting 'I would rate my ICT competencies really highly [...] I studied multi-media for three years' (Teacher Interview, 2012). However, Paul had limited knowledge about designing writing experiences with software such as Read&Write Gold™.

## **What procedures did Paul and students adopt in introducing new text-to-speech technology into writing lessons?**

### **Preparation by Paul.**

Paul's preparation to adopt the new technology was within the preliminary work of the LDWT. With new knowledge gained about explicit teaching, Paul spent approximately three weeks with his students establishing a technological writing environment where he introduced the new text-to-speech technology as a tool for creating instructional writing strategies for students learning to write. The strategies are outlined below within the 'Introduction to the technological activities'. As a member of the LDWT, he worked with his team colleagues to understand how to integrate the various functions of text-to-speech technology on the Read&Write Gold™ software into his teaching of writing. Paul stated, that the work done with the team on customising the tool bar was 'really helpful' to know how to use the technology, 'so we can actually start to use the software and have it set up to be effective' (Wattle Creek School, staff meeting, 2012).

**Introduction to the technological activities.** Paul's approach to implementing the LDWTs goals, focused initially on how to customise the Read&Write Gold™ toolbar.

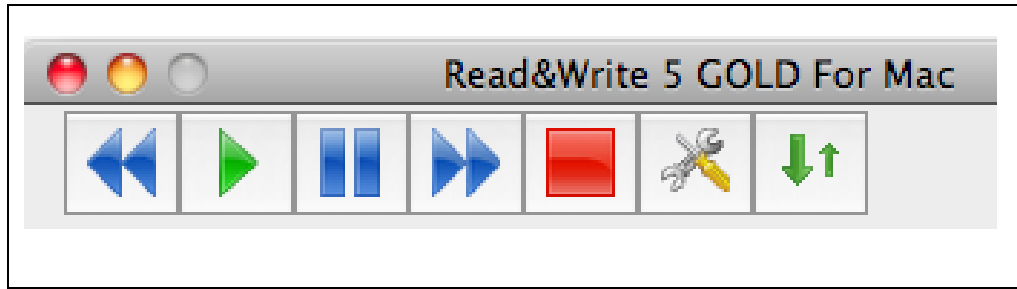
The first thing we did was to customise the tool bar as it is overwhelming, so we just focused on the text-to-speech technology icons. (Wattle Creek School, Staff Meeting, 2012)

**Customising the tool bar.** Paul explicitly demonstrated to his students how to customise the toolbar, explaining, 'If you are learning something new [...] you actually teach a bit by bit' (Wattle Creek School staff meeting, 2012). There were many different things he could teach students with Read&Write Gold™ software, but he suggested it was more effective if he focused only on the text-to-speech technology functionality.

We talked to the kids about how there was too much information there for you to understand. What we have to do is break it down, put it into small pieces. You are going to do that really well first and then we can actually expand your learning and you can actually use different icons. (Wattle Creek School, Staff Meeting, August 2012)

Paul created a hard copy poster of the toolbar (see Figure 12) for display in his classroom. The tool bar consisted of text-to-speech technology icons of '*Rewind*' or '*Backwards*', '*Play*' or '*Go*', '*Pause*', '*Fast forward*' and '*Stop*'.

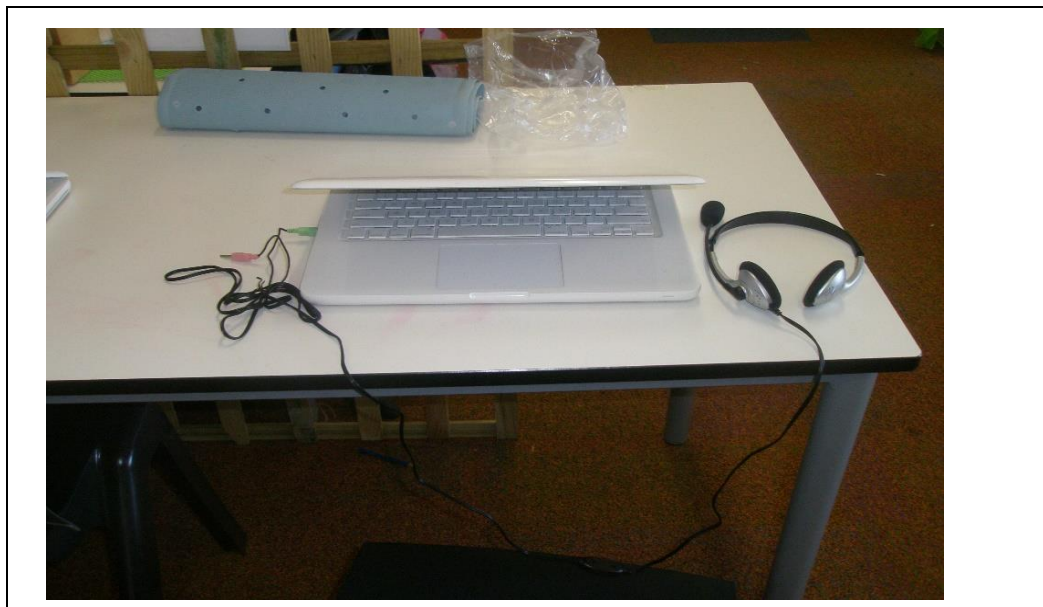
Figure 12 Text-to-speech technology toolbar (TextHelp Systems Ltd, 2012)



The text-to-speech tool bar features are clearly identified and accessible, to facilitate students to write with the new technology.

At the start of every writing lesson Paul and Nicole set the teaching toolbar on the IWB with the same text-to-speech icons the students used on their laptops. As a whole-class focus group, with students sitting on the floor in front of the IWB with their laptop lids at ‘half-mast’ (refer definition in Chapter 1), Paul and Nicole (the ICT Leader) modelled how to set up the different text-to-speech icons. Paul explained how students put their computer lids at ‘half-mast’ when he and Nicole wanted the students to stop writing on their laptops and focus on the explicit instruction the teachers wanted to convey (Field work observations, 2012).

Figure 13 Laptop computer at Half Mast, Wattle Creek School, (2012)



When the screen is placed in a ‘half-mast’ position the student is not distracted by the technology and can focus on teacher instructions.

Paul and Nicole also explicitly taught the students the technological language that would be used during a lesson. The terminology included terms such as ‘text-to-

speech’, ‘icons’, ‘return’, ‘space bar’ and ‘highlighted texts’ (Field work observations, 2012).

Paul taught his students how to log-on to computers using their personal log-on settings, how to use earphones and set appropriate listening sound levels (LDWT observations, August, 2012). Paul outlined how easy it was for students to customise the toolbar because ‘every time they logged-on to another computer the students had to re-customise the icons’ (LDWT observations, August, 2012). He explained how the students, ‘have learnt now, you just get on your computer and click them on’ (Wattle Creek School, Staff Meeting, 2012). He also explained how he taught the students two different ways to customise the toolbar. Students could double click the features they didn’t want on the tool bar from the Read&Write Gold™ software or single click through the ‘preferences’ in the software settings and send an icon out of the toolbar. ‘This simplifies the toolbar so only the ones [icons] the kids are going to focus on are there for them to use’ (LDWT Meeting No 3, 2012).

***Using the mouse pad.*** Paul demonstrated to his students how they could customise the mouse pad on their laptops. He explained how he wanted students to write and use the mouse pads at a speed and with the mouse pointer large enough to assist students to focus on their writing ideas, rather than the technology (LDWT Observations, August 2012).

***Text-to-speech voice play back.*** Paul used an exploratory, but limited approach with his students when choosing how to set up the voice and read-back speeds for using text-to-speech technology (LDWT Meeting July, 2012). The LDWT decided upon 35% as an appropriate speed for students to listen to their texts and 75% as an appropriate pitch. Paul explained how the Australian voices of Lee and Karen were ‘not exciting’, but his students had some fun listening to them and choosing which particular voice they wanted to use. He suggested, ‘If you do this first you are setting the kids up to be successful’ (Wattle Creek School, Staff Meeting, 2012).

We thought 35% was a good speed for them to be able to listen to their writing and 75% was a good pitch. The voices aren’t exciting, but the kids had some fun listening to those and choosing which one they wanted to use. We gave them choice but it was limited. There were lots of voices so we only gave them two options. We looked at the speed it was going to read so the kids had to work out a speed. We put it at 40% to start with and we got the text to play and the kids in Olivia’s class said, ‘I can’t concentrate on what is being said and actually take it in at that speed’, so we had to adjust the speed again. (Wattle Creek School, Staff Meeting, 2012)

***Touch Typing.*** Paul had concerns about his students typing their stories and not knowing how to find letters on the keyboard (LDWT meeting, July 2012). He explained, ‘I needed to teach the students how to type so they would not worry about where ‘i’ or ‘m’ was on the keyboard’ (LDWT meeting, July 2012). Paul wanted his students, ‘to draft, look at the screen and write their stories’ (LDWT meeting, July 2012). After the LDWT had decided on using the ‘BBC Dance Mat™’ (“Dance Mat Typing,” 2012) touch typing freeware, Paul taught his students how to drag the URL into the bookmark bar so they could click on it easily when they started their typing practice activity.

The kids actually enjoy working with this as a 5-10 minute warm up before they start writing. Within a week and a bit of doing it they are so much more confident in just looking at the screen and not looking at the keys. (Field work personal communication, August 2012)

Towards the end of the of the research, Paul highlighted the success of encouraging his students to type as an ongoing part of the approach to establishing a writing environment, ‘There are quite a few that no longer look at where their fingers are going and it’s about the screen and what they are typing’ (Field work observations and feedback, Research Week 14, 2012).

**Instructional literacy activities.** Paul introduced students to each of the text-to-speech technology icons of ‘Play’, ‘Stop’, ‘Fast forward’, ‘Pause’ and ‘Backwards’ by using the Read&Write Gold™ for Mac Educator Resources™ accessible from the TextHelp Systems™ website (TextHelp Systems Ltd, 2012a) <sup>1</sup> and the resources video toolbar links to YouTube™ (LDWT Observations July 2012). He was pleased that he could do this as part of his routine morning literacy teaching, suggesting, ‘I should still be able to do my usual routines as the research is embedded in the morning Literacy Block’ (Field work observations, August 2012).

Paul encouraged students to consider how the read-back feature of text-to-speech technology could be used as a comprehension tool to think about being the writer and the reader of a text (LDWT observations July 2012). This involved teaching students how to press the ‘Stop’ and ‘Rewind’ icons to backtrack over a block of text or groups of sentences to make meaning of what had previously been written. Paul also

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<sup>1</sup> The teaching resources are no longer on the TextHelp Systems Ltd (2012b) website. Some examples are therefore included in Appendix L of this Research.

suggested that students could repeat the action if they needed to reflect further on the meaning of the text.

We spent a couple of lessons, just going through and teaching explicitly each of the icons, what they do and how possibly they could help you with your reading and writing and making sense of what was written. (Wattle Creek School, Staff Meeting, 2012)

Paul uploaded the Read&Write Gold™ Educators Resources of Teaching Tool No 1: Speech onto the IWB as a learning exercise for students to understand how to use text-to-speech technology with written texts (TextHelp Systems Ltd, 2012a). In this exercise the students focused on using the ‘*Play*’ and ‘*Stop*’ icons to facilitate their listening comprehension at a word and sentence level. They also learnt how to follow the text highlights when text was being read-back by the read-back feature of the technology. Paul used the story texts of Trips to the Seaside and The Busy Street provided on the TextHelp™ website (TextHelp Systems Ltd, 2012a) to demonstrate how to use text-to-speech technology to listen for meaning in a text. He completed this comprehension exercise by asking his students to answer the technological comprehension exercises presented from the TextHelp™ website (Field work observations, August 2012).

Paul used explicit teaching to cognitively engage students to think about how to write with text-to-speech technology by scaffolding how each of the functions of the text-to-speech tool could be used. He provided students with practise time over the three week preliminary period to facilitate students to feel confident in using the technology. Paul said that ‘the lead up took longer’ when teaching students to write with the new technology (Wattle Creek School Staff Meeting, 2012) because he had to teach the students how to customise and apply the skill of using the functionality of text-to-speech to the process of writing.

Paul explicitly taught listening skills to engage students cognitively in using text-to-speech technology. He did this by encouraging students to ‘play around’ with different speeds of the read-back feature as they listened to the stories they had created in the short writing sessions. He asked students to customise their toolbar to play-back at sentence level and to notice whether a full stop had been placed at the end of each sentence. ‘Listen to hear if your sentence makes sense and if it sounds right. Where is your full stop? Is it at the end of the sentence’ (Field work observations, 2012)?

**Organisational approaches.** In establishing the writing environment Paul developed classroom routines where student monitors collected the computer trolleys from a central storage location within the school and distributed the computers to students in the classroom. (Field work observations, 2012).

Paul had created ‘log-on to the laptop’ cards to assist students who had difficulty remembering their log on details (Field work observations, 2012). He reported that the level of student engagement with writing had improved as students were ‘[...] logging on, getting set up was successful’ (LDWT Meeting, November 2012).

After students had logged onto their laptops, Paul encouraged students them to practise their touch typing exercises for 5-10 minutes. To assist students to monitor their own typing development, Paul sometimes timed students for 60 seconds in their short-timed sessions of writing suggesting, ‘ I use a one minute improvement test to assess typing skill improvement’ (Field work observations, 2012).

#### **Preparation by the students.**

While many students enjoyed practising their typing skills using the typing tutor, there were other students who found typing practice difficult, as suggested by a novice writer, ‘I don’t like it because it makes me tired. My brain hurts’ (Field work observations, 2012).

As Paul explicitly modelled to students how to use text-to-speech technology, some students shared how they preferred to use the tool.

I like to listen to my writing much slower. It helps me to focus on my spelling.

I like writing on a computer as typing is easier.

I like listening to my stories but not listening to fix my mistakes.

Listening to my writing with friends is fun. (Student comments, Field work observations, 2012)

While many students followed Paul’s instruction to facilitate their competence in use of the technology, the above examples show how a few students used the technology to focus on the meaning and mechanics of their writing.



## **What procedures did Paul and his students use in writing lessons using new text-to-speech technology?**

### **Procedures used by Paul.**

Wattle Creek School had a literacy policy of reading to students at least five times each day (Field work feedback from ICT Leader, Nicole 2012). Paul used the picture books to stimulate students' story writing; he focused on narrative genre structures and how to build an investigation into a story (Teacher Interview November 2012). At this stage Paul introduced the narrative genre terminology (see definition in Chapter 1 of this study) of orientation, event, conflict and resolution (Australian Curriculum Assessment and Reporting Authority, 2011) and he suggested story titles of 'A Spiny Leaf Insect, Free Choice, Animal Story, Space Travel and An Endangered Animal to encourage students to be creative in their writing (Field work observations, 2012). He commented that 'all [students] can recall the structure and are now starting to follow and understand orientation, event, complication and resolution' (Wattle Creek School, Staff Meeting, 2012).

Sometimes Paul provided iPads to students, so they could explore how to generate their own story ideas through the use of Kidspiration™ and Comic Life™ software apps. The idea-generating activities, which could be related to the Hayes (2012b) model were engaging and stimulated students to share their ideas with peers (Field work observations, 2012). 'I use iPads so the students can story map their writing ideas before writing a story' (Teacher Interview Question 1, 2012)

Paul reported that he traditionally approached the teaching of writing by encouraging students to collaborate and to listen to each other's ideas. His usual pedagogy was centred on what he termed, 'short-timed sessions of writing', to stimulate students to think creatively about what they could write (Teacher Interview, November, 2012).

We would have a short-timed session of writing. We would have a focus, maybe 5 minutes on the carpet going over the focus first. Often the focus is brought out by my assessment of the student writing, like something that needs to be addressed in a group of students' writing. If I mark a piece of writing, OK! I need to focus on this and then that will become the focus for the next lesson. I try to use their assessments to inform my focus for the following lesson. (Teacher Interview, 2012)

Paul also used peer-to-peer reflections for students to develop their story ideas, where the reflections followed a process of student's personal 30-second reflection time and then peer sharing. Paul asked his students to sit 'knee to knee' with a partner and verbally plan what they wanted to write. Then in groups of four he asked

the students to report to each other what they had planned, using the terminology ‘ear to ear’. Paul explained how this approach encouraged his students to focus on listening to each other’s ideas. Paul then encouraged the groups of students to provide feedback to the whole class (Field work observations, 2012) before students commenced writing their stories. Before the introduction of the new text-to-speech technology students wrote their stories with pen and paper, but with the commencement of this research they began writing on a computer using the technology.

Paul created instructional procedures to encourage students to ‘have a go’ when writing, and not to correct spelling as they wrote (Field work observations 2012). As he circulated around the classroom he began to explain to the more advanced writers how they could organise their texts into paragraphs and put their name, story title and date on the top of their word document. He also demonstrated to individual students how to use capital letters for names, how to focus on sentence structures and use full stops. He reminded students to listen to their stories at the end of every sentence or after two sentences. When students had finished their stories, he encouraged them to listen to the whole story using the read-back feature of text-to-speech technology and then to also read the story without the use of technology, ‘Listen to make sense and then read by yourself’ (Field work observations, 2012).

Paul encouraged students to think how text-to-speech technology could be integrated as a writing tool from an author’s or reader’s point of view, by creating reflective instructional strategies which he termed, ‘Read to self-strategies’ (Field work observations, 2012). The strategy procedure included;

1. Listen for mistakes,
2. Look for double spaces and green lines,
3. Read first by yourself and then listen to your story, and
4. Listen and then add more.

During Writer’s Workshop sessions, with students seated in front of the IWB with their laptops on their laps and the classroom lights dimmed for ease of reading, Paul selected a student to plug their laptop into the IWB for the whole class to listen and then edit the story. Paul demonstrated how the students could approach editing their stories by asking a series of questions. The copy of the questions was not displayed in the classroom:

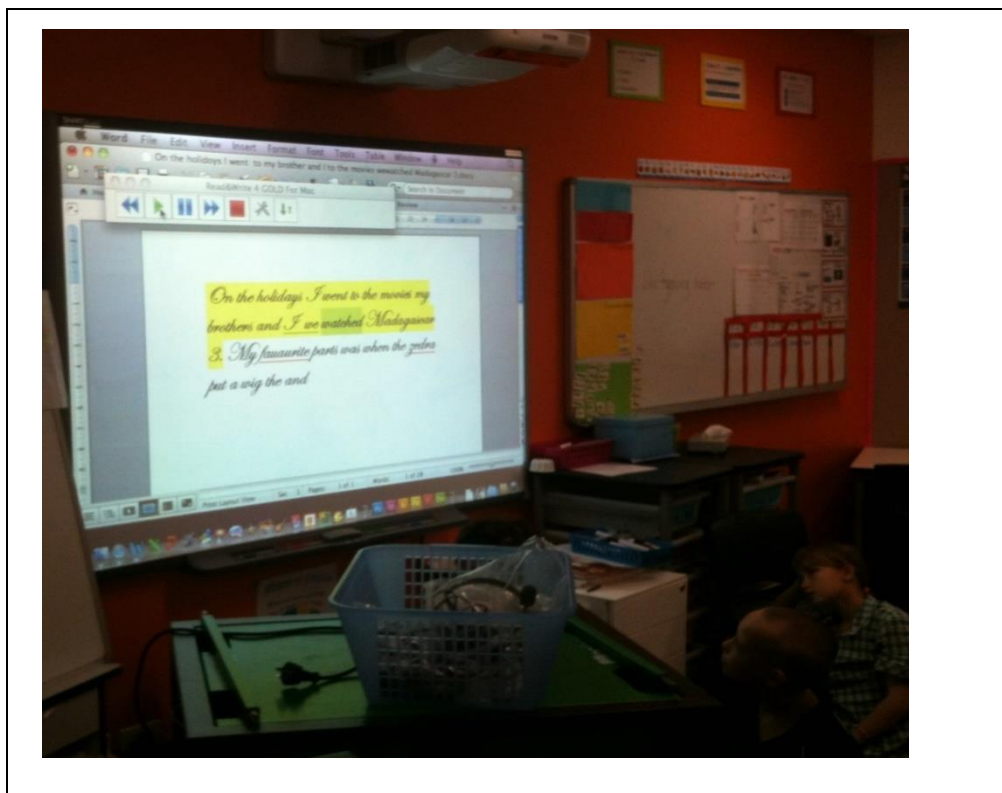
1. Have I started every sentence with a capital?

2. Have I ended every sentence with a full stop?
3. Have I left white spaces between my words?
4. Have I used joining words in my sentences, such as and, because and after?
5. Are there any words that I need to check?
6. Is my writing interesting?

The whole class editing processes enabled Paul to explore editing possibilities with his students, by back-tracking over groups of sentences when students' texts were uploaded onto the IWB (Field work observations November 2012). Paul explained how the combination of the Read to self-strategies, editing questions and different approaches of using the read-back feature of text-to-speech technology used by students in the Writer's Workshops, appeared to empower the students to take responsibility of their own writing. (see Figure 14, Writer's Workshop Session).

The Writer's Workshop is the most powerful part. Push 'Play' to the whole class and it exposes everything and they [students] don't care. It's not name and shame but, how can we help this person to make a great story greater. (Wattle Creek School, Staff Meeting, 2012)

Figure 14 Writer's Workshop session, Year 3, Wattle Creek School, (2012)



As you can see the classroom lights have been dimmed, the text is being highlighted to read by sentence and the text-to-speech tool bar has been placed at the top of the text.

To support his novice students as they learned to manage the functionality of text-to-speech technology during their individual writing time, Paul modelled how to suppress technological distractors such as red and green lines, thus reducing extraneous cognitive load (Retnowati et al., 2010) on student' working memory. He also modelled how students could ignore distractors while thinking about composing and then return to attend to editing skills or meaningful sentence construction when revising over two or three sentences (Field work observation, November 2012). He suggested students became;

Hung up on spelling when listening back, so I encourage them to listen to make sense or use full stops to sound right, but spelling takes over. So I turned off the red and green lines for some students. (Wattle Creek School, Staff Meeting 2012)

Paul also explained to students how they could listen to the length of their sentences to add full stops as exemplified by supporting the following student.

We are going to listen and see where would be a good spot to put some full stops, OK? To break it up, because at the moment if we read it all through at once we are going to have no-where to take a breath. We are probably going to run out of breath. So we are going to, look, [Paul paused] and listen, to see where would be a good spot to put a full stop. (Field work observation, 2012)

When Paul suggested there were students having difficulty focusing on the comprehension of their texts, he uploaded the Xbox 360 comprehension exercises from the Read&Write Gold™ website (TextHelp Systems Ltd, 2012a) and modelled to students how they could use the toolbar and the 'Play' and 'Stop' icons to answer specific questions in relation to a text (Writer's Workshop session, 2012). He suggested, that the explicit modelling for how to use text-to-speech technology to think about the meaning of texts, helped students to understand what he meant when he asked, 'Did that sound right?' (Wattle Creek School staff meeting, 2012)

### **Procedures used by the students during writing lessons.**

As students were writing in their individual writing time they shared with Paul the different ways they were using the read-back feature of text-to-speech technology when focusing on the 'Plan-Write-Revise' strategy at the same time.

I listen, sentence-by-sentence. Sometimes I have spelling mistakes and I make sense by right-clicking on the mouse.  
I write a whole story and then edit. I edit spelling by the red line. Now I write in paragraphs and then listen to the whole story.  
I listen by paragraph and if it doesn't make sense then I go back and read it myself, then correct it. I look for incorrect spelling, make sense. I like to use both. (Field work observations, 2012)

These students were using the technology to build knowledge about writing and for identifying their own writing strengths and weaknesses. One student in particular provides insight into how she created her own text-to-speech revision procedures. The procedures facilitated her skill development for monitoring the meaning of her texts and for overcoming mechanical errors in her writing.

Paul suggested how the use of text-to-speech technology had helped a novice writer to begin to write independently.

Nick [pseudonym], has just gone through an entire session, which has never happened before. He wrote about three or four lines [...] just completely independently. He was listening word by word, trying to use the software to sound each word out, because he actually isn't able to spell any of them. He is unable to read, so seeing the word there visually, even with the correct spelling, wouldn't confirm for him, that's a word. Whereas hearing it, because he has the words in his oral language, listening to it, he can figure it out. (Field work observation, 2012)

### **What was the level of technology integration in this case?**

When Paul combined his new knowledge about the potential use of text-to-speech technology to create instructional writing strategies, with new knowledge about how he could use explicit teaching to teach students to write with technology, he was able to establish a writing environment where the functionality of the technology could be used as a new tool for students learning to write. This knowledge shifted Paul's previous focus, aimed at learning how to use technology, such as 'web design, film production, photography [...] and all that design stuff' (Teacher Interview, 2012), to thinking how his students could use the new text-to-speech technology as a tool to improve their writing. The SAMR Model provides insight into how the integration of the new technology as a tool for learning, *transformed* Paul's teaching, allowing for the creation of a new writing environment, new writing instructions and a different way of teaching and learning how to write.

In terms of the SAMR Model, we can see how Paul used his new technological knowledge to move from being a novice teacher of narrative writing to developing expertise in the design of writing strategies, where the use of the keyboard acted as a direct *substitution* tool for students to write their stories. The use of text-to-speech as an additional writing feature led students to listen to what they would have previously read when writing, thus, according to the SAMR Model, providing a valuable extra dimension to learning to write.

When Paul created instructional strategies and short-time learning sessions with technology, the technology allowed for significant redesign at the *modification* level of the SAMR Model. The technology enabled students to engage in writing and individual, peer to peer and whole class collaborative approaches to reflect on the creation and meaning of texts within a digital environment.

Applying the principles of the SAMR Model, Paul spent time developing his students' technological skills to a fluency level. The adoption of technology at this level enabled Paul to use his new technological and explicit teaching knowledge to focus on developing instructional writing strategies with technology. Students learned to listen and make sense of their writing through self-reading strategies and by using the functions of text-to-speech technology to link text comprehension to creative writing.

When Paul encouraged students to understand and manage technological distractors and how to organise text on a screen to facilitate deep thinking while writing, he had adopted the use of technology at the *redefinition* level of the SAMR Model to transform his teaching. This was especially evident in students' personal writing time, when he developed a range of goal-orientated questions to encourage individual students to read, listen and then collaboratively edit texts with their peers during Writer's Workshop sessions.

While Paul explicitly taught his students how to use technology, the purpose was to ensure that he could adopt technology as an instructional tool to facilitate students to write within every writing activity in the writing process. Paul adopted technology at all levels of the SAMR model, enhancing and transforming not only his own practice but how his students learnt to write. Paul indicated that his students were beginning to view their writing as texts which could be 'read and enjoyed by others' (Audio Reflective Feedback, October, 2012). Paul developed instruction which engaged his students to develop new ways of thinking about writing, through reflecting, reworking and refining how to create narrative texts.

### **What factors influenced Paul and his students' use of the new text-to-speech technology in the writing lessons?**

#### **Factors influencing Paul's use of the technology.**

**Teacher knowledge.** Paul began the research with the knowledge that technology could be used as a tool for creating instructional writing strategies for students

learning to write. However, Paul reported that his developing pedagogical knowledge had not provided him with the knowledge at this stage where he could use explicit teaching approaches to scaffold student learning (Teacher Interview, 2012). His previous teaching with technology prior to this research, had developed as a result of his assessment of his students' writing performance.

Often the focus is brought out by my assessment of the student writing, like something that needs to be addressed in a group of students' writing. I tried to use their assessments to inform my focus for the following lesson. (Interview 1, 2012)

However, the introduction of technology provided Paul with new knowledge about explicit teaching, and a new language for teaching with technology. Paul began developing the skill of explicit teaching combined with the new terminology when Nicole modelled to students how to set the text-to-speech technology toolbar (Field work observation, 2012).

Paul was supported by initiatives and collaborations shared within the LDWT and through the mentoring of Nicole, as he worked to overcome the challenges he experienced. Paul was challenged in situations of what he termed 'just in time teaching' (Learning Design Writing Team meeting, 2012), when he needed to make a pedagogical or instructional decision without prior planning. This was the case when he was unsure how to begin the editing process, especially when working with the following novice writer. Paul had to stop and think how he would begin the editing process of the following student's text (Field work observation, 2012).

Student text: He found a found And his name was Stephen.

Responses from Paul to the student about this text:

'Does that sound right? He found a found. Are these two words the same?

'This word says "found"', so we need to change it to "friend".'

'Excellent sounding out. Now have a listen to that? You sounded that well. Do you remember me telling you last week that friend has a tricky letter in it?

Can I tell you another little secret? We can't start a sentence with 'And'. So, we put a full stop in here. Let's listen to it again? (Field work audio, Week 10, 2012)

Research has shown how novice students can be encouraged to use clues to engage in writing (Pressley et al., 2007). The above editing process exemplifies how the explicit teaching approach used by Paul scaffolded the novice student to listen to and reread the few sentences he had written using Paul's instructional clues.

Paul's pedagogical problem solving approach, was to focus on how he could increase a student's attention to text by minimising the technological challenges which could interfere with writing for meaning. This approach reduces the cognitive load on students' working memory. When working with the student to develop meaning in this text, Paul began by turning off the red and blue distractors. He then guided the student to focus on using full stops to develop sentences, before attending to spelling errors grammar (Field work observation, 2012).

The spider tond [turned] in to a spiny leaf insect it was still blue thay [they] be came frinds [friends] on [One] was a boy and a was a girl. There went home two week afouer [after]. There [They] live near a shop. (A section of the student's story about a Spiny Leaf Insect, 2012).

Paul's instructional competency for learning and skill development with technology demonstrates that he had professional competency at the *entry*, *adaptation* and *transformation* stages on the competency continuum (Russell et al., 2006). At the *entry* stage Paul developed an awareness of the possibilities that text-to-speech technology could hold for him to design instruction that helped his students to write. While he did not have the depth of explicit teaching approaches that could be used to maximise the benefit of learning about the new technology, he did have the mentoring support from the LDWT and his ICT Leader to develop the requisite skills necessary to make significant changes to his practice (Interview, 2012).

This enabled Paul to integrate text-to-speech technology at the *adaptation* stage of the competency continuum, where he developed the skills to apply technology to enhance his traditional teaching procedures. Paul integrated technology into the students' short-timed pre-writing sessions, where students shared their writing ideas before beginning to type their stories. The process of typing stories added functional improvement to these writing sessions.

When Paul designed instructional strategies where he used text-to-speech technology as a catalyst for significant change in his pedagogy, he had integrated the technology at the *transformation* stage as evidenced on the instructional continuum (Russell et al., 2006). The continuum provides insight that students, as well as Paul, adopted new roles when writing with technology. The explorative and collaborative sharing of ideas between Paul and his students, provided the stimulus to think creatively for how text-to-speech technology could redefine the learning to write process for individual students and for Writer's Workshop sessions. The LDWT provided new ways for Paul to think about his teaching, empowering him to promote how



technology could be adopted to transform the teaching of other staff members within the Wattle Creek School community.

When the LDWT presented how they were integrating text-to-speech technology into the teaching of writing to their teaching colleagues, Paul requested that he speak about the importance of customising the tool bar, how he introduced the tool bar to his students, and why he viewed the setting of different voices and speed settings as integral for student's being able to focus on the meaning of their texts, during independent writing time, teacher instructional time and whole class Writer's Workshop sessions (LDWT Meeting July, 2012). As suggested earlier in Paul's case, developing fluency in the skill of using technology was important and required time, 'It took us 3 weeks just to get the kids organised' (Wattle Creek School, staff meeting, 2012). This also included developing skills in being able to apply the technology, while thinking about creating texts at the same time, as exemplified by Paul in his process of explanation to his teaching colleagues (Wattle Creek School, staff meeting, 2012).

**Teacher motivation.** Paul understood that technology should be used as tool for learning.

My belief is that it (technology) should be used as a tool and not as a lesson. It opens up fantastic opportunities to address the learning needs of the students. Learning to use the technology itself is not the lesson, but it's used as a tool for the lesson. I think that's really important and can be confused. (Teacher interview, Question 3, November 2012)

Paul had been motivated by the support of the LDWT to establish a positive classroom environment that promoted active listening and opportunities to personalise the use of technological tools. However, as Paul suggested, it took time, mentoring support and personal experiences to explore the advantages of explicit teaching in the context of his writing lessons and for understanding how he could integrate text-to-speech technology to enable students to think about themselves as authors (Field, work observations, 2012).

Paul's growing confidence to use technology as an instructional tool impacted positively on his motivation to design new writing instruction with technology, where he understood he could use a blend of explicit teaching and student-led teaching practices. Paul indicated that he believed he had become more explicit in scaffolding student learning since teaching with text-to-speech technology because he now modelled the explicit procedure for the students' to use.

I would break things down even more and be even more explicit about the way that I introduce the ICT or each stage of using ICT, whether its computers, or iPad or what-ever it is. (Teacher Interview, November, 2012)

This pedagogical approach adopted by Paul facilitated him to increase his skill and knowledge to develop the technological literacy that Ertmer and Ottenbreit-Leftwich (2010) suggest is necessary as a basis skill of teaching with technology.

**Collegial support.** Paul grew in confidence as a result of the supportive mentoring he received from his LDWT colleagues. He acknowledged that Nicole had been a positive influence on his teaching practice:

Nicole has been a great model for that, because whenever she's taken some lessons that's been a great model for me and I know I will mimic that when I am introducing those things to a new class. (Interview 1, 2012)

Paul's confidence about teaching with technology was also influenced by the opportunities he experienced through participating in the LDWT meetings. These meetings impacted positively on Paul's confidence to acquire new skills and knowledge that would enable him to persevere in teaching with technology.

It's given me some new strategies and some experience about using ICT in the classroom, because I am in my first year and I haven't had a lot of experience doing that before. So it's given me experience. (Teacher Interview Question No 4, November, 2012)

Having access to collegial support through supportive mentoring, stimulated Paul to think differently about how technology could be integrated into the design of new instructional strategies, as a valuable tool for effective literacy instruction. Paul explained in his final interview, how he hoped the technological language the LDWT had developed in the writing classroom and the explicit teaching approaches they had adopted to integrate text-to-speech technology as a tool for writing, would prepare his students for how technology could be used as tool for future learning (Final Teacher Reflective Interview, November 2012).

If we are going to prepare them [students] for what's to come [...] the technology we have is not a lesson for them because it is not the technology they're going to be using in the future. I think it's going to develop too quick for us to teach, but just that learning of using technology as a tool, is an absolute must because that's what they are going to have to do with their lives and that's what we already have to do now. (Teacher Interview, 2012)

### **Factors influencing the students' use of the technology.**

**Motivation.** The instructional procedures that Paul had adopted engaged his students to write and think about the editing of texts. Paul suggested;

I've seen how it [technology] engages the kids in their own piece of writing and I think before we would go back and edit our work, the kids would go back through, for the purpose of editing, but not necessarily be excited to go and read their own work. They can listen to their own story. It is so useful for that notion that they're writing for a purpose. (Teacher Interview Question No 6, November, 2012)

By end of Week 4, a novice writer in Paul's classroom had completed his first story without any teacher support or visual aids other than being motivated to write by using text-to-speech. The student's text, outlined below has been translated by the researcher.

Hors is my friend  
Hors was a nis pet he was a fen he is fun coos he cum over to plad aed he comes over en he walk me too scl. de nd.

(Translation):

Horse in my friend.  
Horse was a nice pet. He was a friend. He is fun because he comes over to play and he comes over and he walks me to school. The end.]

While the use of technology motivated the student to write independently, the students also used the technology to shape the learning to write experience.

**Student difficulties in managing the software.** At the start of the research Paul mentioned how students had difficulties in typing stories as they did not know where the letters were on a keyboard. However, after keyboard practise and the explicit teaching of how to use the functions of text-to-speech technology when writing, students highlighted new difficulties that emerged for managing the technology when writing. These included:

1. Preferring to use earphones when on the typing tutor, to limit outside noises which interrupted student attention to developing typing skills (Field work observations, 2012)
2. Seeking further support from student peers to understand how to use text-to-speech, especially after engaging in the explicit teacher instruction (Field work observations, 2012)
3. Knowing how to change the listening speed of text-to-speech to improve visual processing skills on a screen ( Writers' Workshop observations, 2012)
4. Asking Paul to 'wait', during individualised instruction for the editing of texts, to allow the student to rewind again and follow the highlighted words on the computer before answering the teacher question (Field work observations, 2012)

5. Knowing how to start the editing process when the student had difficulties identifying sounds in words. Paul suggested the student did not know how to sound out words without the use of technology. The student explained how she could listen to sounds using the read-back feature of text-to-speech, but didn't know how to slow the read-back speed to hear individual sounds within a word (Field work observations, 2012)
6. Difficulty in applying words to form a sentence when beginning to understand the concept of a sentence, especially when the teaching focus at this point was on listening to texts at a word level and not using text-to-speech to play back at sentence level (Field work observations, 2012)
7. A novice writer who had not mastered the letters of the alphabet and who also had limited vocabulary, asked for a visual object (grasshopper) as a prompt, for his story map on the iPad to assist him to edit his text (Field work observations, 2012).

**Exploration.** Student feedback provided insight into how the students followed Paul's instructions for knowing how to customise the text-to-speech toolbar to maximise the benefits of the technology to their individual writing needs. The following extract exemplifies how a student customised the text-to-speech toolbar to support how she could reflect on her writing and then explored the best way she could use the tool when writing.

A student was writing using text-to-speech technology to play back at a paragraph level. The student indicated that when she listened to her texts at this level, she was checking for the length of her story, spelling errors, full stops and capital letters. When writing with text-to-speech technology she suggested that she paused a lot while listening to her texts. She also suggested that she had become more confident with her writing, when she used the tool and that her stories were more interesting. The student believed that she could now write longer stories because text-to-speech technology helped her to think about her sentences and the use of full stops when she edited at a paragraph level. (Student questionnaire about using text-to-speech technology when writing a story, and Field work observations, 2012)

Another student reported that he liked writing on a computer rather than handwriting because typing had become easier for him (Field work observation, 2012). He started to realise he could write more interesting stories, check his spelling and length of sentences now he knew how to use text-to-speech technology when writing (Student Interview, Field work, 2012).

A more experienced writer reduced the use of text-to-speech technology after she had used it when writing stories in the early stages of the research. She said that she preferred to listen to the whole story with text-to-speech technology by using the '*Pause*' and '*Play*' icons, rather than listening to individual sentences or paragraphs

as she was writing. After exploring how to use the technology she was ‘now confident to use text-to-speech to backtrack over my whole story to check the story makes sense’. Using text-to-speech this way helped to focus on making her story more interesting. She also found it useful to listen to other students’ stories using the read-back feature of the technology. This helped her to use more interesting words, as well as thinking about her own sentences, the use of full stops and how to write in paragraphs. However, ‘the technology [text-to-speech technology] only helped a little bit to think what next to write [...] and to use speech marks’. (Student Interview, Field work 2012).

The examples discussed provide insight into how students were developing their own personal revision procedures with text-to-speech technology. The procedures were enabling the students to engage cognitively in the writing process to achieve their writing goals, or to overcome difficulties experienced during the process of text construction.

### **Case Summary**

The case of Paul illustrates how he was able to adopt technology as a tool for teaching students to write by developing instructional writing strategies with technology helped by the expertise and mentoring support of colleagues. Paul understood how technology was already a part of his students’ lives and that as a teacher it was necessary for him to ensure his students continued to, ‘write for their work to be heard, rather than just writing because it is a given task’ (Teacher Interview November 2012).

The cross checking between data sources highlighted consistencies for how Paul and his students adopted text-to-speech technology as an instructional writing tool. Paul developed instructional writing procedures with technology to promote students’ listening comprehension and to engage students to write and think about the editing of texts. There were also novice writers who provided a picture of how text-to-speech technology was an effective instructional tool enabling them to listen to their stories and to think about the editing of their texts. The findings from the triangulation process also show how under the guidance of a mentor, a teacher and students can use instructional writing procedures with text-to-speech technology that are effective for enabling students to write as authors.

Paul didn’t face the technical and administrative difficulties faced by Jessica, Brandon and Hayden. The mentoring support available to him through the LDWT

guided him to adopt technology as an instructional tool into his pedagogy. As a novice teacher, Paul was challenged when he critically reflected on his students' use of text-to-speech technology to evaluate the effectiveness of his own instructional decisions. The power of the Writer's Workshop sessions to influence how his students could make a great story even greater, exemplified the influence the power of the LDWT had for ensuring Paul, could adopt technology to redefine and consequently transform his writing pedagogy.

The fact that Paul continued to use technology to teach writing after the finish of the research suggests that the teaching experience was a positive one for him. However, the level of integration of technology that emerges in a specific classroom, is not only understood by the set of teacher-related, student-related and situation related factors within the teacher's classroom. Paul's case suggests that the effective alignment of circumstantial factors is also influenced by the quality of school leadership.

## **Chapter 8: Findings for the Case of Olivia**

Olivia was successful in teaching writing with technology when she collaborated with peers to learn how to combine literacy instructional knowledge with the functional potential of the new text-to-speech technology. She was able to design and then evaluate the effectiveness of her instructional writing goals. The use of the new technology facilitated a collaborative process between Olivia and her students, where some students began to see themselves as potential authors within a global society. Olivia was successful in using the technology to enable her novice and more experienced writers to thrive when writing with technology, with many reflecting critically on their texts. However, Olivia was frustrated by a lack of technical support and the daily organisational processes for accessing laptops for writing in her classroom. Olivia's case provides insight into how a teacher can 'let go the fear of not knowing, of being out of control' (LDWT Meeting, No 1, July 2012) when teaching with technology, by working collaboratively with colleagues and students to understand how technology can be integrated effectively into the teaching of writing.

### **Background Information.**

Olivia was an experienced literacy teacher who was teaching a class of 24 Year 4 and 5 students. Wattle Creek School had a total student enrolment in the 500-510 range. The ICSEA value of Wattle Creek School in 2012 was in the range of 890-1000, with approximately 44% of students in the lowest SES quartile and less than 6% in the upper SES quartile. The school had 11% of students who spoke a language other than English.

Olivia had a class set of laptops which she could access to use for writing lessons in her classroom. Olivia did not enjoy working with technology, admitting, 'I don't love computers and they don't appeal to me' (Field work communication, 2012).

### **What procedures did Olivia and students adopt in introducing new text-to-speech technology into writing lessons?**

#### **Preparation by Olivia.**

Olivia understood technology was here to stay. She explained how her students had grown up with technology and that she would just have to learn to use technology more in her teaching (LDWT Meeting, No 1 July, 2012). As Olivia had some

experience in using technology in her classroom she had come to realise that her understanding about teaching with technology could change.

I am a reluctant IT [ICT] user, but I do get the importance of it. I see it's got its place and it's very relevant, particularly for the future. I [...] use it [...] because it is something that benefits everybody. (Teacher Interview, 2012)

**Introduction to the technology activities.** As a member of the LDWT, Olivia used the same preliminary activities as Paul for using the typing tutor and understanding how to introduce the text-to-speech technology toolbar to her students. Olivia had originally decided with her colleagues to teach students to set the toolbar using the text-to-speech voices of Karen and Lee, with 75% pitch and 40% speed. During the preliminary three-week period, Olivia covered the functions of the toolbar in class and explained how it could be used to support their writing; however, she spent much less time on this than Paul. Oliver reported that her students decided to reset the voice speed to 35%.

We highlighted a piece of text and the students said it was too fast because they couldn't take in what was being said. They couldn't concentrate on the words. They were happy with the voice choices. The restrictions were good because it took away a lot of the problems we have had in the past but also gave them some choice. (LDWT Meeting No 2, 2012)

**Instructional literacy activities.** Olivia was pleased when the LDWT decided to introduce text-to-speech technology as an instructional tool into their practice using explicit teaching because she could continue to use her traditional explicit teaching approaches (Rosenshine, May, 1987).

I haven't ... changed my explicit teaching. You still have to teach a child how to write a story. The program is not going to teach them that, but it is going to aid them in reading for meaning and when they do edit their own work they are going to find their errors - hopefully more easily than they would do without it. (Wattle Creek School, Teacher Interview, 2012)

Olivia used the IWB to download ideas and interactive materials to demonstrate genre structure and motivate her students to write.

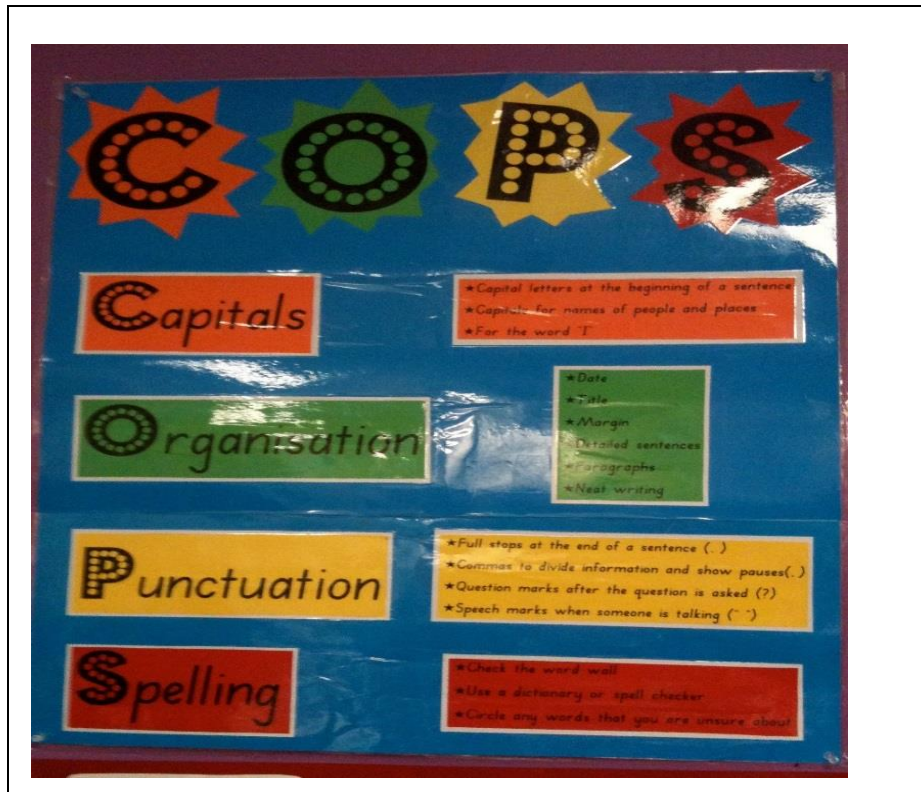
I use the IWB as a scaffold when introducing a new writing topic, drawing elicit ideas from the students by brainstorming. The IWB enables us to download all our ideas. IWB enables me to access examples e.g. interactive materials that use to demonstrate the narrative genre. (Wattle Creek School, Teacher Interview, 2012)

She encouraged her students to use the COPS strategy (Alber-Morgan, Hessler, & Konrad, 2007, p. 117; Schumaker, Nolan, & Deshler, 1985), for editing capital letters, text organisation, and punctuation and spelling errors when students were



typing their finished products on a computer (see Figure 15 for COPS strategy poster in Olivia's classroom).

Figure 15 COPS Strategy Poster in Olivia's classroom, (2012)



The poster highlights each element of the COPS strategy with examples to assist student thinking.

**Organisational approaches.** Olivia developed processes for students to save and retrieve written texts. This enabled students to access their writing at any time and from any place within the school. She explicitly taught students how to save, store and retrieve their writing from the school intranet, their personal writing folders on the intranet and from Dropbox™. This gave students the added advantage to continue writing over the course of a week at school and also from home.

When we began the program we initially began storing the kids work in their own folders but realised we should be keeping them on the school network. We scaffolded the students in how to save their work. When they type up their story they can save it directly into the Elocker™ [Wattle Creek School ICT management system] or to save it into the Dropbox™ where you can access it from home. They are also saving it in their personal folders as well. (Wattle Creek School, Teacher Interview, 2012)

Olivia highlighted the formative assessment advantages for saving student work, describing that ‘if they do that every time they are editing, you have a really great record of where they started and then the changes they made along the way’ (Teacher Interview, 2012).

I had to teach the students that they had to log-onto the intranet, upload their work into the school cloud and download it from the intranet to continue working on it. I also had to teach them to re-save where they were making changes to their stories or they would lose their entire previous story. For formative assessment - if they do that every time they are editing it you have a really great record of where they started and then the change they made along the way. (Wattle Creek School, Staff Meeting, August 2012)

Olivia had developed a ‘classroom agreement’ with her students at the beginning of the year, which she explained was ‘not about expectations but standards of behaviour’ (Field work observation, 2012). The agreement invited students to ‘Prepare for success, try hard to manage emotions, always try your best and always have a go’. Olivia referred to the classroom agreement when introducing the new text-to-speech technology to the students, suggesting,

The agreement also applies to how we all communicate when working with the laptops. We need to remember, there will be no drinks on tables during our writing lessons. (Field work observation, 2012)

Olivia suggested that she needed to rely on her students to support her through the writing process. In establishing her own organisational approach, she prepared a notebook to remind herself of any step-by-step procedures or technological skills she wished to use or had learnt from her students.

I still need a lot of help from the kids. I need to write down every step, get into a flap, and get my notebook out to remind me of the steps. I just show the children once and they literally show me the next time. (Wattle Creek School Staff Meeting, 2012)

Olivia used the IWB to explicitly teach students how to access the URL of the touch-typing tutor ("Dance Mat Typing," 2012) so students could practise developing their typing skills (Field work Observations July-November 2012). She told her students that typing practice would help them ‘to get better at using Read&Write Gold™, especially if you use the full screen version’ (Field work observation, 2012).

### **Preparation by the students.**

Olivia had established organisational procedures where students prepared themselves to participate in the writing lesson. Monitors were responsible for collecting, distributing and returning the laptops to their trolleys for re-charging. However, these

monitors were often frustrated when classes who had used the laptops before them, had not ensured the computers were charging or had been returned to the correct numbered system within the trolleys (Field work observations, 2012).

Students began to use new technological terminology such as ‘password’, ‘scroll down’, ‘turn-it-around’, ‘full screen version’, ‘sleep mode’, ‘intranet café’, ‘Safari™’, ‘server’ to store information and ‘school cloud’ (Field work observations, Research Weeks 1-5, 2012).

Students learnt how to log-onto their laptops, upload text-to-speech technology, download a previous story from the school intranet or open a new Microsoft Word™ (MSWord) document ready to start the writing lesson.

I like computers. I use my password card to log on. Not sure if my password works because sometimes my teacher logs on for me. I do it [set the text-to-speech technology tool bar] on my own and sometimes I get help. (Student Field work observation feedback, 2012)

I can open and save documents. I can type in my name and password without cards. I get frustrated when computers don't work. I know how to customise my tool bar. (Student Field work observation feedback, 2012)

To facilitate ease of reading on a screen, Olivia’s students chose to use Arial or Times New Roman font size 16 for composing stories. They organised their Microsoft Word™ writing page with a story title at the top centre and included a footnote where they wrote their name, date and class. These strategies and processes became standard organisational procedures for establishing the technological writing environment in Olivia’s classroom (Field work observations, 2012).

The following two samples of student writing illustrate how one student explored an appropriate font and size for writing when listening to texts using text-to-speech technology. Both samples have been written using font size 16. However, the student changed the style of font from Arial 16 (in the first sample) to Calibri 16 ( in the second sample) because it was easier for him to read and follow the text highlighting when using text-to-speech technology The student continued to write using Calibri 16 for the duration of the research (Field work observations, 2012).

One freezing morning I woke up I was very cold .I bolted into the lounge shouting, put that heater on now its freezing”. I was just about to turn it on when I

saw some chewy on it. I was (Student writing sample using font style and size Arial 16, 2012)

One night my mum knew that I hated carrots so all she let me eat was carrots so I didn't eat at all. (Student writing sample using font style and size Calibri 16, 2012).

### **What procedures did Olivia and her students use in writing lessons using new text-to-speech technology?**

#### **Procedures used by Olivia.**

Olivia encouraged students to sit in pairs, so they could support each other as they explored how to use the functionality of text-to-speech technology when writing. She suggested to students to, 'Listen with your eyes, brain, hand and body' (Field work observations, 2012), while you are writing.

Each writing lesson, Olivia explicitly focussed on a particular writing skill she wanted students to develop. This included understanding the use of capital letters, full stops, sentence starters, speech and quotation marks.

We went through punctuation, paragraphs for this story. It has capital letters, full stops, sentences, speech marks, and quotation marks. I may spend a bit of time before a lesson reminding students of specifics. This specific story the focus has been on adjectives and similes. All this is done on the IWB before the students go back to commence writing. (Final Reflective Interview, 2012)

During students' individual writing time, Olivia did not circulate in the classroom to observe or support individual students as they were writing. Instead, she worked with a small group of students, sitting on the floor with their laptops, editing their stories. She edited their narratives by listening to the stories using text-to-speech technology herself. She began by listening to the whole story using the technology and then with the support of the small group she edited different sections of the story. The editing process focused on narrative structure (Australian Curriculum Assessment and Reporting Authority, 2011), paragraphing, general punctuation and grammar. Olivia indicated that when she listened to a story using the new technology through the editing process, it allowed the students to model her approach. She suggested, 'I like it [text-to-speech technology being used to edit through a small group process] because it allows the children to have a go' (Field work observation, 2012).

Olivia guided her students through these editing sessions in a fun and engaging way and it was not uncommon to see both teacher and students laughing and gaining much pleasure from the stories they were editing.

Tiffany [pseudonym], we are not going to edit for words. I want to edit using the tool bar [text-to-speech technology] by listening to sentences. [Olivia starts listening to the story and then laughs.]... There are 16 words here. I think we should fix this - put in a full stop. [Olivia continues editing with the group.] [...] Lets now put on '*Continuous Reading*' and listen to the paragraphs. [The group listens to the whole edited story.] [...] I'll take off '*Continuous Reading*' now. Here is your laptop Tiffany. (Field work observation, Small group editing workshop, 2012)

Olivia expressed how the students became inspired to edit their own writing using text-to-speech technology. She suggested;

It makes them think about their writing and go back over and re-edit their work. In a [work] book [prior to the research] I would still make them buddy up and read each other's stories and correct each other's work, but the bulk of it still fell to me to go back and say what's going on here? (Field work observation feedback, 2012)

During the whole-class Writer's Workshop sessions, Olivia used collaborative approaches to guide her students to critically appraise texts. These workshops were highly engaging and students were always keen to have their stories up-loaded onto the IWB to share with the class. Olivia instructed her students to take off any '*Continuous Reading*' preferences before using the read-back feature of text-to-speech to read the story on the IWB. She then explicitly demonstrated how the students could listen by paragraphs but edit by sentences within the paragraphs. The following extract provides an overview of one of Olivia's Writer' Workshop sessions where she was teaching students how to understand paragraph structure:

Olivia: What makes a paragraph?

Author: When you are talking about one thing and then you change to another.

Olivia: Excellent, It is a number of sentences that are working around one main...

Author: thing — idea.

Olivia: Excellent, OK!

Olivia: That's why it's really good that you try and use paragraphs as you write because it makes you think about the ideas that you're having on the page. You can group one main idea in one paragraph and then one main idea in the next paragraph and a few sentences that make up that main idea. [Pause] So if you are setting the scene at the beginning of your story and you are introducing the reader to the main characters, then that's your first main idea. [Pause] Then if you move into the action, then you are going into your second main idea. So you need to think about it. (Field work observation, writers' workshop session, September, 2012)

Olivia facilitated the Writer's Workshop sessions by focusing students' attention on using text-to-speech technology to listen for meaning. This is in contrast to Jessica, Brandon and Hayden who found this difficult to do. Olivia's students began listening to the author's completed story before back-tracking to the beginning of the paragraph to re-listen for the purpose of editing the text. The whole-class editing approach was facilitated by the student author and Olivia. However, the author made the final decision of whether editing suggestions from the class were acceptable.

It is slow but important that kids progress and polish. Kids get frustrated at not completing work to a standard. If I edit their work I want to change – to analyse the work. Where, as a class I can focus on paragraphs ... the whole class editing is very powerful. The student [author] can decide the best way for the class to edit their work. Caitlyn [pseudonym] likes to use both [text-to-speech technology set at a read-back '*Paragraph level*' and then at a '*Sentence level*']. (Field work observation, Writer's Workshop, September, 2012)

Olivia explained how she encouraged students to listen for meaning by using prompts to engage students to think about listening to the whole sentence, listening and editing for meaning by sentences and by encouraging students to be aware of spelling errors and the use of homophones.

If listening doesn't make sense, then go back and read it again and then correct it. Look for incorrect spelling and see if makes sense. (Field work observation, Writer's Workshop, 2012)

Olivia used technology to focus students' attention to improving their story structure and spelling errors. She encouraged students to reflect on the narrative genre framework and reminded them of the different technological or non-technological strategies they could choose for correcting spelling errors. She suggested,

Do you use a spell checker? You can listen at the '*Sentence level*' [with text-to-speech technology]. If you are not sure about using a spell checker, go back to strategies you feel comfortable with and stretch the word out and then listen [with text-to-speech technology] to recheck. (Field work Writer's Workshop observation, 2012)

### **Procedures used by the students during writing lessons.**

Students used a range of procedures when writing with text-to-speech technology to support them to make sense of their writing in their individual writing time.

When I write a paragraph, I highlight my work and it reads my story. When it reads my sentence and doesn't sound right, I 'Stop' it and 'Reverse' back and correct my mistakes. If I write a sentence and doesn't stop, it just keeps going to the next one. I then go back and re-read to put the full stop in. (Student Interview 1, 2012)

I listen to the whole story for meaning as well as mistakes. My stories sound like Paul Jennings or Andy Griffiths [Children's authors of novels this student enjoyed reading]. My stories have the same type of humour. I think that is helping me to develop humour in my stories. I used to write fantasy stories and now I write humour stories. I prefer to highlight where I want it to read and then press 'Play'. (Student Interview 1, 2012)

Listening to my writing something was wrong. I found I needed to use a full stop, think about word spacing and spelling. I don't like 'Continuous Reading'. I use go ['Play'] and 'Stop' icons and the toolbar set to read each sentence. (Student Interview 1, 2012)

The above extracts show how students reflected on the instructional procedures they created to facilitate a focus on text organisation on a page, the meaning of the texts under construction and the mechanics of their writing at the same time. The students were beginning to shift their perspective from using non-technological instructional procedures to using a combination of both. The examples show how Olivia's role in the writing classroom facilitated her students to bring together their knowledge and experiences about writing and technology to have a greater impact on their learning than previous writing experiences. This supports the findings of Sutherland et al. (2004) and Dexter, Doering, and Riedel (2006), suggesting that Olivia understood the conceptual relationship between the reader and the writer for the construction of texts, but it was her students who became the co-constructors of knowledge (Sutherland et al., 2004, p. 420) through the instructional procedures they developed. The following extract taken from a student's narrative, titled, 'I never did like carrots', exemplifies how the student adopted organisational procedures for viewing the text he was writing on a computer screen. The student used double spacing between paragraphs with 'Read-back' feature of text-to-speech technology set to 'Continuous Reading' [text-to-speech technology highlighting in yellow] and font style Calibri 16.

Now I am trying to think of another plan. I think I got one.

I will say to mum I need to go to the toilet, then I will pop them down my pants.

Ok here we go, I say to mum I need to go to the toilet. She said well go then, before your carrots go cold. (Extract taken across paragraphs from a sample of a student's text, 2012).

Students supported each other as they developed their conferencing skills during Writer's Workshop sessions. They added detail to a text, by questioning the author on different possibilities for improving the text. The class as a large group would brainstorm suggestions and then discuss the pros and cons of these suggestions. The author would listen, clarify or reflect on the suggestions. The following comments exemplify student reflections during Writer's Workshop sessions as they provided feedback on two different texts.

I think your story is interesting. You can add more detail to the story if you use more adjectives. You can change words to different words, e.g. will into would, favourite for best food and desert to dessert. (Field work observations, Writer's Workshop Session, September, 2012)

Your story is good. There are 2 or 3 spelling errors. It did make sense. (Field work observations, Writer's Workshop Session, September, 2012)

While all students participated in the Writer's Workshop sessions, there was one occasion when two more experienced writers, Jared and James (pseudonyms) sat at the back of the class and were observed having a private conversation of their own. They discussed how they imagined they could access the Internet to embed a sound clip into the story they were collaboratively developing. The students were not interested in participating in the paragraph-editing workshop and were more excited about creating their own story, title 'The Lucky One', using a section of a song clip from the Internet (Zebrahead, 2008), to make the text funny and interesting.

#### The Lucky One

First of all I was about to jump out of a plane with a parachute of course. But still it is dam pretty scary.

"Don't push, don't push me over the edge" (Zebrahead, 2008).

So I jumped. There I was 600 ft in the air when I went to pull my string to open the parachute. It didn't work. What had happened I thought? Then I was worried. I fell for a long time, well it seemed long. (Field work observation Story No 1, 2012)

The school education support officer explained how there was one particular student who would copy anything he was given and could orally tell a great story. However, he had difficulty writing more than one line when using pen and paper. She



explained how his writing changed when he started to write using text-to-speech technology.

He wants to use the laptop and understands that he actually needs to think about something to put down to be able to use it. He wants to touch those keys. We set text-to-speech up to read by sentences. He would have a listen to it. If he thinks it is OK he will move on. If he doesn't think it is OK, he will think about it. Sometimes he will move on and sometimes I will say, 'Do you think you need to listen to that again'? If there is something wrong he will usually pick it up. He is actually getting good at picking up if something doesn't sound right. (School Education Support Officer, Audio Interview, October 2012)

Writing a narrative for many students took at least three or four writing lessons in Olivia's classroom. Students took time to develop their writing ideas, review their drafted texts and then complete a final copy. One student who started writing her narratives by setting the scene in narrative genre orientation structure, often changed back to her life experiences when developing her narrative genre story complication. She explained how she tried to use the read-back feature of text-to-speech technology to listen for meaning in her texts and as a means to help her develop her ideas. She explained she found it useful to reread her texts by sentences and then backtrack by two sentences or by a paragraph.

I always listen to previous paragraphs before commencing a new paragraph and I learnt that I can have more than one sentence in a paragraph, there must be more than one sentence in a paragraph. [...] Sometimes I use emoticons to express my emotions. (Field work observation, Student feedback, 2012)

### **What was the level of technology integration in this case?**

The explicit teaching scaffolds the LDWT established for understanding how to set the toolbar, provided Olivia with a direction for knowing how to adopt technology into her writing practice at every level of the SAMR Model (Puentedura, 2008) to enhance and transform her practice.

Olivia enhanced her pedagogy at the *substitution* and *augmentation* level by supporting her students to know what tools and knowledge were required to create narrative texts. When Olivia established a digital writing environment which maximised the potential of using websites (TextHelp Systems Ltd, 2012a), the new text-to-speech technology and MS Word™ software for writing, she had promoted the adoption of each of the technologies into her teaching practice at the *substitution* level of the SAMR Model. She had allowed for the technologies to make functional improvements to the writing environment and writing process, which enhanced the

writing experience for students. The introduction of the new technology acted as a direct *substitution* tool, enabling students to listen to texts on a screen, rather than reading texts from paper, as would have previously been the case.

Olivia adopted technology at the *augmentation* level of the SAMR Model to enhance her teaching, through the demonstration of instructional procedures on the IWB. The procedures enabled students to access and prepare their writing environment on a computer screen, know how to access and save URLs onto personal laptops and structure stories using a visual combination of paragraphs and white spaces. Olivia particularly adopted technology to add functional improvement to the writing process at the *augmentation* level, by teaching students how to look and listen for spelling errors when writing using text-to-speech technology and how to save and retrieve texts from any location at school and at home.

Olivia transformed her teaching practice at the *modification* level of the SAMR Model, by using a blend of traditional cognitive scaffolds and resources. She particularly adopted text-to-speech technology as a digital writing tool when she monitored the writing development of her students during their individual writing time. The technology allowed for a redesign or creation of new instructional scaffolds, promoting opportunities for whole class collaborative feedback. When Olivia developed new routine procedures for students to save and retrieve texts to facilitate formative assessment processes, she had adopted technology at the *modification* level of the SAMR Model. The technology allowed for a significant redesign of the purpose for saving texts, enabling her and the students to reflect on individual writing progress according to writing standards. The structural processes Olivia adopted for saving students' written texts, transformed how she could monitor the development of individual student's texts, as well as facilitating all students to think differently about the process of formative assessment.

Olivia created new ways of learning with technological tools, which enabled her students to write for the purpose of engaging a reader. When Olivia used the functionality of text-to-speech technology as a revision tool within a digital environment, the adoption of technology transformed her teaching practices by redefining the instructional scaffolds, prompts and classroom organisational structures necessary for teaching writing. When Olivia developed instructional procedures using text-to-speech technology that enabled her students to read and listen to texts with ease, she had adopted the use of the technology to transform her

own teaching at the *redefinition* level of the SAMR Model. This was exemplified by consciously changing the read-back speed of text-to-speech technology and choosing to read texts at a whole text, paragraph or sentence level, created instructional procedures for the editing of texts, which would not have been conceivable before the adoption of the new technology. Olivia also redefined her own approach to teaching when she adopted text-to-speech technology into small group editing and Writer's Workshop sessions. The use of technology on these occasions allowed for the creation of different thinking processes at the *redefinition* level of the SAMR Model. Olivia realised, that students began to use the functionality of text-to-speech technology according to their differentiated learning needs, resulting in a transformation of teacher pedagogy and student learning procedures.

### **What factors influenced Olivia and her students' use of the new text-to-speech technology in the writing lessons?**

#### **Factors influencing Olivia's use of the technology.**

**Teacher knowledge.** Olivia knew teaching with technology would be challenging for her, despite understanding that technology was the way forward and she needed to embrace it in her teaching.

I do appreciate its relevance. Technology is the way forward and I know it is not going away so I do try really hard to embrace it. There is no love for me in it though. (Wattle Creek School, Teacher Interview, 2012)

Olivia understood how to teach narrative writing using a range of pedagogical approaches but she had no previous knowledge about how to use or teach with text-to-speech technology. She was influenced by the collaborations she had with her LDWT to envisage a way where she could use the strengths of her previous literacy teaching to effectively overcome the difficulties she envisaged she would have in teaching with the new technology. Olivia suggested her students also influenced how she adopted the technology to teach writing. She was teaching in an environment in which her students were more empowered than she was. 'The kids are more empowered to edit themselves, it [text-to-speech technology] makes them think about it [editing], and go back over and edit more readily' (Teacher Interview, 2012). Olivia came to realise that, 'it [teaching with technology] doesn't have to be a problem, you just have to let the kids run with it and you still facilitate the learning side' (Final Reflective Feedback, 2012).

When Olivia realised her students were becoming more autonomous in editing their writing when using text-to-speech technology, she began to use verbal prompts such as ‘What are we looking for?’ ‘Press ‘*Play*’, did that sound right, why not’ (Field work observations, 2012)?

Olivia was also influenced by the growing development of her new computing skills. She realised how any technological progress she had made, must be understood from her own perspective and from what she wanted her students to achieve when writing with technology.

I know my computing skills have gone up a lot, but when I compare myself with other users. I know I am down the bottom of the spectrum, but you have to look at it from you own individual progress. (Wattle Creek School, Teacher Interview, 2012)

I still use all of that [traditional literacy instruction e.g. COPS strategy instruction] and because I have older children, even if they forget it, it just needs a reminder each lesson and they remember. (Wattle Creek School, Teacher Interview, 2012)

Olivia’s instructional competency for learning and skill development with technology demonstrates that she had professional competency at the *entry*, *adaptation* and *transformation* stages of the competency continuum (Russell et al., 2006). At the *entry* stage Olivia developed an awareness, in collaboration with colleagues and students, of the possibilities that text-to-speech technology could have for learning how to reflect as writers and readers on the construction of texts. During this awareness stage, Olivia came to realise that if she was to integrate the technology into her traditional writing pedagogy, she and her students would need to develop technological fluency when using text-to-speech technology, touch typing and practice in reading and listening to texts on a computer screen. Olivia and her students developed professional competency at the *adaptation* stage when they developed reading, listening, viewing and communication skills using technology and then applied those skills to enhance the writing process. At the *transformation* stage, Olivia had adopted text-to-speech technology as a catalyst for significant change to her writing pedagogy. She collaborated with her students through small group editing workshops and whole class critiquing of texts to redesign instructional writing procedures using technology. The elaborate instructional procedures she designed with the new technology provided evidence for how Olivia transformed her own and students approaches to the reviewing and production of texts.

**Teacher motivation.** As Olivia gained confidence on how the integration of technology into her pedagogy could be effective for shaping students' writing development, she realised that she could let go of her previous fears of teaching with technology. She came to understand how 'the structures of getting a child to write a good story from a teaching perspective remain the same' (Wattle Creek School, Teacher Interview 2012) even when combined with the use of technology.

The positive influence of being able to continue using explicit teaching approaches helped her to remain focused on the development of students' narrative writing as she had always done before teaching with technology.

I haven't actually changed my explicit teaching. The read write program had aided the children to be more autonomous [...] and to have a bit more confidence to have a go without running to me every two minutes, but I don't believe the teaching per say has changed. (Wattle Creek School, Teacher Interview, Question 1, 2012)

**Technical support.** Before the start of the research, Olivia had access to two days of technician support each week. She viewed this as a 'nuisance because when things went wrong she often had to wait until a technician was available to solve the problem' (Interview, 2012). This was different from Paul's case because he had this technical knowledge himself, which Olivia did not.

We only have IT [ICT] support 2 days a week, which is a real nuisance because if things go wrong you have to wait and put in an order and then it's back logged. Regular ICT support is essential. Children need to access technology whenever, without it being a big operational process. (Wattle Creek School, Teacher Interview, 2012)

**Collegial support.** The knowledge gained through participation in regular LDWT meetings impacted positively on Olivia's use of text-to-speech technology for teaching writing. Collaboration with peers, encouraged Olivia to focus on how the functionality of the technology could enable her students to reflect on the quality of their texts. Olivia was able to discuss in these meetings how she could maximise the potential use of the technology in combination with her traditional writing instruction. The strategies the LDWT developed to introduce the new technology to the writing classroom, provided Olivia with a foundation to further explore with her students, how she could adapt her traditional writing instruction when students were writing with text-to-speech technology.

I think it [technology] sort of creeps up on you. Each day you use it a bit more and then you sort of look back and think, where was I? It's kind of blurred because you are involving yourself in it on a day by day process, but I absolutely use technology 100% more than I did. I am sharing with students,

listening to their writing and my editing has adapted to fit the technology for sure. (Wattle Creek School, Teacher Interview, 2012)

**Administrative arrangements.** Olivia experienced operational difficulties for accessing computers on a daily basis and especially when she wanted to use them at a designated time for writing lessons. Wattle Creek School provided students with the use of laptop computers, which were shared between classes. Organising when she could access the computers each day became part of Olivia's daily routine, despite the fact she could only have access to a full class set for one hour. This was different from Paul's case because his Year 3 students used a different set of laptops. Olivia had access to a set of laptops which she had to share with three other classes.

If I want to have one on one computers I have to prearrange with the other staff in our building every day. Every morning in our building, the teachers converse and negotiate when they can book in the computers for their classes for that day. There are 5 pods of computers, but each pod is less than a class set. The number of computers in a pod relate to the year level of students. If it's Year 4 it is one computer between three and for Year 5, it is one computer between 2 students. A computer trolley has the capacity for a class set, but we have a ratio of computers to a year level until we can afford [at Wattle Creek School] class sets for every year level. Organising the computers for the day becomes part of our daily routine. We only get one hour to have a class set. (Teacher Interview, 2012)

**Factors influencing the students' use of the technology.**

**Student difficulties in managing the software.** Students found the use of text-to-speech technology frustrating when the technology read back their friends' names with incorrect pronunciation. This influenced how they collaborated with Olivia to solve the problem. The students and Olivia explored the 'Say like' preference in 'Speech Options' in the Read&Write Gold™ software using the IWB to know how to make adjustments to the functionality of text-to-speech technology, so text pronunciations could ensure that names were spoken correctly by the read-back feature of the technology when written. The students then realised it was easier to adjust all the names before they started writing a story, rather than editing them individually during the writing process (Field work observations, 2012).

Students also had difficulties in relating to Olivia if a problem that arose when writing texts was related to a technological problem or knowledge about writing. As Olivia explained

One of the kids asked me the other day about direct speech and I thought they meant, how do you know where to put direct speech quotations in writing? So I went into the elaborate description of you ask, What is being said? Quotate it! Who it is being said by? Quotate it! They [the student] listened really patiently

and they said, yes! But! What I asked was, how do you put the quotation mark on the page? That was a bit of a wake up moment for me as a teacher. I tend to overlook that because I see them as being the expert and me running to keep up with them. (Final Reflective Feedback, 2012)

**Exploration.** The students were not observed to experience difficulties when exploring how to use text-to-speech when writing because Olivia had established a positive writing environment that ensured that the technology could be used to benefit everyone, ‘I will use it because it is something that benefits everybody’ (Teacher Interview, 2012). The following extracts suggests how one student was comfortable changing from his traditional editing approach to exploring a new approach when writing with text-to-speech technology.

It helps me with spelling. I usually copy writing words onto the computer using Look, Say, Cover, Write, Check [a spelling strategy]. It [using text-to-speech technology] makes it easy for me to think of ideas because when I listen to my story I can think of the next thing. (Field work student feedback, 2012)

Students explored the operational functions of text-to-speech technology, sharing their ideas with Nicole when she visited the classroom (see Appendix H, Wattle Creek School pedagogical development tips list) for knowing how to use the technology more efficiently. The students suggested:

If you press ‘Pause’ to make a correction with text-to-speech technology, press ‘Pause’ to start again. The text you were listening to remains highlighted. You can move anywhere in the document, but when you press ‘Pause’ again the voice will start where you first left off.

When you ‘Pause’ and ‘Stop’, ‘Stop’ will take you back to the beginning of the sentence. ‘Pause’ will stop where you are in the middle of a sentence and start in the middle.

If you press ‘Backwards’ once, you will go back one sentence. If you press the button twice, then you will go back two sentences. (Field work observations, 2012)

The collaborations between the students and Nicole were important experiences for developing student voice and for facilitating Nicole to consider the relationship between writing pedagogy, technology and writing (Viilo et al., 2011).

### **Case Summary**

When Olivia integrated technology into her writing classroom she did not view technology as being more important than the learning to write process. The LDWT provided her with the some technological knowledge and an understanding of the explicit teaching skills necessary to explore and critique the potential of integrating technology as a means to provide rich learning to write experiences for all students.

The Wattle Creek School philosophy of explicit teaching and the collaborative consultations Olivia experienced as a member of the LDWT encouraged her to design instructional strategies where she could continue to remain effective in teaching her students to write.

A cross checking of data through the triangulation process showed consistencies for how the collaborative learning environment provided a rich learning-to-write experience. Feedback from students showed how they worked in collaboration with Olivia to problem solve writing issues that emerged from the integration of technology. The cross checking of data also showed how Olivia with her students developed a range of instructional procedures to access and prepare the learning environment to write with technology. This included the collaborative creation of procedures with text-to-speech technology which enabled students to make sense of their writing.

Olivia drew on the depth of her literacy knowledge when collaborating with her LDWT colleagues to envisage how text-to-speech technology could be integrated into the writing process. As she suggested,

Writing is across the curriculum. It's in every aspect of the curriculum so you need to think bigger than a single subject. When you teach at the primary level everything integrates with each other, so you should think that way in terms of your teaching practice. (Teacher Interview, 2012)

The case of Olivia highlights how a reluctant technological user can embrace technology through mentoring and collaborations with colleagues and students, to find a balance where technology can be intergraded successfully into writing pedagogy.

The fact that Olivia continued to use technology in her teaching after the research project had finished, suggests that the experience was a positive one for her. However, while there were a set of aligned teacher-related and student-related factors that impacted positively on her level of integration, there were situation-related factors that created difficulties for Olivia. While the teaching experience can be positive, the level of integration in a classroom still needs an effective alignment of teacher-related, student-related and situation-related factors.



## Chapter 9: Findings for the Case of Stephanie

The case of Stephanie illustrates how a teacher in collaboration with colleagues and students, can learn how to create instructional writing strategies with technology that can personalise and de-privatise the writing process for all students learning to write. Stephanie was successful in integrating the new text-to-speech technology to teach writing because of the collaborative experiences she shared with her Learning Design Writing Team (LDWT) colleagues and her students. The collaborations helped her to reflect on new ways of teaching and how she could create her own writing instructions with technology. Stephanie used the ‘*Plan-Write-Revise*’ writing concept, in combination with the new technology, to focus her students’ thinking on the relationship between the writer and the reader as students were writing. At the end of the research Stephanie realised she had differentiated the learning-to-write experience for all students through the writing instruction she designed with the text-to-speech technology.

Stephanie was initially challenged in knowing how to integrate the new technology into her teaching. Her case provides insight into how a teacher can adopt explicit teaching approaches (Rosenshine, May, 1987), in collaboration with colleagues and students, to know how to teach writing using text-to-speech technology. Stephanie designed and then scaffolded instructional procedures with technology through the mentoring of her colleagues which impacted on students learning to write.

### **Background Information.**

Stephanie was in her first year of teaching. She was teaching a class of 26, Year 4 and 5 students. Wattle Creek School had a total student enrolment in the 500-510 range. The Index of Community Socio-Educational Advantage (ICSEA) value of Wattle Creek School in 2012 was in the range of 890-1000, with approximately 44% of students in the lowest SES quartile and less than 6% in the upper SES quartile. The school had a total enrolment of 11% students with a language other than English. The ICT Leader, Nicole had established a LDWT for the purpose of designing learning experiences to teach writing using text-to-speech technology. At the start of the research Stephanie classed herself as a competent user of technology and was pleased her personal experiences with technology could be nurtured through the support of her LDWT colleagues for teaching students how to write with technology.

## **What procedures did Stephanie and students adopt in introducing new text-to-speech technology into writing lessons?**

### **Preparation by Stephanie.**

As a novice teacher, with limited experience in teaching with technology, Stephanie was looking forward to learning from her colleagues in the LDWT how she could 'cement' her classroom practices and use explicit teaching to teach writing with technology. Stephanie used the same preliminary activities as Paul and Olivia for using the typing tutor and understanding how to introduce the text-to-speech technology toolbar to her students. In addition, she explained how she viewed technology as an organisational and publishing tool, which could also be used to personalise student learning (Teacher Interview, 2012).

I don't have cemented practices as yet. I use ICT to personalise student learning, to design specific courses and learning experiences and as an organisational tool. (Teacher Interview, 2012)

Stephanie traditionally preferred her students to hand write their stories, explaining

We would have a topic and hand write and go through the process as a pen and paper task. We only used computers really, to publish pieces of student work. (Teacher Interview, 2012)

Stephanie suggested that she would need to teach her students how to use the text-to-speech technology by using explicit teaching and explorative approaches. She also understood that she didn't have the teaching skills necessary at this stage of her career, to find a way to engage students to write with technology. However, she did understand that the new technology could be used to prepare students to become international authors, where their texts could be read by others on the Internet.

It is important to teach kids how to find the answers and that we don't just stand there and say, 'I don't know'. We need to model, 'I don't know, but this is how I am going to find out'. I think this software can prepare kids to be international authors. (Wattle Creek School, Teacher Interview, 2012)

**Introduction to the technology activities.** At the beginning of the research Stephanie worked in collaboration with her LDWT colleagues to understand how to teach students to personalise the Read&Write Gold™ toolbar speech settings as well the appearance of text on a page. When Stephanie first introduced text-to-speech technology to her students during the preliminary three week period, she was supported in the classroom by her ICT Leader Nicole, who explicitly modelled to Stephanie and her students how to upload the tool bar onto a MS Word™ page.

To increase her own knowledge for how to use text-to-speech technology, Stephanie accessed the TextHelp Systems Ltd (2012a) website with her LDWT colleagues to seek further information.

We knew we needed to teach narrative, but we were struggling a bit, about finding our way [with] what to do with the laptops. We got some information from the Read&Write Gold™ website. It has information that explains every icon. You can go through with your students exactly what each one does. You can actually use Read&Write Gold™ to read it straight from the website. (Wattle Creek School, Staff Meeting, 2012)

Stephanie created practice writing sessions with text-to-speech technology, where students learnt how to set up the technology speech settings to facilitate ease of using the technology while listening to texts at the same time. She suggested the focus was to establish a writing environment where students could type and listen to their stories rather than only write and then read what they had written. (Wattle Creek School, Staff Meeting, 2012)

We then realised we needed to change the speech settings [...] to speak each sentence, otherwise text-to-speech plays a letter or word and you need to keep pushing 'Play' all the time to listen to what is written. (Wattle Creek School, Staff Meeting, 2012)

Stephanie suggested that if the text-to-speech technology preferences were set to continuous reading, it would give students 'a couple of sentences to listen to' (LDWT Meeting No 2, July 2012).

Stephanie also suggested that it was important for students to understand the font size and style, word spacing and highlighting colours that would make it easy for students to view texts on a screen as they were writing when using text-to-speech technology.

The other thing we decided because most of the kids would waste 20 minutes deciding what colour and font they would use instead of writing. All our writing is set to Arial 16 and then we also realised we needed to put in line spacing [...] because kids would have all this text that they are focusing on. (Audio recording, Staff Meeting, August, 2012)

Stephanie knew that the visual appearance of print on a screen was important, especially for assisting students to edit their texts. She suggested the font size of 16 may be too small for some students and that a focus on white spacing on a page would also assist student reading.

What the kids are doing is, they are listening and watching with the technology, as a tool to edit their writing. To be able to watch and read, they actually need that white space in the text, otherwise it is just too much. I found [font size] 16 was a bit small for some students, so it's a good idea to have a

conversation with them [students] individually first. (LDWT Meeting No 2, July 2012)

**Instructional literacy activities.** The LDWT decided to use an explicit teaching approach (Rosenshine, May, 1987) to introduce text-to-speech technology into the writing process. They also decided to be guided by the students for how the new technology could be used as a tool to support the development of meaning when creating texts. To ensure that students could adopt the technology as a tool for writing, Stephanie spent time encouraging students to share with her the different speeds and voices and the problems they experienced when exploring how the technology could support them to write.

We are now using ICTs and Read&Write Gold™ to learn how we can read for information and how we can use the tools that we have to highlight text and focus on key words. What I am passionate [about] is to teach students to read for information and what do we actually get out of a text and what's useful. (Interview, November, 2012)

**Organisational approaches.** The LDWT realised that if students were to write using text-to-speech technology they would need to teach the students how to type. Stephanie explicitly taught her students how to save the Dance Mat touch typing URL into the bookmark bar so the students could load the website quickly at the start of every writing lesson ("Dance Mat Typing," 2012).

We needed to teach them [students] ... how to type. We looked for free ware in touch typing and the most engaging free one we found was BBC Dance Mat ("Dance Mat Typing," 2012) touch typing. We taught the kids how to drag the URL into the bookmark bar so they just have it on [loaded] starting at Level 1 and follow the steps through. There are quite a few [students] who no longer look at where their fingers are going and it's about the screen and what they are typing. (Stephanie, Wattle Creek School, Staff Meeting, 2012)

### **Preparation by the students.**

The students learnt different ways to manage text-to-speech technology for writing. One student indicated that she found it difficult to use the 'Rewind' icon when she was writing. She hoped that as she learnt how to use the new technology, she could continue to listen to her stories to know if they made sense.

It is really clear to hear and you can change the speed of it. I change the speed when I am listening to words that don't make sense. I go slower, about 25-30%. (Personal communication, 2012).

Another student explained how she had problems learning to manage the different functions of text-to-speech technology while thinking about her writing at the same time.

It's annoying. When I press the 'Play' button it sometimes didn't play, and when I pressed the 'Forward' button it sometimes went backwards or didn't work at all. When that happens, I read it [my story] to myself. (Personal communication, 2012)

Stephanie explained how the students enjoyed spending time at the start of every writing lesson learning how to touch type. The students termed the typing sessions as 'finger warming exercises' (Field work observations, 2012). One student suggested, it was 'easier not to copy [handwritten stories onto a computer] [...] it also helps me to use speech marks in my stories' (Personal communication, 2012).

Another student, Paul [pseudonym], suggested there were positives and negatives for learning how to touch type. Paul's positive touch typing experiences suggested, It's good. It shows you where to put your fingers and you don't have to look at the key board. It makes a noise if you get it wrong, and you get to try every letter. You get to repeat [the letter and words] to get used to it. (Personal communication, 2012)

He also had negative touch typing experiences:

Makes you tired and my brain gets tired because it uses energy. The loading time [of the website] is too long and sometimes my hands get tired. (Personal communication, 2012)

## **What procedures did Stephanie and her students use in writing lessons using new text-to-speech technology?**

### **Procedures used by Stephanie.**

At the start of every writing lesson Stephanie would spend approximately ten minutes providing explicit instruction to students about how to improve different aspects of their writing. On one occasion, Stephanie was observed facilitating students to think about important key words that would make texts more interesting. 'What do you think are the important key words? What does the word look like and sound like?' (Field work observations, October 2012).

**Developing meaningful sentences.** Stephanie introduced the 'Plan-Write-Revise' writing framework in combination with the new text-to-speech technology to assist students to develop meaningful sentences. She used the IWB, to model how students could listen for meaning in the sentences they were writing, by using the read-back or 'Rewind' feature of the technology to backtrack over groups of sentences and listen to what they had written. Stephanie also workshopped examples of student's written texts on the IWB, to explicitly teach how students could use the technology

to listen to the construction of sentences, by suggesting, ‘A sentence is more than one thought’ (Field work observation, 2012).

**Developing listening skills.** The instructional procedures that Stephanie adopted using text-to-speech technology also enabled her to develop students’ listening skills to assist in the development of meaningful sentence construction.

It’s far easier using ICT to add to the writing process than using pen and paper. The listening is so much more powerful than just reading because through the listening you hear the [pause] I need to take a breath. Sometimes if students are not reading in a fluent manner they don't actually pick that up, but they can hear it. (Teacher Interview, 2012)

**Creating meaningful texts.** Stephanie suggested how students could listen to individual words or sentences within texts, to reflect if the words assisted in the creation of a meaningful text (Teacher Interview, 2012).

What is the information we want to take out of this [story], keeping in mind this is what we want to focus on? Sometimes there's 3 sentences, sometimes there's 3 words. We talk about why that is important and why we need to do this process. I say, because when we are reading for information we can't copy. (Field work, personal communication, 2012)

**Differentiating learning to write experiences.** When Stephanie introduced text-to-speech technology into her classroom, she did not plan to differentiate the learning to write experience for her students, despite realising that students were working at their own developmental writing level.

I don't need to plan for differentiation. When we talk about engagement and differentiation, it is all happening. Where we work with those kids is exactly where they are at and exactly the support that they need, but nowhere in that process have I had to plan for that. The students have created that. Whether it’s me who’s giving them the idea that week for the story, or we've taken it from some learning, or they have had something they really want to drive. (Wattle Creek School, Teacher Interview, 2012)

**Comprehension skills for a computer screen.** Stephanie worked with individual students to explore the advantages of the preference settings such as ‘Speak by Sentence’, ‘Continuous Reading’, listening by three sentences, three words or a paragraph, to comprehend what had been written while reading from a screen. She prompted students to focus on the print appearance and particularly the white spaces between words to facilitate ease of thinking while reading and viewing texts. Stephanie also developed students’ questioning and screen reading skills at the same time, by suggesting how they could backtrack over sentences to ‘Read, Filter,

Understand and Reapply' (Field work observations July-October, 2012) new meaning.

When listening to the story for meaning, remember, we don't want to change the story and change the meaning. Ask yourselves some of the following questions?

Is this your Story?

Is this what you want?

Do you want to change it?

Does that sound right?

Is this what your story should say?

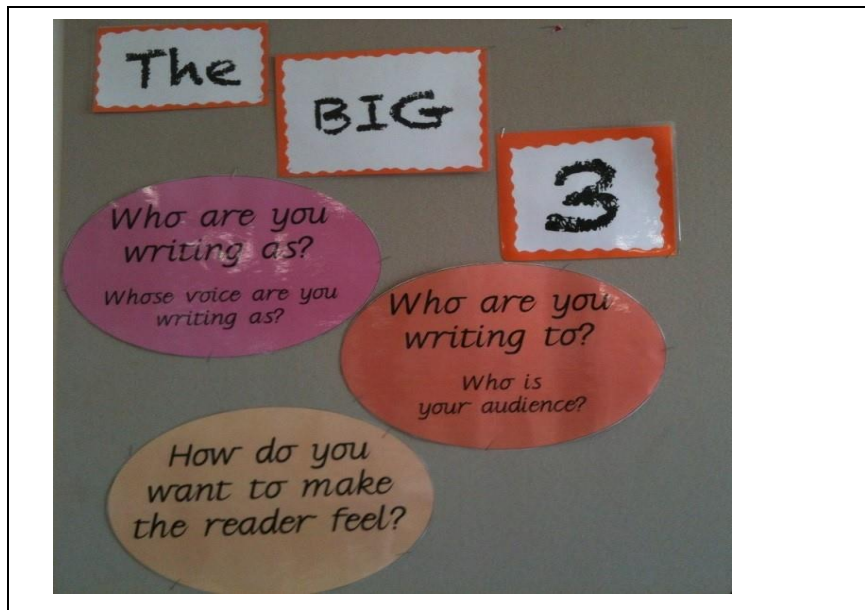
Is this what you meant? (Field work observations, writers' workshop, November 2012)

**Integrating new instructional strategies into traditional strategies.** Stephanie integrated new instructional strategies into her traditional story-grammar training (Villalon & Calvo, 2011) to promote students' to think about the comprehension of texts at a paragraph and whole text level through the use of text-to-speech technology. She combined the story-grammar questions with three new specific questions, which she called the 'Big 3'. The three new questions were designed to assist students to think about writing to entertain a reader, while at the same time maintaining their own author identity. (Field work observations, 2012). See Figure 16.

We are now talking about this idea of the Big 3. There are kids working their now, as opposed to just in story-grammar. Who are you? Whose voice are you writing as? Who are you writing to? Who is your audience? How do you [as an author] want to make them [audience] feel?

The story-grammar questions included; How does the story end? Who is the main character?, Where and when did the story take place?, and What do the main characters do? (see Figure 16 below)

Figure 16 Stephanie's Big 3 questions which she combined with Story-grammar Training.



Stephanie created a poster to assist her students' to scaffold the use of Big 3 during writing lessons. The questions focus on the 'who' and 'how' for developing an author's voice.

**Editing texts.** The integration of text-to-speech technology into the writing process, changed how Stephanie encouraged students to edit texts during their individual writing time. She developed a three-step instructional editing process of 'Write, Edit and Print' to encourage all students to edit their individual stories before sharing texts through a whole class Writer's Workshop process. The first instruction involved students using the read-back or 'Rewind' feature of the technology to listen to their whole story before back-tracking to re-listen to individual sentences when editing for spelling errors and what Stephanie termed 'run on sentences' (Field work observation, 2012). These are lengthy sentences which run on without full stops. The second instruction required students to check for capitals letters and full stops while the third process focused on the organisation of white spaces between words and paragraphs, the editing of the length of sentences and to see if students could make conjunctions from words they had previously written (Field work observations, 2012).

Stephanie: We are going to check for run-on sentences Jakob [pseudonym].  
What speed do you want to play it [text-to-speech technology] back and who is  
telling the story?

Jakob: 34% and I am Jack [in the story]

Stephanie: Are you happy now to let that read?



Jakob: I haven't got it edited yet by myself because later on the story I want to check it.

Stephanie: That's OK. Can I hear from the start to where the full stop end is because that's a whole sentence? The comma doesn't make it two sentences. (Field work observation, extract from individual student editing with Stephanie, 2012)

**Whole class critiquing of texts.** Stephanie also viewed text to-speech technology as a tool that could facilitate a whole class to critique a text, through the Writer's Workshop process. Stephanie encouraged individual authors to guide the editing process of their texts while still maintaining author control over the text.

I know writing is a really personal thing and yet vary rarely do any of them [students] not want to share. In fact the list [of students] gets so long we really have to try and limit them. It's about sharing a text and being brave enough to say what we think it means. (Interview, 2012)

**An elaborate two-part editing process.** During Writer's Workshop sessions Stephanie scaffolded students through the editing process using a new elaborate two-part procedure which she created. The first part, focused on the editing process which engaged all students at the same time to think about the construction of a text. In a Writer's Workshop session for the editing of Tony's [pseudonym] story, Stephanie reset the speed of text-to-speech technology to function at a slower instructional level, as determined by Tony at the start of the workshop.

All students listen to Tony's story and laugh. Stephanie asks for text-to-speech technology toolbar to be moved off the text on the screen and Tony asks if text-to-speech voice speed could be slowed down.

Stephanie: Did someone hear something they thought might need to be changed?

A student responds: Could we change 'called' to 'named'?

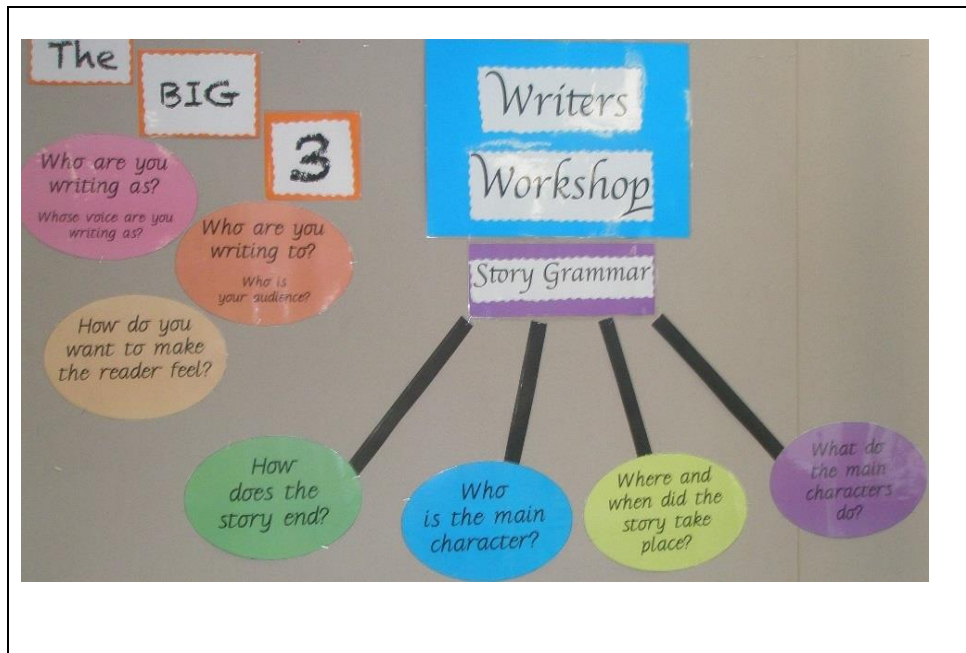
Stephanie You can, either way it works. What do you think Tony? It's your story.

Tony: Named!

Stephanie: You can make that change Tony. I don't think it is going to make too much difference to the structure of the story, but it still sounds right. (Field work observation, extract from a writers' workshop session, 2012)

The second part of Stephanie's editing process focused on thinking processes to facilitate publishing outcomes using story-grammar questions and the Big 3 questions (Field work observations, 2012), (see Figure 17).

Figure 17 Story-grammar and the Big 3 writing strategies displayed in Stephanie's classroom (2012).



The figure shows students how they can account for author identity and the mood and feeling being conveyed through the text.

The instructional procedures Stephanie designed promoted students to think about becoming authors who could communicate to a global community (Field work observations, 2012).

I want to get to the stage where the students are producing E Books and publishing them. Interactive E Books. You can actually upload onto iTunes™ and have it as freeware. (Interview, 2012)

***Adopting a routine approach to using text-to-speech technology in the editing process.*** During the Writer's Workshop sessions, Stephanie developed a routine approach to using text-to-speech to facilitate the editing process. Students began the editing process by listening to a student's whole story using the read-back feature of the technology, before going back to the beginning of the text and structuring the story into separate paragraphs (Field work observations, 2012).

Stephanie then provided instruction on how to listen to one sentence or a paragraph at a time. She asked students to, 'Listen for emphasis and sentence length.' Think-aloud as you edit'. 'Listen to the sound of your sentences and paragraphs'. 'Is that how you want it to sound?' 'Are you happy with that change?' (Field work observations, 2012)

Stephanie also suggested, 'If students needed to take a break in the voice, then they need to consider if they should put in a comma or a full stop'. (Personal communication, 2012)

### **Procedures used by the students during writing lessons.**

The students were observed adopting text-to-speech technology in both their individual and whole class writing experiences. They developed their own procedures to listen and then re-listen to their own texts and those of their peers. The following student reflected on the routine approach she adopted for using text-to-speech technology to edit her text.

I read first to myself and then listen to my story by sentences. Then I listen for mistakes and look for double spacing. Then I listened to my whole story and then added more. (Personal communication, 2012)

Students also indicated how using text-to-speech technology to listen to texts while they were writing, enabled them to focus on the prompts Stephanie used to facilitate their thinking.

Student 1:

I '*Play*' text-to-speech, '*Rewind*', listen to a sentence. When I have a big amount of writing to make sense I '*Stop*' in the middle of the sentence and pause to think. (Field work personal communication, October 2012).

Student 2:

I '*Rewind*' and '*Fast forward*'. If a sentence doesn't make sense, I put in a full stop. I check spelling by rewinding and pausing to keep pace of my story. (Field work personal communication, October 2012)

During individual student writing time, some students shared in the creation of their stories with peers. They used this time to seek feedback or to share an interesting idea. However, one student explained how she was still learning how to adopt text-to-speech technology as well as developing confidence with her own writing (Field work observations, 2012).

I never '*Rewind*' to check if my stories make sense and I only sometimes press the '*Pause*' and '*Play*' combinations. I am beginning to use text-to-speech to help me think about what next to write. I think I am more confident with my writing, but I have never listened to others' stories or shared mine. (Personal communication, 2012)

The revision procedures that students developed when using text-to-speech technology helped them to listen for meaning in their texts. After ten weeks of reflecting on how he used the technology when writing, one student indicated how he preferred to write using the technology.

I found when I listen to my stories there are too many words in one sentence. It [text-to-speech-technology] helped me to understand, narrow down. It was hard to understand. I like to use it to listen to the whole of my story. I never use the 'Rewind' to go backwards or the 'Pause' and 'Play' combination during the writing process. Sometimes I choose to use the 'Fast Forward' icon. (Personal communication, 2012)

When students had been composing narratives with text-to-speech technology for a period of ten weeks, students began to identify specific writing goals they wanted to achieve. One student suggested she wanted to improve her grammar, while another wanted to know how he could make sure the creative names he used, could sound creative when they were read back and listened to using the 'Rewind' feature of the technology. A novice writer indicated how text-to-speech had helped her to improve her spelling while she was writing and that she was hoping she could also improve her writing by writing in paragraphs (Personal communications, 2012).

### **What was the level of technology integration in this case?**

Stephanie's case demonstrates how she adopted technology into the teaching of writing at every level of the SAMR Model (Puentedura, 2008). She adopted technology to enhance student learning at the *substitution* and *augmentation* level of the model, by exploring how effective text-to-speech technology was as a tool for enabling students to engage with the functionality of technology while thinking about their writing at the same time. This involved using the information from the TextHelp™ website ("TextHelp Web Apps," 2014) to know what tools and possibilities could be appropriate to support students' comprehension of texts. When Stephanie observed how her students used text-to-speech technology within the TextHelp Systems Ltd (2012a) comprehension exercises, she re-designed how her students' could compose texts, enabling them to write with the new technology on a computer screen instead of the traditional pen and paper process. During the new writing procedures with text-to-speech, Stephanie had adopted the use of technology at the *modification* level of the SAMR Model, allowing for a significant redesign of the writing process.

Stephanie's approach to teaching writing demonstrates how her new understanding for adopting text-to-speech technology transformed her own teaching practice and student learning opportunities at the *redefinition* level of the SAMR Model. Stephanie redesigned her instructional approaches so her students could think as authors and focus on their comprehension and revision goals. She specifically

designed different editing processes during Writer's Workshops which assisted individual students to focus on the screen, while developing listening skills at the same time as they reflected on their written texts. Stephanie linked writing knowledge to the comprehension capabilities of her students within a whole class context, by using the 'Read, Filter, Understand and Reapply procedure' (discussed above in Procedures used by Stephanie) on the IWB to model how students could listen to the meaning of texts at an individual word, sentence or continuous reading level. The revision procedures students used helped individual students to think more deeply about the construction and editing processes as authors of texts to be read enjoyed and critiqued by others within a digital environment.

The instructional procedures Stephanie created, exemplified how she adopted technology at the different SAMR levels within her own pedagogy. Her perspective about integrating text-to-speech technology as an instructional writing tool, highlights how a teacher can change from viewing technology as a typing tool or for personalising learning at the *augmentation* and *substitution* level of the SAMR Model for enhancing learning, to thinking about integrating technology as a tool that could redefine the learning to write process for all students.

When Stephanie used her traditional story-grammar training, combined with the 'Big 3' questions to focus students' thinking on entertaining a reader, maintaining author identity and creating a feeling or a mood within a text, her teaching practice was transformed. The adoption of text-to-speech technology into the editing process had allowed for the creation of new instructional thinking. This is taken as evidence of action at the SAMR Model *redefinition* level, action that allowed for the creation of new tasks.

Stephanie's realisation emerged as a transformational teacher when the new writing environment she established and the instructional strategies she designed enabled her students to have conversations about texts as active authors of texts. Stephanie had de-privatised her own approach to the teaching of writing by using the power of text-to-speech technology with the power of language, to guide students to write with technology.

If we talk about giving students the power in their learning, in the perfect world I want resilient and responsible learners. We are teaching students skills to be those people. The students are learning more than just writing. I think if we want those people in our community, then we have to teach them to be those people. (Wattle Creek School, Teacher Interview, 2012)

## **What factors influenced Stephanie and her students' use of the new text-to-speech technology in the writing lessons?**

### **Factors influencing Stephanie's use of the technology.**

**Teacher knowledge.** Stephanie began the research unsure if her teaching practices were sufficient for using technology effectively to develop students' writing. She developed new knowledge through the LDWT and spent time explicitly modelling and then scaffolding students to develop foundational skills for understanding the functionality of the new technology so her students could write fluently using the tool. When Stephanie applied her new knowledge about explicit teaching, she was able to facilitate students to explore and share with her, how they could use the potential of text-to-speech technology to support their individual writing goals. To enable her students to focus on writing good stories and for her to focus on the impact of her own teaching practice, Stephanie worked towards achieving instructional TPACK (M. Koehler, 2014) by creating a flexible learning environment. This enabled her to use different approaches to teach different writing activities with technology. When Stephanie used a combination of explicit and exploratory approaches to facilitate student understanding of the functions of technology, she was able to focus on developing the scaffolds and prompts she believed would enable her students to think about creating and editing their own texts.

It was important to Stephanie, that her students could develop technological fluency so they could focus on the new writing scaffolds she created. She indicated how she developed instructional writing scaffolds to enable her students to think and focus on text comprehension. Stephanie knew that while technology would always be an integral part of the students' lives, they would still need to continue to use pen and paper and know how to write, as society would never be paperless. Stephanie explained how she was using technology as a 'vehicle, to enhance student engagement in writing', and that she was there to support her students to develop their own writing knowledge and skills (Wattle Creek School, Teacher Interview, 2012).

Stephanie reflected on how the use of text-to-speech technology in her writing classroom had made learning to write a more communal and shared process.

I think your immediate head set is when kids are working on their own with their own story that, that's how it stays. That it is a personal relationship that they've got with it and I think that through group editing we've de-privatised

that a little bit and opened it up. Not all the students are at that stage. Some of them are still quite like a private relationship with their laptop [...] a one to one type of thing and through the group editing process especially and working on the same program at the same time, we've made it something that they can actually talk about, they can actually share what they are doing. It doesn't feel like we have separated the two. I think we are de-privatising writing. (Final Reflective Interview, November, 2012)

Stephanie explained how text-to-speech technology had made her think differently about how students acquired literacy skills. She came to understand that group editing 'de-privatised' the personal relationship that some students had with their texts (Final Reflective Interview, November 2012). Stephanie suggested she grew in confidence when she introduced open communication in her writing lessons (Final Reflective Interview, November 2012). However, she was unsure if it was part of her pedagogical journey or what happens when technology is being used as a learning tool.

The open conversation is different and I've learnt to let them (the students) drive where we are going and what we are doing. That's where I wanted to go, but I don't know whether I would have gotten here now or where I would have been? (Wattle Creek School, Teacher Interview, Question 5, 2012).

Stephanie's instructional competency for learning and skill development with technology demonstrates that she was successful in developing professional competency to the *transformation* stage on the competency continuum (Russell et al., 2006). Stephanie used text-to-speech technology as a catalyst for significant change in how she taught students to write. She created a writing environment, instructional strategies and editing procedures that enabled students to critique and reflect on the quality of their own texts. The new learning procedures that Stephanie created, were made possible because of the explicit and collaborative teaching approaches she adopted with peers and students.

While the focus of this research remains on teacher pedagogy with technology, it was Stephanie's students who also provided insight into how the adoption of technology can influence their future writing goals. Novice writers indicated how they viewed the potential use of text-to-speech technology as a tool to attend to new learning goals. This included the construction of meaningful sentences through the use of creative vocab and a focus on the length of sentences. More experienced writers adopted the new technology to think about becoming different types of authors through the development of humour in their texts (Student Interview 1, 2012). This

also included thinking differently about how they could write to communicate for global audiences (Field work observations, 2012).

**Teacher motivation.** As indicated throughout Stephanie's case, working in collaboration with her LDWT colleagues and her students was integral for her motivation to promote the importance of teaching students to write.

I don't believe we will ever do away with pen and paper. I think [...] people were trying to go paperless. Technology is still around, but where children are going in their lifetime – they are always going to need to write properly. (Teacher Interview, 2012)

The opportunity to work with colleagues and students to explore how text-to-speech technology could be integrated as a tool for writing, impacted positively on Stephanie's confidence to adopt technology within all writing activities. Stephanie's motivation for designing new approaches to teach writing with technology was also influenced by the leadership of her ICT Leader Nicole. Stephanie was fortunate that she did not have technological or administrative difficulties that could have impacted negatively her own approaches to teach writing with technology. She also knew that she had regular support and feedback from her teaching colleagues and a pedagogical leader, who were also motivated to understand how to teach writing technology through the sharing of their ideas and personal experiences.

**Collegial support.** Stephanie had access to regular collegial support through the LDWT meetings, where she was able to reflect on ideas and understand how she could create her own writing instruction and view the use of technology as a communication tool and for personalised learning outcomes.

I use technology personally every day. I also use ICT to personalise student learning and as a personal organisation tool. When you think of working with ICT, it is personal. (Teacher Interview, 2012)

The Wattle Creek School philosophy of explicit teaching and the supportive leadership structures provided the foundations on which Stephanie could build and reflect upon her own skills, knowledge and strategies to develop students' writing. However, Stephanie was challenged by the impact that text-to-speech technology had on the writing outcomes for individual students during their personal writing time. As a member of the LDWT she became aware that the new technology could be used as a tool to facilitate a conceptual approach to writing using the 'Plan-Write-Revise' strategy which could then facilitate conversations about the editing and writing



process. Stephanie indicated that this change in thinking happened gradually for her and she had now become more confident in her own practice as a result of collegial mentoring.

It's far easier using ICT. The listening is so much more powerful than the reading because through the listening you hear. I am in conversation with the editing process, in conversation with the spelling process, in conversation with structure. I have an idea where the students are explaining to me their understanding, what they want to do and how do I get there. I know exactly where they are at. How they come and where they are going. Even those students who are still stuck with spelling issues, I can see that they have gotten a bit beyond that. It's a process. (Wattle Creek School, Teacher Interview, Question 10, 2012)

The mentoring support that Stephanie gained from the LDWT also encouraged her to adopt explicit teaching approaches which she used effectively to introduce new instruction with technology to her students.

Now with ICT it is very different and more collaborative because we can do group editing in a way we can put it on a screen. This is about enabling them [students] to achieve at any level on a scale and grow and develop. (Teacher Interview, 2012)

### **Factors influencing the students' use of the technology.**

**Motivation.** The collaborative writing experiences and instructional procedures which Stephanie promoted, motivated her students to adopt text-to-speech technology to write stories. Students were observed sharing and enjoying listening to each other's texts as well as discussing how they could use the technology differently to improve their writing. Caleb and Tony [pseudonyms] provided insight into how the use of text-to-speech technology motivated and influenced them to think about writing with technology.

Caleb liked using text-to-speech to listen to his stories and felt that the technology was helping him to gain more confidence in his writing and helping him to think what next to write. He thought his stories were becoming more interesting and that he was using more interesting words. (Student Interview, 2012)

Tony really liked using the technology to listen to the stories of other students, but he wondered how it could help him to think about what speech marks could do, because he didn't know what they were. (Student Interview, 2012)

The teaching of writing with text-to-speech technology also motivated another student to continue writing her story at home. She suggested, 'It is really good helping me when I am writing. I wish my mum had it on her lap top' (Personal communication, 2012).

**Student difficulties in managing the software.** At the start of the research Stephanie mentioned how she liked to be in control of the learning process, but through the adoption of text-to-speech technology and the difficulties her students experienced in managing the tool she had learnt to think differently about her practice.

I'm a control freak and I feel like I need to be on top all the time and through this I have really let go of that and let them [students] drive where we are going and what we are doing. They are all driving their learning. (Teacher Interview, 2012)

Despite students, 'driving their learning' (Teacher Interview, 2012), there were challenges that students experienced when editing texts. One student with significant spelling difficulties became frustrated when the red and green lines appeared on her screen as she was writing. 'It's hard to use because of the underline in red. I get confused. I 'Rewind' it back too far' (Personal communication, 2012). Stephanie modelled to the student how she could turn off the underlines in MS Word™ and Read&Write Gold™ and write only using the text-to-speech technology features. In an interview with Stephanie, she reflected that while the student's story required significant editing for spelling errors, the student's enthusiasm for writing and length of story improved (Teacher Interview Week 5, 2012).

### **Case Summary**

Stephanie emerged as a transformational teacher when the instructional writing strategies she designed with technology enabled her students to have conversations about texts as active authors of texts. Stephanie had de-privatised her own approach to the teaching of writing by using the power of the new text-to-speech technology, with the power of language to guide students in learning how to write.

If we talk about giving students the power in their learning. In the perfect world I want resilient, responsible learners and we are teaching them skills to be those people. They are learning more than just the writing. I think if we want those people in our community, then we have to teach them to be those people. (Wattle Creek School, Teacher Interview, 2012)

The case of Stephanie highlights that when a teacher collaborates with colleagues and students to integrate text-to-speech technology into their traditional writing strategies without technical and administrative difficulties, then writing practice can change. Stephanie designed writing experiences for use in a digital environment with the new technology at a higher level than she could have accomplished without the technology.

Using the process of triangulation, Stephanie's case shows there were consistencies between the data sources she provided and those of her students. Stephanie adopted and used text-to-speech technology to differentiate the learning to write experience for all students. Student data showed how the instructional procedures adopted and used by Stephanie, facilitated them to attend to their individual writing goals and share their ideas about writing with technology.

The fact that Stephanie did continue to use the new technology to teach writing beyond the period of the research suggests that the experience was a positive one for her. This was not because of a result of how she used technology. The level of integration that resulted in her classroom was associated with the effective alignment of a set of factors, teacher-related, situation-related and student-related, all dependant on the influence of sustained leadership and mentoring.

## **Chapter 10: Findings for the Case of Nicole**

The case of Nicole illustrates how an ICT leader can develop teachers' knowledge and skills to effectively integrate technology for students learning to write. Nicole was initially positive about the use of the new text-to-speech technology as she could envisage how explicit teaching approaches (Rosenshine, May, 1987) could be used to ensure the technology was used as a tool for learning to write and not used as a tool to determine (Jordan, 2011) the learning process. Nicole was successful in mentoring all members of the Wattle Creek Learning Design Writing Team (LDWT) to redefine their writing instruction when teaching with text-to-speech technology. Many students in all of the Wattle Creek School research classes, who learnt to write using the new technology, emerged as enthusiastic authors, motivated by a desire to have their stories read and appreciated by others.

However, Nicole was challenged by technical faults that impacted on the Learning Design Writing Team's instructional time and by not having an opportunity to explore the potential use of text-to-speech technology to achieve writing standards. Nicole's case provides insight into how leadership using a whole school approach, can sustain teaching and learning with technology when technology is integrated as a tool for learning.

### **Background Information.**

Nicole was an experienced teacher. She was the ICT Leader at Wattle Creek School at the time of the research and although she did not have her own class in which to use the Read&Write Gold™ software, she worked with the LDWT and their students in their classes and chaired all LDWT meetings.

Wattle Creek School had a total student enrolment in the 500-510 range. The ICSEA value of Wattle Creek School in 2012 was in the range of 890-1000, with approximately 44% of students in the lowest SES quartile and less than 6% in the upper SES quartile. Eleven per cent of the school's students spoke a language other than English at home.

Nicole had a personal teaching philosophy based on explicit teaching (Rosenshine, May, 1987), suggesting that she wanted to use explicit teaching approaches to lead the Wattle Creek School LDWT to understand how to integrate technology so students would know what to do when learning how to write.

I went into this job as a person who understood teaching and learning. At that time I was doing the Special Ed role as well, so that explicit teaching that you actually have was something that linked up to the ICT. All students should have explicit teaching, but particularly the students in our school. When you are explicit with what you are teaching, then children know what they need to do. Explicit teaching is something that I think is very important and what's been confirming is that when you ...listen to research, explicit teaching is something that comes across a lot in research as well as something you need to do. (Teacher Interview, Explicit Teaching. Audio Transcript, October, 2012)

### **What procedures did Nicole and students adopt in introducing new text-to-speech technology into writing lessons?**

#### **Preparation by Nicole.**

Nicole was looking forward to the research as it provided her with the stimulation to think how she could continue to mentor her teachers to teach writing using text-to-speech technology. Nicole established a writing environment at the start of the research, which helped teachers to focus students thinking on the development of their story ideas. Over the previous five years at Wattle Creek School Nicole suggested she had helped teachers to think about adopting technology into their teaching. She had also refined her own technological knowledge and expectations around teaching with technology. She said she had worked hard to establish a culture within the school that focused on how to teach with technology rather than what she termed, 'wiz bang outcomes' of using technology (Teacher Interview. Role of an ICT Leader. Audio transcript, October 2012).

My focus is teaching and learning with technology. If students start to use it properly they start to see it as a transferable skill. (ICT Leader Interview. Role of ICT Leader. Audio transcript, October 2012)

Nicole also focused on the teaching and learning to write process, as well as how to manage technology. For this research she established a teacher Learning Design Writing Team (LDWT) consisting of the three research teachers (Paul, Olivia and Stephanie) and herself, with the aim of focusing on teaching practice using technology while writing. The LDWT met six times through the life of the research. The team formulated their objective as 'Write for meaning, not write to edit' (LDWT Meeting No 1, July, 2012). In the initial meeting the team based their approach to teaching with technology by determining explicit teaching (Rosenshine, May, 1987) approaches for:

- customising the toolbar

- becoming familiar with the keyboard
- increasing the mouse size
- determining the speech voice and speed
- typing for listening at sentence length
- weekly lesson structure and time frame
- peer review and narrative story-grammar training
- deciding upon a common language for technological terminology, inclusive of prior terminology the teachers were using, such as ‘half-mast’ (see Research definitions, Chapter 1).

The team proposed that explicit teaching procedures were necessary to scaffold students to understand how to use text-to-speech technology. The teachers decided to use the following terminology as a prerequisite to learning about the functionality of the technology; text-to-speech (representing the combination of the ‘*Backward*’, ‘*Play*’, ‘*Pause*’, ‘*Fast forward*’ and ‘*Stop*’ features), toolbar, icons, speech control buttons, return, Half Mast, preferences and work area.

When you want to use some of these things (technological tools), there is actually a lot of scaffolding and explicit teaching that goes on before we have actually got to writing anything. The kids picked up the scaffolding and explicit teaching really easy. It took us the first 3 weeks just to get the kids organised. (Wattle Creek School, Staff Meeting, August, 2012)

**Introduction to the technology activities.** Nicole did not want to create what she called a ‘worksheet program’ with the software (LDWT observations, 2012). She was aware of how individual teachers could start using software in their writing lessons and then revert to using the laptops as typing tools or for downloading information from the Internet. Nicole wanted to look for the potential in the technology that her teachers could use to promote students’ thinking when writing.

I attended a conference where the focus was on using ICT so a child can show you what they can do. I was thinking of a boy in my class. Oh! I don't give him any opportunity to show me what he does in a different way. For a lot of kids a laptop doesn't make life easier, unless you've got the explicit teaching and the things that actually support them to reach their potential. (ICT Leader Interview. Role of an ICT Leader. Audio transcript, October 2012)

**Customizing the tool bar.** Nicole was concerned how the teachers often referred to using text-to-speech technology as a teaching program and she indicated that she needed to be more specific about discussing teaching practices and strategies through the LDWT process. She wanted her teachers to know that they were responsible for the decisions they made in scaffolding instructions for students to become good writers (ICT Leader Interview. Role of ICT Leader. Audio transcript, October 2012).

Nicole provided leadership by facilitating the teachers to explore a range of possibilities to understand how to become familiar with the functionality of text-to-speech technology as a cognitive tool in the writing process. 'The first thing we did was to customise the tool bar as it is overwhelming. So we are just focusing on the text-to-speech' (ICT Leader Interview. Role of ICT Leader, Audio transcript, October, 2012). This helps to reduce cognitive load on the students working memory load (Sweller et al., 2011a, p. 45).

In developing the LDWTs knowledge of how to customise the text-to-speech toolbar, Nicole decided to use the resources provided on the TextHelp UK website (TextHelp Systems Ltd, 2012a) for understanding how to manage the different features of the text-to-speech technology tool bar. The teachers then decided they would teach students, what a 'preference was and how to function preferences' (LDWT Meeting No 1, July, 2012). This they understood would enable the students to personalise the Read&Write Gold™ toolbar to suit their specific writing needs. Nicole then scaffolded an instructional approach the LDWT could use to model to students how to set-up the toolbar to only use text-to-speech technology with limited functional choice. This included the choice of Australian voices of Karen or Lee, set at 75% pitch and 40% speed (LDWT Meeting No 1, July, 2012).

***Touch typing.*** Nicole realised that students would not be able to create interesting stories if they could not type with a degree of fluency that would allow them to focus on the quality of their texts, rather than the use of technology.

You know when a child starts to write and they have forgotten what they want to write, so we were introducing another problem which is, I have trouble writing, I have trouble typing. That's why I suppose before we get into the actual teaching of the narrative ... all these things came up. The fact is, if we are asking a child to hold their thoughts and they don't know where any letters on the key board are, we actually had to do something for them that can actually help them to learn where those things are, so it's not going to stop their thoughts or their ideas or the words that they want to write. (Wattle Creek School, Staff Meeting, 2012)

Nicole searched the Internet for freeware which could be used to develop students' typing fluency and keyboard knowledge. She knew that the typing tutor needed to be very goal-orientated, easy for students to use on their own and engaging. Nicole encouraged the LDWT to promote students to self-pace themselves through the Dance Mat touch typing course ("Dance Mat Typing," 2012) for 10 minutes at the start of every writing lesson. She suggested how learning to type opportunities at the start of every writing lesson ensured the teachers and students were organised and

ready to begin focusing on the explicit teaching of strategies for creating narrative texts. As the students began to develop and use technical terminology such as ‘cap locks’, ‘home keys’ and ‘space bar’, Nicole then linked keyboarding skills to narrative writing. She prompted students when they were composing texts to use the ‘cap lock’ keys for capital letters and to listen to the sounds of words they were writing as well as the meaning of sentences being created. Nicole was aware there were students who were not focusing on the touch typing practice skills as she would have preferred, but was pleased these students had not developed incorrect typing habits (ICT Leader Interview. Explicit Teaching. Audio transcript, October 2012).

***Allocating computers to students.*** Nicole encouraged student engagement in writing by establishing student roles and responsibilities for allocating computers to individual students at the start of every writing lesson. The computers were allocated by numbers and students used personalised log-on cards if they needed log-on prompting (Field work observations, 2012).

We have done the explicit expectations of how we use laptops at our school, the kids are involved in that. Not parameters, but the expectations, the culture of how you set up to use ICT. So! You just can't give people and children a heap of laptops and say off you go because it is not going to work. (ICT Leader Interview. Explicit Teaching. Audio transcript, October 2012)

**Instructional literacy activities.** Nicole mentored the LDWT to adopt text-to-speech technology as a tool for writing. Her instructional approach for learning how to manage the tool was not different from the explicit teaching approaches she promoted before teaching with technology.

Without explicit instruction you have nothing. Kids still need to explore, but you can't just let them explore without [...] breaking it down. We are going to concentrate on these few because there is so much that you can do. Read&Write Gold™ has got this big task bar and we are not going to do all of it at once. What we are going to do, is just break it down and we are going to concentrate, focus on this little bit of it. (ICT Leader Interview. Explicit Teaching. Audio transcript, October 2012).

Nicole explored the TextHelp Systems Ltd (2012a) website looking for exemplars that could support teachers and students to know how to manage using the different functions of text-to-speech technology when writing texts. The team decided to use the resources provided on the website because there were sample texts students could use as exercises, for practising how to use the different functions, especially the speech features for comprehending texts.

There are sample texts on the website and you can go through them step by step. It's not the kids' stories as they haven't written anything yet, so you can



work through the examples that are in there. The examples are useful because you can get to a point where the kids are actually understanding what's happening. (Wattle Creek School, Staff Meeting, August, 2012)

Nicole wanted the teachers to think how they could design writing strategies using text-to-speech technology to support students to focus on the meaning of their texts. She understood that students would need to know how to type with a degree of fluency if they were to focus on developing their story ideas instead of where letters were on a keyboard. She promoted a combination of typing practice with writing instruction as a means for students to develop typing fluency. (Field work observation, 2012). This included encouraging students to be aware of the fingers they were using for capital letters, full stops and spaces between words and also reading what had been written on the screen rather than looking at fingers while typing. Nicole pointed out how most students were eager to log-on and start touch typing. The typing tutor provided an engaging learning environment for these students, with visuals, touch typing rules and a language that was easy to understand how to use the keyboard (Field work observation, 2012).

***In-class mentoring.*** In the first five weeks, Nicole visited every writing lesson as the LDWT teachers worked with their students in their classrooms to gain knowledge about how managing text-to-speech technology when writing. She supported the teachers and students to establish effective technological routines to prepare for writing with technology, beginning with helping students to learn how to log on to their laptops. She checked to see that all earphones or other equipment were in working order. After students had completed their 10 minutes of touch typing at the start of each lesson, she would call for 'half mast' to teach a new technological function that supported the establishment of a technological writing environment. This included saving and retrieving work on the school intranet, explaining what a cloud was or how to update software. The IWB was generally used throughout these explicit teaching procedures, with the students, the teacher or Nicole sharing how to problem solve or create a new way of preparing to learn with technology.

On many occasions, Nicole was observed reassuring and praising students for how they were using the technology and preparing themselves for writing lessons. 'The younger they were' she suggested, 'did not necessarily mean it was too difficult for them to achieve' (Wattle Creek School, Staff meeting, August, 2012). She explained that as long as the teacher had prepared log-on cards, most students could eventually set themselves up with minimal input from the teacher.

**Organisational approaches.** Nicole encouraged the LDWT to focus on how the traditional classroom writing environment advantaged or disadvantaged students to write with technology. She led the team discussion by suggesting that; ‘When you are introducing something new you need to do the other stuff first [technological activities]’ (LDWT Meeting No 2, July, 2012).

When we began the program we initially began storing the kids work in their own folders but realised we should be keeping them on the school network. We scaffolded the students in how to save their work. When they type up their story they can save it directly into the Elocker™ or to save it into the Drop Box™ where you can access it from home. They are also saving it in their personal folders as well [on the school intranet]. We also found we had to teach the students that they had to log onto the intranet, upload their work into the school cloud and download it from the intranet to continue working on it. (Reflections from Olivia on the LDWT decisions, Wattle Creek School, Staff Meeting, August, 2012)

### **Preparation by the students.**

**Touch typing.** Student feedback during the 10 minute touch typing practise at the start of every writing lesson, reflected how the students felt about learning to type. Comments from six students during interviews in week 5 are representative of the majority of students:

1. ‘I think it helps me to get better at using Read Write Gold.’ (Student in Olivia’s classroom, 2012)
2. ‘Shows you where to put your fingers and you don’t have to look at the keyboard.’ (Student in Paul’s classroom, 2012)
3. ‘Helps you to type faster – start to know where letters are on the keyboard.’ (Student in Paul’s classroom, 2012)
4. ‘I like the noise if you get something wrong.’ (Student in Paul’s classroom, 2012)
5. ‘I like doing the different stages.’ (Student in Stephanie’s classroom, 2012)
6. ‘I like how you can try to learn every letter and you repeat to get used to it’. (Student in Stephanie’s classroom, 2012)

However, there were a few students who were uncomfortable in using the typing tutor. The feedback they provided indicated a dislike for the noises that interrupted their thinking about how to type, frustration at waiting for the website to load and hands becoming tired during the typing exercises (Student questionnaire feedback Week 5, August 2012).

Over the weeks of typing practice as students began to use keyboard terminology Nicole and the LDWT became more conscious of linking keyboarding skills and terminology to student narrative writing. ‘I’ve noticed you get more teachable moments, you can see how children can improve and focus on editing, that’s how he

types (Field work observations, Nicole, October, 2012). This is exemplified by the feedback from a student discussing with Nicole how he found it easy to edit paragraphs because he understood the difference between his typing and writing errors. The student realised if he focused on improving his technical typing skills to overcome his inconsistent keyboarding skills it would enable him to write more interesting stories.

I can use the scroll bar, but errors I consistently made – spacing, full-stops and not a space before capitals. Sometimes double spacing between two small words, like 'to' and 'it' and before writing 'it' each time. If I improve this I can make my stories more interesting. (Field work observation, Stephanie's classroom, October, 2012)

**Text-to-speech technology voice speed.** When Nicole and the LDWT decided to provide the students with the text-to-speech technology Australian voice choices of Lee and Karen and voice playback speed of 40%, the students found it difficult to concentrate on the texts they had written. Although the students liked listening to the Australian voices, the students in Olivia's class indicated that they wanted the voice speed lowered from 40% to 35%. 'We highlighted a piece of text and the students said it was too fast because they could not take in what was being said, they couldn't concentrate on the words' (LDWT Meeting No 2, Olivia, 2012). Nicole outlined how, 'the restrictions were good because [...] it gave them [the students] some choice' (LDWT Meeting No 2, Nicole, 2012).

**Organisational approach.** At the start of every writing lesson, student computer monitors were responsible for collecting the computer trolleys within the school and distributing the laptop computers to students using correct carrying procedures. The students had automated the collection and distribution of the computers in each classroom, supported by Nicole, who ensured there was minimal disruption during lesson changeovers. Students turned-on, logged-on, and supported each other as they prepared for their writing lessons. Nicole also demonstrated to the computer monitors how to check that students had successfully shut down and logged off their computer at the end of every writing lesson and that the computers were successfully returned to the trolleys where they could be recharged ready for the next class to use. This was a more difficult process for the students to automate, as many students had to learn how and then remember to save their texts before logging off (Field work observations Weeks 1-6, 2012).

## **What procedures did Nicole use with teachers and students in writing lessons using new text-to-speech technology?**

### **Procedures Nicole used.**

There were a number of procedures, which Nicole suggested shaped success in how text-to-speech technology could be integrated for learning. She worked alongside each LDWT teacher in their classrooms, providing explicit teaching and modelling to students how to use text-to-speech technology when writing. Nicole modelled to the students in Paul's classroom how Read&Write Gold™ was not a 'program to go into' but a 'tool bar that can sit on top of a word document so you can listen to your own stories'. She explained how text-to-speech would help students to go back and listen to the meaning of what had been written, as well as editing texts.

The student can go back over their texts for the purpose of editing but not necessarily be excited to go and read the meaning of their own work. Which I think is the main thing. They can listen to their own story. It is so useful for knowing they are writing for a purpose. That can give the students so much power and independence in their writing (ICT Leader Interview on Explicit Teaching, 2012).

Paul suggested how Nicole had been a 'great model' for showing him how he could enable students to focus on the meaning of their texts by using the technology as a tool for writing. This included supporting students to personalise the playback speed of the technology to their specific writing needs (Field work observations, 2012).

Nicole encouraged the LDWT to think about the pedagogical approaches to writing they could use when teaching with technology. This included reflecting on how the '*Plan-Write-Revise*' approach to writing could be reflected through the operation of text-to-speech technology, where students could back-track over the texts they had constructed and listen as readers to their stories (LDWT Meetings, July to October, 2012). Nicole suggested the teachers could adopt the following five approaches to support students as they began to write with the new technology.

1. Allow students to revise their texts using a hard copy if they prefer in the early stages of writing with text-to-speech.
2. Encourage students to adopt a text-to-speech strategy to their [individual student] needs. Be flexible. We are also experimenting with strategies.
3. Allow students to show you how they use text-to-speech. Support them how to figure out for meaning [show you how they use text-to-speech to focus on the meaning of their texts] by using procedures over strategy.
4. Get student to demonstrate. Look for student cues if the use of text-to-speech is not working or is working well. Note student questions to you [the questions students ask you].

5. It's OK to work a strategy out as you go. (LDWT Field work observation, 2012)

Nicole also monitored the effectiveness of classroom organisational structures to ensure that all students could engage in writing with technology, praised students on how they were using text-to-speech technology to reflect on their text construction while writing and modelled how to use the read-back features to listen to texts.

Listen to the story first. Then go back to the beginning, structure the story into separate paragraphs. Listen to the first sentence. If you need to take a breath put in a comma. Listen for emphasis – place commas, sentence length, paragraphs, spelling and pronunciation. Ask students to think aloud as they are editing in Writer's Workshop. (Writer's Workshop, October, 2012)

Nicole suggested, that technology would not necessarily improve learning, but 'enrich learning and give students an opportunity to get the most out of their learning' (ICT Leader Interview. Explicit Teaching. Audio transcript, October 2012). As a pedagogical leader she wanted to ensure that the LDWT focused on teaching writing with technology and not just focus on the management of the technology.

When you use software programs you have to go into them to use them. This [program] just sits on top of a word document so the students can engage with their work. The proper use of technology is to assist students to get better. It's not a separate thing. (ICT Leader Interview. Role of ICT Leader. Audio transcript, October 2012)

Nicole modelled to Olivia's students how they could listen to the meaning of their stories by revising their texts by back-tracking over groups of sentences or the whole text. She worked with students during one Writer's Workshop session modelling how this could be done while at the same time encouraging them to create a sense of emotion for a reader. Student feedback highlights how one student found this approach helpful and fun.

It helps me. I usually copy writing words onto the computer using Look, Say, Cover, Write, Check [procedure]. It now makes it easy for me to think of ideas because when I listen to my story. I can think of interesting words and of the next thing I want to write. I can then backtrack and listen to the sentence. (Student personal comment in Olivia's classroom, 2012)

**New writing instruction.** Nicole encouraged teachers to think about designing new writing instructional strategies that focused on students learning to write and remaining engaged in the writing process, rather than spending time playing with the software.

You can use technology as a program which is all the creative things you can do with it. On the other side you can use technology to set the expectation, the

culture of how you use ICT so the students can remain engaged in their learning. It is not about technology making your work look showy. It is about having good teaching practice. Kids still need to explore and play but you can't just let them explore without actually focusing on learning. You still need to use or design instruction in every task so the students know what to do. (ICT Leader Interview: Explicit Teaching, October, 2012)

The instructional approach in combining typing practice with writing instruction provided an engaging and motivational aspect to the writing lesson. Nicole highlighted how the typing tutor provided an engaging learning environment for students, with visuals, touch typing rules and a language associated with typing skills that was easy to use when students were composing texts.

During a Writer's Workshop session in Stephanie's classroom Nicole suggested the terminology 'Listen and Tell', could be adopted to focus students' attention on listening to the stories to be critiqued and then discussing possible improvements (Field work observations, 2012). She also encouraged all teachers to plan how they could monitor student writing performance by using the five approaches previously outlined when writing with text-to-speech technology. This included monitoring the development of meaning in texts and the editing of student writing.

We want students to write for meaning first and then worry about editing afterwards. I can see when kids are using text-to-speech they are actually doing that without realising it. (LDWT Meeting No. 3, 2012)

Nicole began formulating a 'Tips List' (see Appendix H Wattle Creek School pedagogical development 'Tips') to share newly discovered strategies from students (especially those in Olivia's class) for how technology was being integrated into the writing process (LDWT Meeting No 2, July, 2012).

**New teaching procedures.** In the first five weeks, the LDWT discussed the writing pedagogy and took part in Writer's Workshop sessions on how to teach students to work with technology (LDWT Meeting Agenda Meeting No 2, 2012). Writing pedagogy discussions focused on keyboarding skills, the 'Plan-Write-Revise' strategy and how to use text-to-speech technology so students could focus on the meaning of their texts. Nicole also monitored how students customised the text-to-speech toolbar, student choices of speech voices and voice read-back speeds, that students were typing at a sentence level and the management of the weekly lesson structure and time frame. During Writer's Workshops for the revision of texts she suggested that students listen to the entire story at the start of the session, and suggested story-grammar questioning (Villalon & Calvo, 2011) be used to support

idea generation and that the font size and text-to-speech voice and speed settings were effective for instructional feedback (Field work observations based on LDWT Meeting Writing Pedagogy, No 2, 2012).

### **Procedures used by the students when Nicole was present in writing lessons.**

Students adopted procedures using text-to-speech technology that supported the development of their listening comprehension skills. Student feedback to Nicole during a writing lesson on how they were using the new technology when writing, highlights how one student responded to texts he had created after listening with the read-back feature of the technology set to read at a sentence level.

Listening to my writing something was wrong. I found I needed to use a full stop, think about word spacing and spelling. I spelt boat as boot. I did spell boat correct the first time so I was able to copy it. I don't like continuous reading. I like to use go [*Play*] and *Stop* icons. (Student personal comment in Olivia's classroom, 2012)

Another student suggested how she preferred to use text-to-speech technology highlighting when listening to her texts.

When I write a paragraph I highlight my work and it reads my story. I like listening to my stories. I know how to customise my tool bar. When it reads my sentence, when it doesn't sound right, I *Stop* it and *Reverse* it back and correct my mistakes. It helps me with my spelling because it says the wrong word. If I write a sentence and don't stop it just keeps going to the next one. I then go back and re-read to put the full stop in. (Student personal comment in Olivia' classroom, 2012)

Another student in Olivia's classroom suggested to Nicole that he used text-to-speech technology to listen to the meaning of his texts, by listening to the whole of his story when he had completed writing his narrative. It 'helped me to understand, [and] narrow down as there are too many words in one sentence and it was hard to understand.' This student never used the *Rewind* icon or the *Pause* and *Play* combination during the writing process. He suggested that text-to-speech technology was helping him to gain more confidence in his writing, helping him to think what next to write and to think about his sentences and using full stops. He thought his stories were becoming more interesting and that he was using more interesting words. Finally he suggested,

I really like using text-to-speech to listen to the stories of other students'. 'I don't know what speech marks are so I don't know if text-to-speech helps me to think about using them. (Students personal discussion, September 2012)

When this student was asked by Nicole whether there was anything he wanted to improve he stated:

I have fun listening to stories because I like listening to my writing. I make up such creative things and I want to hear if they are right. Since I make up such creative things I use a lot of names and I want to know if they sound right.  
(Field work observation, 2012)

### **What was the level of technology integration in this case?**

If we look at Nicole's leadership in terms of the SAMR Model (Puentedura, 2008) she knew that it takes time to understand how the functionality of text-to-speech technology can impact on student learning. When Nicole promoted the adoption of the technology as a tool for learning, she was laying the foundation where the teachers could ensure that the technology acted as a direct tool, substituting for functional improvement in the writing process, providing evidence of the *augmentation* level of the SAMR Model. This also included allowing for the creation of new instructional tasks. 'It's a tool that can assist students. There are skills that need to go with it, but it's a tool' (ICT Leader Interview. Explicit Instruction. Audio transcript, October 2012).

When Nicole collaborated with the LDWT to understand the functionality of text-to-speech so students could develop technological fluency in using the tool, the use of the technology enhanced the teaching of writing at the *augmentation* level of the SAMR Model. The functional use of the new technology and typing skill development allowed for functional improvement for students' learning to write as well as improvement to the writing environment. The formation of a LDWT enabled the teachers to discuss effective teaching practices in relation to the functionality of text-to-speech technology, the management of the laptops they were using and the interactions of Microsoft Word™ tools. Nicole's formation of the LDWT provides evidence of the adoption of technology at the *redefinition* level of the SAMR Model. She used the LDWT meetings to guide the process of adopting the new technology, to foster the creation of new writing experiences, through the development of relevant instructions and writing procedures that previously were inconceivable without the use of technology.

Self-reflection and collaboration on teaching practice provided opportunities for Nicole to scaffold the LDWT to understand the specific instructional procedures that could emerge from using technology to develop listening and reading comprehension, screen viewing, and editing and revision procedures. The SAMR model highlights how a combination of all technological tools, such as text-to-speech



technology, the keyboard and the computer screen, allowed for a redefining of the writing environment, instructional writing procedures and collaborative opportunities that would not have been conceivable without the use of technology. The technological influences enabled the LDWT and students to remain focused on the complex relationship learning to write with technology. Students could develop listening and comprehension skills, write for the purpose of engaging a reader and use the functionality of text-to-speech technology as a revision tool in their individual writing time and through the critiquing of whole class Writer's Workshop sessions.

The SAMR model also demonstrates how the different teacher trajectories for understanding the potential use of text-to-speech technology over the 20 weeks of the project, developed from functionally enhancing the writing experience for students, to significantly redesigning how students could achieve their differentiated writing outcomes when writing. As Nicole did not have her own class of students she was not in a position to create her own instructional procedures with the new technology. She instead, encouraged and supported her colleagues through their teaching experiences with technology. However, Nicole as the Wattle Creek School ICT Leader had a significant impact of how the teachers could integrate technology into the teaching of writing. She created a knowledge building and social learning environment which helped teachers to transform their writing pedagogy.

The SAMR Model (Puentedura, 2008), provides insight into how teachers could value the use of technology as being more important in the learning process. The model does not however account for the whole school and technological systemic conditions, supports and influences that Nicole established as being essential for using technology as a catalyst for creating writing experiences for students. It was the role of the technician under Nicole's leadership that ensured systemic technological conditions could enable teachers to manage and use technology effectively in their classrooms.

I think it is very important ...to keep on developing infrastructure, make sure it is up to date, make sure we have any fail safes in place. The technology that they [students] are using now is going to be old hat by the time they hit the workforce. We need to be able to implement new technologies and keep all the computer equipment and software running and to maintain what has been put in-place. (Technician Interview, September, 2012)

Nicole aspired for the LDWT to develop instructional strategies and have an opportunity to reflect on the implementation of their practices and to collaborate with

their colleagues and students as they gained insight into how they could remodel their teaching experiences with teaching with technology (ICT Leader Interview. Explicit Instruction. Audio transcript, October 2012).

### **What factors influenced Nicole's and the students' use of the new text-to-speech technology in the writing lessons?**

#### **Factors influencing Nicole's use of the technology.**

**Teacher knowledge.** Nicole's leadership highlights the degree of influence and time required for teachers to know what technological tools enabled the '*Plan-Write-Revise*' writing concept to be made explicit when writing with technology. To achieve a transformation of teachers' ongoing learning and skill development with technology, the explicit teaching and collaborative approaches to learning that Nicole promoted, helped teachers to develop students' writing skills and knowledge about writing with technology. Nicole suggested, that to redefine teacher pedagogy using technology, she needed to ensure school management processes were efficient and accessible to maintain a problem-free technological learning environment (ICT Leader Interview. 2012).

As the ICT Leader, Nicole was responsible for the role of the ICT technicians. She prioritised their work based on the needs of teachers for being able to teach using technology in their classrooms. In an interview with one of the technicians, he explained how, 'We give no [pedagogical] guidance and direction to the school' (October, 2012). The technicians' role was to specially maintain the computer system, equipment and resources and all computer, IWB and printer problems.

The technicians' day-to-day work was centred on managing the Central Management System for the school. All software was imaged and managed through the school server. Each computer was installed with Read&Write Gold™, Clicker 5™ Comic Life™, Kidspiration™, Inspiration™, Art Rage Studio™ and all the Adobe™ software. The technicians had worked with the ICT Leadership Team to establish a Helpdesk System using email as a communication means to 'Log a Job'. When teachers were new to the school it was the technicians' responsibility to introduce them to the school portal system and to ensure teachers understood the school's policies and guidelines around Internet safety and the boundaries between the technicians' role and the ICT Leader.

The day of the teacher standing at the front of the class knowing everything and imparting that to their students is gone. The teaching how to learn, not what to learn is more important. We do the same. I don't know everything about IT [ICT], but you learn the skills to be able to pick up things fairly quickly or to research different problems that come along. (Interview with technician at Wattle Creek School, Audio transcript October, 2012)

Nicole used technology as a catalyst for redefining teacher pedagogy, as exemplified at the transformation stage of teachers learning and skill development with technology (Russell et al., 2006). Her case illustrates that school management processes and teacher collaboration are important influences for how successful the adoption of technology can be for knowing how to teach with technology. When Nicole established the LDWT for teachers to share their conceptions of teaching with technology, the teachers used the design collaborations within the team as a catalyst for creating new skills and knowledge, establishing new roles and responsibilities in the writing classroom, developing new communication processes to support each other through the change process, and for the exploration and design of new instructional strategies aligned with TPACK (M. Koehler, 2014).

Nicole believed it was how technology was integrated as a tool for learning and how it was implemented that motivated teachers to persevere with new approaches to teaching.

Some teachers have asked if they can have specific software, but I say, how does that fit in with what we are doing? I wouldn't be purchasing that ... because it is a [...] program. This is a big leap for our school, to stop referring to the software as a program. (ICT Leader Interview. Explicit Teaching. Audio transcript, October 2012)

Nicole realised that as a school, Wattle Creek had all the equipment they needed. However, she was, 'concerned about the rigour and how students were using the computers'. She stressed that if they just focused on engaging students by doing the 'Google™ thing' and 'free time on the laptops to play games', they would not develop the structures, routines and specific expectations to motivate and engage students and teachers in learning (ICT Leader Interview. Role of ICT Leader. Audio transcript, October 2012). When Nicole had 'really frank conversations with teachers' (ICT Leader Interview. Role of ICT Leader. Audio transcript, October 2012), the teachers realised 'they needed to provide a safe and rigorous learning environment for children to learn' (ICT Leader Interview. Role of ICT Leader. Audio transcript, October 2012).

Nicole wanted her teachers to think about achieving writing standards and how technology could be used as a tool to achieve those standards. Nicole thought it was important that the teachers and students didn't have to go into a pre-packaged computer software program and that they could concentrate on the writing they wanted to create. 'The students are writing – we are not introducing a software program. We are introducing something that would assist their writing'. She wanted to focus more on the writing standards the school wanted to achieve for every student and to know how technology could support them to achieve those standards (ICT Leader Interview. Role of ICT Leader. Audio transcript, October 2012).

**Teacher motivation.** Nicole did not have deep prior knowledge of the functionality of text-to-speech technology. However, her personal philosophy of promoting explicit teaching procedures influenced her own motivation to support the LDWT to use explicit teaching procedures to develop knowledge about the functionality of the new technology.

Nicole understood the focus of writing with technology needed to be on teaching and learning with technology and not 'learning technologies above everything else' (ICT Leader Interview. Role of ICT Leader. Audio transcript, October 2012).

They are not actually two separate things. They are about how do you use it together? You need to be careful that technology for technology sake doesn't take over learning. (Audio, Final Reflective Interview, 2012)

Nicole wanted her teachers to share more about their teaching with technology and the formation of the LDWT provided her with the stimulation in which to guide and mentor the teachers and students towards writing with technology. She believed,

If nothing is improving, then the technology is not working. It's actually about the teacher. How you as a teacher are introducing something or your pedagogy or scaffolding is not working. (Audio, Final Reflective Interview, 2012)

**Technical support.** The integration of text-to-speech technology into the teaching of writing took more time than Nicole originally planned. Nicole was conscious of what she termed the 'bugs, glitches and patches' (Field work observation and Interview, October 2012), for improving technical accessibility. She would have liked to work more closely with the school technician and the software company for support on how students could personalise their toolbar settings without having to reset personal preferences every time they loaded the toolbar. Nicole was frustrated with how student's personalised settings were lost once the software was imaged onto the

school laptops and the technicians were unable to provide the infrastructure to enable the software to set personalised settings for students.

We are proponents of Centralised Management of ICT within a site, but that comes at a cost of being able to personalise it. We have found if people are given more control of a device it leads to mucking things up and things not working. There are aspects now of looking at personally, managing things, but also being able to centrally manage the core to keep things running. (Technician Interview, 2012)

**Collegial support.** The LDWT structures and understandings that Nicole promoted at Wattle Creek School set the foundation for regular team meetings. Nicole's motivation for valuing the design of new teaching and learning experiences grew as she continued to draw on the strengths and enthusiasm of her colleagues. She understood her leadership role was in 'supporting teachers who approached [her] for help' and for 'working with teachers, planning together and modelling learning experiences in classrooms for teachers to observe' (Interview on Role of ICT Leader, 2012). In developing effective teaching practices, Nicole wanted 'teachers sharing what they weren't good at and what they needed to do to improve', suggesting that 'because of the relationship we all have with each other, there was no, I can't do it' (Interview on Role of ICT Leader, 2012). She also suggested that Olivia and Stephanie are 'now using technology discourse in their classrooms without ... realising it is happening' (Interview on Role of ICT Leader, 2012).

Nicole met weekly with the school technician to ensure the 'computer equipment was running, all the software and all the different systems had been put in place' (Interview with technician, 2012). The collegial support Nicole provided to the technicians, ensured there was a respectful relationship between the technician and the teachers. The technician suggested it was important to:

Treat everyone with respect, [and] making sure you don't treat people like an idiot for asking a question, being willing to have patience with people because everyone is at a varying level of technological competency and there is no particular one that is correct. (Interview on Role of ICT Leader, 2012)

The collegial respect between Nicole, the teachers and the technician ensured that Wattle Creek School remained a school, where technology continued to 'revolutionise the way that a teacher teaches' (Interview with technician, 2012).

We need to keep on the forward edge of that technology, so that they won't be disadvantaged in later life. We are also a facilitator of learning, not a repository of all information. The IT Coordinator [Nicole] deals with the teachers and we help her along and keep it up and running. More recently I have been able to guide this site with network management software which gives us the ability to

remote into any machine. We can diagnose problems and fix it remotely.  
(Interview with technician at Wattle Creek School, Audio transcript October, 2012)

**Administrative arrangements.** While timetabling, technical and computer management issues were primarily addressed through daily routine practices, Nicole understood she needed the support of her Principal for more time to explore the potential of technologies.

I had a meeting with the Principal and we talked about where we were heading and we really needed some time. She was very supportive of that and I was given a school closure day on ICT [...] and the resources we have [...] to improve student outcomes. (Interview with Nicole, 2012)

**Factors influencing the students' use of the technology.**

**Teacher pedagogy.** Nicole asked the students in Paul's classroom, 'Does a teacher give you all the information at once when you were learning something new?' The students responded, 'No, you do it bit by bit' (Audio, Nicole Final Reflective Feedback, 2012). The explicit teaching philosophy that Nicole promoted to ensure that every task in the writing classroom had 'some explicit instruction so kids knew what to do and what their expectations were' (ICT Leader, Interview on Explicit Teaching, 2012), influenced how successful students were in adopting text-to-speech technology to support their writing plans. Nicole explained that she had spent time over the year talking to Paul and Stephanie as beginning teachers, about what it means to be explicit by focusing on the 'how to do and what to do', when teaching (Audio, final reflective feedback, 2012). A student in Stephanie's class illustrated how she adopted text-to-speech technology to edit her stories because, 'it was easier to check spelling because the voice sounds out to me and makes better sense.' The student suggested that it was 'easier not to copy' as she had previously done when writing from pen and paper onto a computer and that the new technology helped her to use speech marks.

It is really good helping me when I am writing. I wish my mum had it on her lap top. It helps me [...] so I know it makes sense. (Field work observation, Week 10, 2012)

The explicit teaching procedures the teacher used, had enabled her to adopt text-to-speech technology as a writing tool. Consequently this helped her to become more confident in using the '*Rewind*' icon to check that her story made sense and that she could use the technology to help her to focus on the length of her sentences and where to use full stops. The student aimed to continue to listen to her stories, hoping

she would be able to improve her writing by writing in paragraphs, ‘because it is really clear to hear and you can change the speed of it. I change the speed when I am listening to words that don't make sense. I go slower about 25-30 (%)’ (Field work observation, Week 10, 2012).

**Student difficulties in managing the software.** When the students in Olivia’s classroom were understanding how to use and manage text-to-speech technology they became frustrated about having to reload their personal choice of voice, voice speed and highlighting settings at the start of every writing lesson. One student asked, ‘Can I save the tool bar under my own name?’ (Field work observation, Week 3, 2012)

Students were also developing habits of learning and typing that Nicole suggested may not have been an advantage for learning to write (ICT Leader Interview. Explicit Teaching. Audio transcript, October 2012). The students were using text-to-speech technology to alert them to errors in their writing, rather than thinking about how to use the tool to manage their writing goals. The following extract from a student’s story exemplifies how the technology directed the student’s attention to his writing errors through the blue and red underlining.

I ran for the door. I just **new** there was a ghost and I wanted to get out. The door **woodent** open. I turned and I ran to the back door, same thing. (Extract from ‘A Scary Ghost Story’, Olivia’s student, 2012)

Nicole wanted teachers to use the Writer’s Workshop (Graves, 1985) experience to be aware of how technology can determine (Jordan, 2011) the learning process for students, as distinct from how teachers can design instruction to facilitate students to focus on developing their story ideas (Hattie & Yates, 2014), (ICT Leader Interview. Explicit Teaching. Audio transcript, October, 2012).

I think the power of it [text-to-speech technology] has been that you are taking writing, which is like you are pulling teeth, a kids doing some writing but you are using the software not as the focus. The software takes away the whole thing about – Uh! We are editing our work. The students are still working just as hard, they still have to do and know if it makes sense or not sense but it has put a different layer on it. The kids’ engagement is high. It’s like marrying the two together. If we could get kids doing Writer’s Workshops using technology it takes it to another level. I asked a child in Writer’s Workshop, ‘How did you feel about that?’ It was only 4 lines that he had written, but in the end he had 4 lines that made sense. (ICT Leader Interview, October, 2012)

## Case Summary

Nicole's leadership exemplifies how a whole school approach can be developed towards sustaining teaching practices when teaching writing with technology. She promoted explicit teaching of instructional activities which reflected the characteristics of designing effective literacy based and engagement practices. Through the LDWT, Nicole developed processes which helped the teachers to develop organisational, motivational and instructional procedures that would lead to the successful integration of text-to-speech technology as a tool for learning to write. The procedures influenced teachers and students focus on the writing, rather than the technology itself.

The findings emerging from a cross checking between data sources to see if Nicole and the Wattle Creek students gave the same conclusion in regards to technology being integrated as a tool for learning are consistent. Nicole emphasised the use of explicit teaching to allow students to write with technology. The convergence of data through the triangulation process confirms that students used the adoption of text-to-speech technology to attend to their writing goals and to think how they could use the technology as a tool to help improve their writing. Some students, in particular, recognised that their writing with text-to-speech did facilitate the development of their listening comprehension skills.

The fact that Nicole was successful in using the LDWT as a forum for the adoption of technology suggests the experience was overall a positive one for her. However, Nicole was frustrated by a lack of time to make the necessary changes she understood would more likely benefit students' writing achievement. The level of integration of technology that resulted from her leadership did evidence the effective alignment of the set of teacher-related, student-related, situation-related and leadership-related factors. More time was necessary to align these factors. Achieving writing standards through the set of aligned factors, suggests there may need to be in the future a reworking of the alignment factors.

Chapter 11 discusses how teacher pedagogy to develop student writing through the integration of text-to-speech technology can be understood by the analysis of the complexity of the patterns of interactions between writing pedagogy, technology and learning as related in the Literature Review.



## **Chapter 11: Concluding Discussion**

The chapter discusses the findings of the research through the themes that emerged from an interpretive analysis of the data. The research questions are answered within the findings with the emerging themes being identified as RQ1, RQ2, RQ3 and RQ4. The four research questions are:

### **Research Question 1 RQ1**

What procedures did teachers and students adopt in introducing new text-to-speech technology into their writing lessons?

### **Research Question 2 RQ2**

What procedures did teachers and students use in writing lessons using new text-to-speech technology?

### **Research Question 3 RQ3**

What was the level of technology integration adopted by the teachers and students when teaching with technology?

### **Research Question 4 RQ4**

What factors influenced teachers' and students' use of the new text-to-speech technology in writing lessons?

### **Themes emerging from the findings**

Themes emerging from the findings of the individual teachers provide insight into how the teachers planned to adopt and use the new text-to-speech technology, and how they acted to integrate technology into the teaching of writing and the instructional procedures they created to redefine their own pedagogy.

The findings from the teachers provide insight into a set of emerging themes, as discussed below. The research questions are identified and answered within discussion of each of the emerging themes.

1. De-privatising writing practice (RQ1, RQ2, RQ3 and RQ4);
2. Digital fluency (RQ1 and RQ3);
3. A culture of collaboration (RQ2, RQ3 and RQ4);
4. Students harnessing the transformative power of teacher pedagogy (RQ1, RQ2, RQ3 and RQ4);

5. Leadership;
6. Factors influencing the integration of technology in writing lessons (RQ3 and RQ4); and the
7. Influence of technology alignment on theory (RQ1, RQ2, RQ3 and RQ4).

In reference to Research Questions 1 and 2 the teachers and students used a range of procedures to adopt and use text-to-speech technology when writing.

### **Research Question 1 RQ1**

What procedures did teachers and students adopt in introducing new text-to-speech technology into their writing lessons?

### **Research Question 2 RQ2**

What procedures did teachers and students use in writing lessons using new text-to-speech technology?

The procedures are summarised in the discussion of the themes *De-privatising writing practice*, *Digital fluency*, *Collaboration* and *Students taking the lead at times*. The role of the teacher had a significant impact on the integration process, enabling some students to develop mastery of their own writing skills. The acquisition of *Digital fluency*, while varied amongst teachers and students, became an entry level to the transformation of teachers' pedagogy as this stimulated some students to refine their own writing experiences.

Similarities and differences between the themes highlight how teachers used different methods of integration and faced challenges that impacted on their level of technology integration when teaching with technology.

### **Research Question 3 RQ3**

What was the level of technology integration adopted by the teachers and students when teaching with technology?

While the use of technology created a learning environment to write with technology, it was the opportunity for teachers to collaborate and share their knowledge with students that provided a more effective level of integration for transforming the culture of the writing classroom. The range of findings on the level of integration adopted by teachers and students are discussed below in the themes of *De-privatising writing practice*, *Digital fluency*, *Collaboration*, *Leadership* and *Resourcing*.

Challenges need to be addressed if teacher beliefs about their capabilities for teaching with technology are to have a positive influence on the integration process.

#### **Research Question 4 RQ4**

What factors influenced teachers' and students' use of the new text-to-speech technology in writing lessons?

The range of pedagogical, motivational and administrative challenges, including time constraints, impacted on teachers and students use of the new text-to-speech technology. The discussion through the themes of *De-privatising writing practice*, *Digital fluency*, *Collaboration*, *Students transforming their practices*, *Leadership* and the *Factors influencing integration* shows how overcoming these challenges requires the creation of a culture of collective responsibility for both teachers and students. *De-privatising writing practice* and *Digital Fluency* enabled students to transform their own writing experiences while *Collaboration*, *Leadership*, *Teacher Pedagogy* and *Influential factors* stimulated teachers and students to engage and inquire into their own practices, problem solve and share their ideas.

#### **De-privatising writing practice (RQ1, RQ2, RQ3 and RQ4)**

Practices associated with technology integration can help to de-privatise teachers' writing practice. De-privatisation is a result of teachers' making their practice public. This study has shown that teachers were successful in de-privatising their writing practice when they discussed the teaching process with colleagues, a school leader and through their interactions with students.

#### **Teachers discuss the teaching processes with colleagues, a school leader and their students.**

This study has shown that discussions between teachers, with a school leader, and between teachers and students on the potential use of technology can act as a stimulus to think differently about their pedagogy. Discussions can also stimulate teachers to examine and make public their practice, as evidenced by pedagogical discussions within the LDWT and through teacher and student collaborations within Writer's Workshop sessions at Wattle Creek School. As others have noted, teachers can de-privatise their writing practice and design new differentiated learning experiences using digital and non-digital resources and tools (Brunelle & Bruce, 2002; Yates, 2008).

Teachers in this study who used the technology as a stimulus to think differently about their pedagogy also promoted a range of instructional techniques to acquire a deeper understanding of the effect of their pedagogy on student learning. The Learning Design Writing Team (LDWT) in particular were successful in publicly discussing the complexity of the interrelationships between teaching writing, technology and student learning. They also made public their teaching processes as they collaboratively designed key teaching approaches for introducing the technology to their students. This study confirms that the teacher can have a significant impact on the integration of technology in a writing classroom through the teaching and learning goals they adopt and use for enhancing learning (Chen et al, 2009), the opportunities they have to discuss and interact with others about using technology as a pedagogical (Ertmer & Ottenbreit-Leftwich, 2010; Somekh, 2008) and learning tool within students' zone of proximal development (Subramaniam, 2007 and Vygotsky, 1978), RQ1, RQ2 and RQ3). The study shows that teachers who have opportunities to de-privatise writing practice can adopt and use technology to redefine their own practice and shape the writing experiences of their students. This study shows there were students who also used the technology to shape how they learnt to write. Student examples in this study from Paul, Olivia's and Stephanie's classrooms specially highlight how they used the technology to organise their texts on a screen and attend to revision procedures. These students designed their own instructional procedures with technology, making public their composition thinking processes. While many of the students and teachers collaboratively explored how text-to-speech technology could be used as a writing tool, this study has shown there were a few students who understood how to manage the interconnected complexities of technology and literacy when writing with technology.

### **Teacher-student interactions**

Teachers' discussion about their practice can promote an *openness* in the student-student and teacher-student inter-relationships within the classroom (RQ4). Stephanie and Paul reflected on how teaching with text-to-speech technology through the group editing process in the writing classroom had made learning to write a public and more communal process in lessons. Stephanie gained confidence through the group editing process to focus on the potential of the new technology to understand how she could support her students' developmental writing level, while

Paul suggested the openness of conversations within his classroom appeared to empower the students to take greater responsibility for their own writing.

This was not the case for Brandon and Jessica who acknowledged they were not successful in integrating text-to-speech technology into their traditional print-based writing experiences. They did not discuss teaching processes or interact with students to make their practice public through the collaborative pedagogical experiences that Wolz et al (2011) suggested were necessary for sustaining their teaching with technology when writing (RQ2 and RQ4). The cases of Brandon and Jessica show that teachers and students might be encouraged to openly discuss and critique the adoption and use of technology as a tool to shape writing development. To do so requires conditions where student-student and teacher-student inter-relationships can publicly discuss the complexities between teaching writing, technology and student learning (RQ1 and RQ2).

### **Digital Fluency (RQ1 and RQ3)**

Digital fluency is associated with the bringing together with different interconnected skills for the creation of new competencies and skills for teaching and learning with technology (RQ1). Digital fluency with text-to-speech technology can be acquired when teachers' and students' thinking focuses on developing reading and listening comprehension skills, functional skills of technology and organisational skills to process information on a computer screen at the same time. Developing speed and efficiency in the procedural knowledge of using technology is essential for teachers and students to develop the competencies and skills necessary for teaching and learning with technology.

### **Developing digital fluency to write with technology.**

Research into the use of text-to-speech technology has highlighted how teachers can use the new technology as an instructional tool (Englert et al., 2005, p. 185) as distinct from limiting the focus to the individual functions of technology as tools for learning as suggested by others (Conway & Amberson, 2011; Dexter et al., 2006; John & Sutherland, 2004), (RQ1). The research of Mavers et al. (2002) suggests that if teachers have an awareness of student computer literacy skills and technological skills, they may then design learning experiences that can maximise learning for every student. This study has shown that when Brandon and the LDWT developed students' digital fluency, both teachers and students could design their own learning

experiences with technology within the culture of a socially-orientated classroom (RQ1). The study has also shown that teachers and students varied in terms of digital fluency.

The leadership of Nicole was integral in reducing the variation in digital fluency among students at Wattle Creek. The preparatory work of the LDWT in preparing students to adopt new technology and develop transcription skills with technology showed a greater effect upon teachers' and students' ability to develop digital fluency, than was the case in Brandon's classroom.

The practices of the LDWT could also be seen to have facilitated a reduction on the load on students' working memory, enabling the Wattle Creek students to subsequently focus first on creating writing competencies and skills without having to focus as much on the mechanical process of managing the keyboard at the same time (RQ1, RQ2 and RQ3). The de-privatising of writing practice also enabled the teachers in the LDWT to reflect on how they could adopt and use technology (TextHelp Systems Ltd, 2012a) (TextHelp Systems Ltd, 2012a) (TextHelp Systems Ltd, 2012a) to design instructional procedures where the functional features of text-to-speech technology could be combined with listening comprehension, reading and organisational skills to enable teachers and students to develop speed and efficiency for writing with technology.

The LDWT and Brandon provide insight into how they designed instructional procedures enabling students to develop digital fluency, confirming with Brunelle and Bruce (2002), that the focus of their teaching could be more on students making meaning of writing rather than only learning the functionality of the software. These teachers were successful in sustaining their own and their students' confidence, competencies and knowledge about adopting text-to-speech technology through the acquisition of the digital fluency (RQ1). Their cases also highlight how teachers and students can 'be the computer instructors' (see Brandon, Chapter 5, Final Interview, 2011), when learning how to use technology, (Applebee & Langer, 2011; Sweller et al., 2011a; Whitney et al., 2008), (RQ2).

The LDWT and Brandon have shown that within teachers' and students' zone of proximal development (Vygotsky, 1978b) it is how the teachers and students focus on the use of technology as a stimulus to think differently about their pedagogy and learning that made the difference.

### **Developing a culture of practice with technology**

Previous research by Bosco (2006) has shown how technological tools can be used to transform classroom culture. The cases of Brandon, Hayden and Olivia support this finding. These teachers made organisational and pedagogical changes to manage technology based on the functional potential of the technology to develop a new teaching skill. Brandon's case was impressive because he developed students' thinking skills to consider the relationship between technology and writing using a combination of explicit teaching and explorative pedagogical methods which previous research has found beneficial for student learning (Brown et al., 1989; Flower & Hayes, 1981; Graham & Perin, 2007). Brandon's teaching focus was for students to consider how the functions of technology could be adopted to promote the relationship between the author and the reader of texts, while at the same time enhancing students' learning (RQ1 and RQ3). Brandon's approach to teaching confirms the findings of Badia et al. (2011), where teaching practices are the major influences for students' interactions with technology while learning.

The established socially-orientated practices within Brandon's classroom, provided an example of practices designed for the purpose of students developing fluency in using the technology to enhance their learning (Hakkarainen, 2009; Villalon & Calvo, 2011), (RQ1 and RQ3). During this process Brandon used different pedagogical practices for the purpose of engaging students in developing functional capabilities for writing with text-to-speech technology, listening comprehension skills, and editing procedures. His practice included explicitly introducing the functionality of text-to-speech technology simultaneously with the plan-write-revise strategy (Flower & Hayes, 1981), encouraging students to explore and understand how they could adopt text-to-speech technology to listen to the meanings of their own sentence construction and editing of spelling. Brandon provided time for students to share with each other the stories they had written and the procedures they had adopted when listening with text-to-speech technology during the composition process. This also reflected the characteristics as previously suggested (Figg & McCartney, 2010; M. Koehler, 2014; Puentedura, 2008; Russell et al., 2006) of teachers transforming their own pedagogical experiences to teach with technology (RQ1 and RQ3). Brandon's teaching approach was compatible with the research of Snyder (2000) in that teachers should not make their current teaching practices more 'technologized' (p.99), but should find ways to enable the strengths of technology to empower the teaching and learning process.

Where this occurred students had the opportunity to think and discuss their writing and the instructional procedures they could use as they adopted technology to facilitate mastery of their own writing skills. This is an important finding of this study because students were able to develop writing competence and skills to create their own strategies, which previous research has highlighted can enable them to take control of their own learning (Dunn & Finley, 2010; Graham & Perin, 2007; Hattie, 2009; Kolikant et al., 2006; Mason et al., 2011; Pressley et al., 2007; Rogers & Graham, 2008; Rowe, 2006), (RQ1 and RQ3).

This research suggests that students did have different ways of experiencing writing with technology. They also varied in their awareness of how they listened with technology when writing, confirming the previous research of Mavers et al. (2002). The culture of a socially-orientated teaching and learning environment de-privatised writing practice enabling opportunities for students to develop greater digital fluency.

#### **A Culture of Collaboration (RQ1, RQ2, RQ3 and RQ4)**

A collaborative, knowledge-sharing culture, as exemplified by the LDWT in this study provided an example of a way to align individual teacher orientations to the teaching of writing, technology and learning that John and Sutherland (2005), Conway and Amberson (2011) and Viilo et al. (2011) suggest is important when integrating technology to enhance or redefine teacher pedagogy (RQ3 and RQ4).

The LDWT provided a culture of collective responsibility for teachers to think creatively about their complex relationships between writing pedagogy, technology and learning. This was a significant factor for promoting the Wattle Creek teachers' ongoing confidence, learning and skill development to teach with technology. Such a culture was not present for Brandon, Hayden and Jessica, who were frustrated by a lack of opportunity to be stimulated to inquire into their own practices, to problem solve and share their ideas so that they could overcome challenges (Hakkarainen, 2009; Wolz et al., 2011), (RQ4).

#### **Collaboration and Team Approach**

Collaborative team approaches used by the LDWT made discussion of teaching public, and so the subject of reflection. This is a significant finding of this research which was previously not prominent in the literature in this field (Al-Alaoui et al., 2008). Nicole's case in Chapter 10, discusses how she created the LDWT so her *'teachers could focus on the potential of the software that they were not using'* (ICT



Leader Interview. Role of an ICT Leader. Audio transcript, October 2012). This provided a clear example of suggestion in the literature in this field of how a community of teachers can facilitate the design of new instructional procedures, (Akbiyik & Seferoğlu, 2012; Morphy & Graham, 2012; Peterson-Karlan, 2011; Riley & A°hlberg, 2004; Turner, 2011), (RQ2). This included opportunities for the teachers to reflect on the needs of their students (Figg & McCartney, 2010; Hmelo-Silver et al., 2007; Nail & Townsend, 2010).

Engaging in collaborative social practices that promoted the use of instructional scaffolds with technology helped Paul to generate new instructional procedures. Paul found the collaborative support of the LDWT a positive influence on his teaching practice. He learnt by communicating with his colleagues how to teach students to customise the text-to-speech technology toolbar so it could ‘be effective’ for teaching writing (see Chapter 7, Paul, Wattle Creek School Staff Meeting, 2012). Paul added strength to students’ writing procedures with technology when he demonstrated to students how they could write with the new technology as a whole class instructional tool. Olivia and Stephanie furthered this strength through de-privatising writing practice as a catalyst for opening up and sharing their pedagogy with students. The new socially-orientated culture within their classrooms redefined the relationship students as authors and readers developed with texts (RQ3).

Olivia reflected on how she needed to be even more explicit when she created instructional procedures that promoted the relationship between writing and technology. Stephanie’s case shows how she constructed knowledge to become creative when she adopted a blend of explicit and student-centred inquiry teaching approaches to scaffold her students to deconstruct texts (RQ2 and RQ4). Previous researchers have shown that collaborative design teams, supported with direct instructional scaffolds, can be used to make significant improvement in students learning, especially as previous research suggests through the use of inquiry based instructional practices (Hmelo-Silver, Duncan, & Chinn, 2007).

The collaborative culture for teachers was also associated with development in the student authors to retain responsibility for the quality and final production of their texts (RQ4). Collaboration or teamwork amongst teachers, as suggested by Wolz et al. (2011), can facilitate teaches to engage students in computer thinking skills so they can read, analyse and write texts within online multimedia environments. This study has shown that a multidisciplinary team can engage and transform teacher

practice and redefine the learning experiences of primary school students when learning to write with technology.

### **A collaborative environment to revise and critique texts.**

Collaborative learning opportunities motivated the teachers in the LDWT and this was reflected in these teachers' classes where there was evidence of the students sharing and learning from each other as they developed skills related to collaborating with technology. The acquisition of digital fluency which had originally transformed teachers' pedagogy had now become a new entry level for students when writing with technology in the Writer's Workshop process. The Writer's Workshop provided opportunities for the LDWT teachers to establish a community approach within their classrooms, 'de-privatising writing practice. Using students' narrative texts as worked examples, the teachers and their students collaborated in this new writing environment to identify the procedures and behaviours which were an example of differentiating and creating meaningful writing experiences (RQ2, RQ3 and RQ4). Previous research has shown how worked examples can assist students to acquire new information (Retnowati et al., 2010).

Paul established a socially-orientated learning environment enabling his students to maximise the effect of their new digital fluency skills and competencies when collaborating to think as authors and as readers to make 'a great story greater' (see Paul Chapter 4, Wattle Creek School Staff Meeting, 2012). Stephanie created an elaborate instructional procedure that facilitated students to connect writing and learning with technology within the collaborative learning environment of her classroom. She facilitated her student writers and readers to focus on how readers may respond as critical authors of texts (see Stephanie, Chapter 9) (RQ2).

All the teachers however, provided time for students to develop an awareness of how to write with technology to focus on the meaning and editing of texts (RQ2). The collective creation of instructional revision procedures using text-to-speech technology shows how the procedures the teachers' created acted as plans within a collaborative culture to guide students on how they could revise texts. When the LDWT in particular designed writing procedures that focused at the word and sentence levels of language they were supporting students to overcome the limits of their working memory as separate goals, confirming the research of Berninger et al. (2010), Hayes (2012b) and Sweller et al. (2011b). This study through the identification of the three knowledge-telling instructional revision procedures

supports the findings of previous research for how an understanding of cognitive load theory with working memory can enable teachers to understand how learners learn and how learning experiences can be differentiated to facilitate learners to process information (Berninger et al., 2010; Hattie & Yates, 2014; Retnowati et al., 2010). See Appendix I Knowledge-telling instructional revision procedures (RQ2).

### **Teachers' use of effective principles of learning**

The findings emerging from the Wattle Creek cases illustrate the power that discussions and interactions with colleagues, a school leader and students can have on making teacher practice explicit and, if necessary, new teaching procedures can be developed. This can be viewed as an additional principle which can be included into the five effective learning design principles as advocated by Yates (2008) (see Definitions Effective learning design principles, Chapter 1, this thesis).

Hayden, Brandon and the Wattle Creek teachers demonstrated how they *considered* their own and students' prior knowledge (example of Yates (2008) effective learning design principle) about adopting and using technology for writing. Brandon particularly designed learning experiences to adopt the use of text-to-speech technology based on his prior teaching knowledge and his students' prior knowledge of narrative writing to teach his students the skills necessary to write with technology through short bursts of pre-writing exercises (RQ1). The LDWT *promoted* questioning techniques in the design of their instructional procedures to stimulate students to personalise how they could use text-to-speech technology to support their writing goals (example of Yates, (2008) effective learning design principle) (RQ2). Questioning techniques facilitated some students to acquire deeper understandings about how to revise their texts and they developed instructional procedures with technology that enabled them to focus on the more elaborate knowledge-transformation and reflective writing processes used by expert writers (Hattie & Yates, 2014).

When the LDWT shared with their students how text-to-speech technology could be used as a tool to stimulate students' thinking about the quality of written texts, the teachers demonstrated that acquiring digital fluency (RQ1) was a relevant and meaningful learning activity (example of Yates, (2008) effective learning design principle) for learning to how to write. These teachers supported students to acquire knowledge and skills about using technology so the use of technology when writing did not become an added complexity on student thinking when composing texts.

In addition to Yates (2008) principles of considering prior knowledge and promoting questioning techniques, the LDWT *acknowledged* the effect of the collaborative process for enabling teachers and their students to make teaching and learning processes public. The teachers could draw on the strengths of a social learning environment and interact with their students to understand how to use, analyse and reflect on the outcomes of integrating technology into different writing activities in the writing process. This study has shown through the individual cases of the Wattle Creek teachers that the positive social learning environment promoted by Pressley et al. (2007) is an effective environment for a collaborative culture to stimulate teacher thinking. This study has also shown how a culture of collaboration can promote the use of effective principles of learning, enabling teachers, students and a school leader to think creatively about the complexity of writing pedagogy, technology and learning,

#### **Students' harnessing the transformative power of teacher pedagogy (RQ1, RQ2, RQ3 and RQ4)**

Although the focus of much analysis in this study was on the teachers, it also became clear that the students became significant players influencing the impact of the new technology. Establishing a culture of collective responsibility, involving teachers and students, opened up the teaching of writing and generated opportunities for students to gain confidence to de-privatise their own writing experiences. De-privatising writing practice in the Wattle Creek classrooms particularly generated a different learning environment for students to stimulate their engagement and the refinement of their own writing experiences (RQ2 and RQ4).

#### **Students thinking differently about their writing experiences.**

Some students drew on the strengths of a socially-orientated learning environment to understand how to manage technology when writing. This study provides insights into how these students recognised technology as a change agent to become engaged in the writing process (see Paul's students, Chapter 7), (RQ1 and RQ3). Nick, a student in Paul's classroom specifically listened with text-to-speech technology to engage in the writing process so his written texts could be enjoyed by others. The student began to write independently when he focused on a combination of listening comprehension and visual skills, enabling his writing to be affirmed (see Paul, Chapter 7, 2012), (RQ2 and RQ4).

The study provides insight into how other students recognised technology as a means for learning how to communicate their ideas, confirming the requirements of Australian National Educational Policy (Australian Curriculum, 2013; Australian Curriculum Assessment and Reporting Authority, 2011; Ministerial Council for Education Early Childhood Development and Youth Affairs, 1999, 2008). The students at Wattle Creek School created new organisational procedures to specifically focus on the relationship between reading and the need to write with ease within a screen environment (RQ1). These new procedures included Olivia's organisational procedures for viewing texts on a computer screen using the read-back feature of text-to-speech technology set to '*Continuous Reading*' and font style Calibri 16.

This didn't necessarily happen quickly. Students required time, especially a minimum of three to four weeks in every classroom to first develop digital fluency and personal revision procedures. After approximately ten weeks of writing with text-to-speech technology there were students in Olivia, Hayden's and Brandon's classrooms who began to redefine how they attended to their writing goals (RQ3 and RQ4). These students had developed their own pedagogical knowledge for learning how to write. The importance of allowing time to develop instructional procedures supports the findings of Akbiyik and Seferoğlu (2012) in that lesson time and having regular access to technology is a major factor contributing the development of instructional approaches to use software to facilitate learning. While the research of Akbiyik and Seferoğlu (2012) relates to teacher development, this study has shown how students, with time, can also develop their own instructional procedures with technology.

The collaborative learning processes promoted by the LDWT enabled students to use the potential of text-to-speech technology to create shared knowledge and take responsibility to scaffold their own learning experiences. The students in Paul's classroom created a technological language to better communicate problems when they arose, confirming the findings of Berninger et al. (2002) and Berninger et al. (2010), (RQ1 and RQ2).

This suggests there were students who developed their own instructional procedures as a result of the pedagogical approaches implemented by their teachers. Hayden's case provides insight into how students can move beyond a teacher's traditional pedagogy and shift their own thinking towards de-privatising the writing process. As

two students' suggested, 'It is just like my teacher reading it to me, we can all hear' and 'it is quite important for students to exercise or improve our writing' (see Chapter 6, Hayden, Student feedback checklist, Week 7, 2010), (RQ4).

Many students particularly used the read-back feature of text-to-speech technology to listen for meaning in their texts (see Olivia, Procedures used by students, Chapter 8; and see Paul, Procedures used by students, Chapter 7) and to correct spelling errors, the length of sentences and to fix capital letters (see Brandon, Procedures used by students, Chapter 5). The text-to-speech technology made the students 'works in progress' more *available and accessible* for informal, formal and impromptu feedback. The students could hear their work in progress, rather than wait until a piece was written. When some of Hayden's students used the read-back feature to peer review each other's texts there were a few students who developed instructional procedures to read ahead of the highlighted written text. These students suggested that thinking ahead of the spoken word helped them to listen and think about the writing (see Hayden Chapter 6, Procedures used by students, 2010), (RQ2).

There were also a few students who created instructional procedures because they drew on strengths of their peers, their digital fluency and the resources available to them to think differently. These students didn't need teachers to teach them critical thinking and technical skills to overcome challenges as previous research has found (Hollender et al., 2010; Puentedura, 2008; Subramaniam, 2007; Vygotsky, 1978b), (RQ4).

### **Proactive approaches of students to develop their own knowledge and skills.**

The impact of the integration of technology into the writing classrooms of the LDWT shifted the perspective from creative teachers designing the learning to write experience as promoted by Dexter et al. (2006) to teachers de-privatising writing practice. This enabled creative students to be proactive and design their own differentiated learning experiences using digital and non-digital resources and tools to enhance and transform their own learning (RQ3 and RQ4).

### **Students collectively creating new instructional procedures.**

Some students at Wattle Creek School and in Brandon's classroom used technology as a catalyst to design their own instructional procedures when they collectively critiqued their writing ideas during Writer's Workshop sessions as authors and readers of texts. However, when Brandon reflected on his students' use of technology during this process, he suggested 'the technology [didn't] edit the

students work very well' (see Chapter 5 Brandon, November 2011). This was in contrast to feedback from students, who focused on the potential use of technology to think differently about writing with technology to support their writing goals (RQ2). When reflecting on students' level of technology adoption, the procedures created by students in this study suggest there were many students who could go further in their learning and skill development to enhance and transform their own writing experiences, even with a teacher present in the classroom. The students were creating their own technological and pedagogical knowledge for writing, knowledge that they could use in the significant periods of time when they had to direct their own learning (RQ3 and RQ4).

### **Leadership (RQ1, RQ2 & RQ4)**

#### **The impact of leadership on the integration of technology**

Insights gained from the effectiveness of Nicole's leadership have shown how the creation of the LDWT enabled the Wattle Creek teachers to work as a design team to reflect on the effectiveness of their own practices and students' learning. When the individual teachers collaborated with their students for feedback on how technology facilitated students' writing skills and competencies, the teachers displayed characteristics that previous researchers promote as being different from novice pedagogical practitioners (Fullan, 2007; Hattie, 2009; Rogers & Graham, 2008; Yuen et al., 2003) (RQ1 and RQ2).

Nicole's leadership in the promotion of social experiences between teachers and teachers, teachers and students, and students and students was effective for understanding how to use, analyse and reflect on integrating technology. The social learning environment she established stimulated the LDWT and some Wattle Creek students to consider, promote and acknowledge different learning experiences for different writing activities within the writing process (RQ4).

The findings of Nail and Townsend (2010) suggest that it would be a benefit for collaborative teams to consider using problem solving approaches, authentic learning experiences and involve a diversity of people when designing writing instruction with technology to overcome technical and pedagogical challenges that emerge when exploring how to write with technology. While this study supports this finding, the study has also shown that strong leadership, time and school systemic structures may be important factors for sustaining the teaching of writing with technology (RQ4).

### **The impact of leadership and organisation.**

This study has shown the organisational culture of a school is important if teachers are to be associated in designing writing experiences that engage students to write with technology. Administrative challenges impacted on how successful Hayden, Jessica and Brandon were in establishing a safe and rigorous learning environment to teach with technology. Spending time organising and developing operational processes and timetables so students could write with computers in every writing activity was a frustrating experience for these teachers. This experience impacted negatively on their confidence to teach writing with technology. These teachers were acting largely on their own (RQ4).

In the case of the Wattle Creek teachers, the leadership of Nicole ensured that the role of the school administrative team was separated from that of the practice of teaching. Nicole established an administrative structure where she influenced how the organisational processes could be used to support teachers. She managed the role of the technicians so the technicians could maintain the technical organisational structures within the school, the day to day technical issues that arose and the smooth running of all computer equipment. As the ICT leader Nicole was responsible for the software selection and installation processes, Internet safety protocols as well as the training of teachers for knowing how to use different technologies and software. Nicole's leadership in creating a supportive learning environment for teachers to teach with technology confirms previous research related to the importance of school leadership and shared understandings of the role and impact of technology on curriculum learning (Fullan, 2007; Yuen et al., 2003), (RQ4).

### **Factors influencing the integration of technology in writing lessons (RQ3 and RQ4)**

#### **Motivational Factors**

There were a number of factors that the teachers in this study experienced that impacted on their motivation and confidence for how successful they were for integrating technology into their pedagogy.

While Nicole thought about the pedagogical methods for motivating and sustaining the change process for the LDWT to teach with technology, the cases of Hayden, Jessica and Brandon provide insight into how a lack of technical, administrative and collegial support, as promoted by other researchers, can impact negatively on a



teacher's confidence to sustain teaching with technology (Albion, 1999; Chen et al., 2009; Nail & Townsend, 2010; Westwood et al., 1997), (RQ4).

When Brandon had to change from using his traditional socially-orientated teaching methods, confidence was a key factor that impacted on his willingness to continue to engage in designing writing instruction with technology. This was not a factor for Paul because his growing confidence in learning how to use explicit teaching methods highlighted that teachers can change their practices to design new writing experiences when they have access to regular collegial support, thus confirming previous research (De La Paz, 2009; Kervin & Mantei, 2009; Viilo et al., 2011; Whitney et al., 2008), (RQ4).

### **Collegial Support.**

Lack of access to collegial support was an important factor for Hayden, Brandon and Jessica who could not draw on the knowledge and strengths of their peers to overcome pedagogical and technological challenges they were experiencing. This gradually impacted negatively on their capacity to design writing experiences to engage their students to write with technology. Researchers have found that experienced practitioners can support others to design instructional teaching practices, especially for collaborative teams, as has been exemplified by the LDWT in this study (Nail & Townsend, 2010).

The case of Stephanie provides insight into the effect that collegial support can have on teacher pedagogy. The support Stephanie received from her LDWT enabled her to reflect on new ways of teaching and she created instructional procedures using the potential of technology to open up the writing process for students. Stephanie was successful in enabling her students to have conversations about texts as active authors of texts within a de-privatised writing environment (see Stephanie, Chapter 9, 2012), (RQ3 and RQ4).

The case reports in Chapters 4-10 of this study have shown that the integration of technology into the writing process requires more than addressing a teacher's knowledge about teaching writing with technology. Challenges as outlined in this section, need to be addressed if technology is to be given the chance to act as a catalyst by teachers and students to transform their own learning and skill development for writing with technology (RQ3 and RQ4).

## **The influence of technology alignment on theory (RQ1, RQ2, RQ3 and RQ4)**

In one school the organisational arrangements and leadership were effectively aligned to support the teachers. This enabled the generation of effective teaching procedures and facilitated more effective integration of the new technology into the writing lessons.

For other teachers, a lack of alignment of administrative arrangements and collegial support made the task of the teacher more difficult.

Biggs and Tang (2011) have argued for the importance of the constructive alignment of teaching and assessment for outcomes. In this study of the integration of a new technology into the teaching of writing we can suggest that successful integration is more likely when key sets of influences are aligned in a constructive way. The Wattle Creek cases provided examples of such alignment.

It also might be suggested that there were instances in this study where the students generated their own examples of constructive alignment, between the capabilities of the technology and the demands of their writing tasks.

Becoming an expert teacher to teach with technology means aligning the process of teaching and learning with technology to theoretical models that contribute to a cognitive view of learning. The findings from this study suggest some ways to generate a more effective alignment, especially for making explicit how to integrate technology and revision processes into writing process theory.

The next section presents some important ideas that emerged in the process of analysing data and considering findings.

### **Newly developed Models, Frameworks and Instructional Procedures from this Research**

**A Technology Writing Process Model.** A Technology Writing Process Model has been designed by the author to interpret what happens when the teachers integrated technology into their pedagogy, with an emphasis on the socially-orientated context of the writing classroom and the instructional procedures reflected through teacher instruction within the writing process (see Figure 18 below). The model adds to the field of writing because it shows how technology can be integrated by teachers who do not have the mentoring or professional development opportunities to facilitate an understanding of how to create instructional writing procedures within the culture of a socially collaborative writing classroom. The model illustrates the teachers'

instructional choices as understood through the adoption of fluency in writing skills (RQ1) and for developing meaning in the writing process in students' personal writing and de-privatised writing experiences (RQ2). There are similarities between the technology process writing model and the digital storytelling model of Figg and McCartney (2010). Both show the focus of learning within a socially-orientated environment, the importance of motivation on student engagement in learning through the adoption and use of technology and the need to promote the development of students' writing, language and technological skills. However, the Technology Writing Process Model provides deeper insight into the design of instructional procedures with technology and the level of technology integration (RQ1, RQ2, RQ3 and RQ4). The adoption of digital fluency skills (RQ1) particularly emerged in this study as being important for establishing the foundation for students to focus on the knowledge-telling revision and instructional procedures as understood through the theoretical lens of the TPACK Framework to develop deep awareness and critical thinking skills as authors of texts to be globally shared (RQ2). While the study provides insight into the pedagogical methods Hakkarainen et al. (2000) promote as being necessary for knowing how to teach with technology, the Technology Writing Process Model makes explicit the structure of learning and instructional procedures that others suggest are necessary to facilitate teachers to promote students' to address their own approaches to learning (Graham & Perin, 2007; Rogers & Graham, 2008). The Model also provides a structure for teachers to gain a deeper meaning of how they can integrate text-to-speech technology to teach writing.

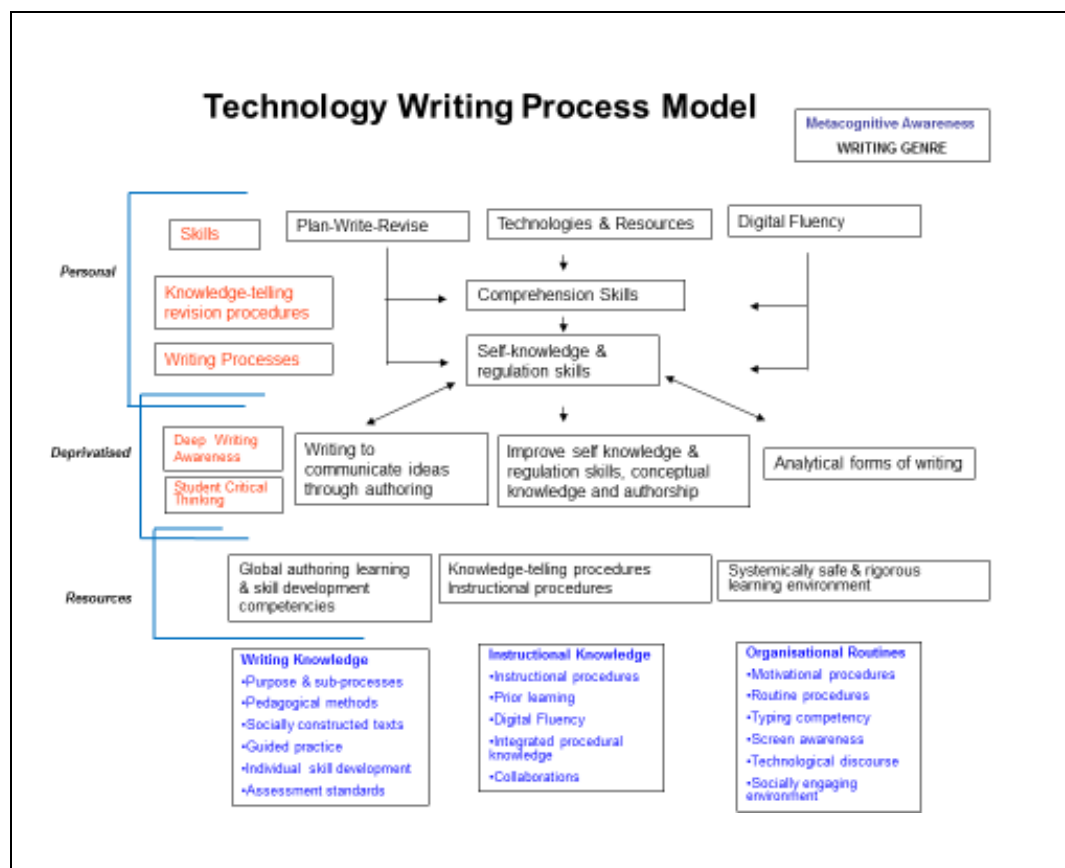
The Technology Writing Process Model (see Figure 18 below) acknowledges the developmental learning pathways for guiding **all** students from active listeners to global authorship through the development of digital fluency, comprehension and knowledge-telling revision procedures for students to differentiate their own learning with technology within their personal writing time. The model then illustrates how teachers can create deeper student awareness and critical thinking as authors and readers of texts when they de-privatise the writing process. Finally the model accounts for the changing knowledge, behaviours, practices and processes required to establish a technologically effective teaching and learning environment.

This is done through the instructional procedures that teachers and students can develop based on writing and instructional knowledge and the organisational routines made explicit in the model.

If novice and expert writers are to learn how to write so they can communicate within a global society, then teachers may be able to use the Technology Writing Process Model (see Figure 18 below) to adopt deeper knowledge about teaching with technology and how they can create effective writing practices with technology.

Figure 18 Technology Writing Process Model (Andrew, 2016)

The model is to be understood as a process where teachers and writers are continually generating ideas in writers’ personal and de-privatised writing time.



As you can see from the model, resources make explicit thinking skills and knowledge for writers to continually think about writing with technology throughout the entire writing process.

The technology writing process model above shows how the teachers integrated technology into the design of writing instruction within every writing activity in the writing process ( Hayes 2012) to shape how authors and readers of texts can think about and reflect upon the production of texts, while attending to their individual writing goals. The model illustrates how teachers and writers can continually generate ideas in a writers’ personal and de-privatised writing environment.

Personalised writing accounts for individual student composing differences while composing, as understood through the conceptual plan-write-revise approach to writing (Flower & Hayes, 1981; McCutchen et al., 1994). This includes the use of tools and resources that novice and more expert writers can draw upon from their working, short term and long term memory structures to overcome writing difficulties or to meet their individual writing goals (Baker et al., 2002; Christensen, 2004; Englert et al., 2005; Harris, 2011; Villalon & Calvo, 2011). Particularly the model highlights the inclusion of the knowledge-telling revision procedures through the use of text-to-speech technology and digital fluency skills at a personalised writing level. Digital fluency skills account for the inclusion of a new competency which requires students to develop speed and efficiency in using a combination of reading and listening comprehension skills, the functional skills of writing with technology and organisational skills to process information on a computer screen at the same time while self-pacing their own composition and revision processes (Abell & Lewis, 2005; Al-Alaoui et al., 2008; Brunelle & Bruce, 2002).

The knowledge telling revision procedures show the reflective instructional strategies that emerged from teachers' integration of text-to-speech technology through the choices students made when writing with the technology to attend to their individual writing goals. The procedures are important for facilitating novice writers to think about writing as a problem solving process rather than a process of content generation (Bereiter et al., 1988; Scardamalia et al., 1984). The deprivatised writing environment within the technology writing process model highlights the importance of teaching students to think as authors and readers of texts within a digital environment through collaborative learning experiences. Collaborative learning and reflective writing experiences can enable authors and readers to acquire deep writing awareness as they communicate their individual writing ideas and differentiated writing approaches through the analytical appraisal of texts (De La Paz, 2009; Nail & Townsend, 2010; Viilo et al., 2011).

Making resources explicit within the model shows how teachers need to design learning to write activities and strategies that use both digital and non-digital resources and tools John and Sutherland 2005. A focus on global authoring competencies, instructional strategies with technology and the creation of a safe and rigorous learning environment require a focus on teacher pedagogical development. This is to ensure that students can acquire the skills and competencies necessary to maximise their learning to write outcomes (Mavers et al., 2002; Webb, 2005).

Finally the model makes explicit the writing and instructional knowledge and organisational routines necessary to teach writing through the integration of technology of technology.

This study has identified the challenges teachers and students experienced in writing with text-to-speech technology, how the writing process model provided a means to identify how teachers integrated technology into different writing activities and the effective instructional procedures that enabled students to engage in narrative writing with technology. The findings here are compatible with those of Chen et al. (2009) and Dexter et al. (2006) in how the role of the teacher is important for integrating technology into the classroom and for showing how concepts such as the plan-write-revise approach are important in the writing process.

**Innovative Instructional procedures.** A variety of instructional procedures created by the study teachers has emerged from this research. The instructional procedures add to the field for understanding for how text-to-speech technology as a literacy-based technological tool can be used by students to make meaning of their own texts while writing. The level of technology use as listed in Table 44 from these procedures has been shown to enhance or redefine teacher pedagogy as exemplified through the instructional procedures analysed through the lens of the TPACK theoretical framework of this study (see Table 44 below). The identification of the knowledge-telling instructional procedures has also shown how writing with text-to-speech technology can be differentiated according to students’ developmental writing skills and knowledge (RQ1, RQ2 and RQ3).

Table 44 Instructional writing procedures with text-to-speech technology

Instructional Writing Procedures with Text-to-Speech Technology			
Instructional Procedures	Description	Practice	Teachers
Pre-Writing Activity	Writing short passage using text-to-speech, listening & typing skills; plus text organisation.	Redefined	Brandon Jessica Olivia
Transcription Technology	Finger Warming Exercises.	Enhanced Redefined	Wattle Creek
Narrative Writing No 1. Revision Procedures for Novice Writers	Read to Self-strategies; Writer’s Workshop Questions;	Redefined	Paul

	Text-to-speech to read at a word & sentence level.		
Narrative Writing No 2. Read text while composing with self-reflection questions	Self-reflection Questions; Text-to-speech at continuous reading; Print a double spacing.	Redefined	Stephanie
Narrative Writing No 3. Knowledge-telling revision procedures	Revising texts using text-to-speech to focus on meaning and/or for critiquing texts.	Redefined	
Writer's Workshop No 1.	Knowledge-telling revision procedures combined with Revise for Meaning Strategy for novice writers or Read for Meaning Strategy for all writers.	Redefined	
Writer's Workshop No 2.	Listening, conferencing and editing of texts	Redefined	

The table shows how instructional procedures are expressed within the different writing activities of the writing process. The instructional procedures demonstrate teachers' right fit of technology, pedagogy and content knowledge for the purpose of supporting students learning to write through the use of text-to-speech technology.

Technology use that redefined teacher practice had a transformational effect on the teaching of writing. The technology use added to the enhancement of teacher practice because teachers and students were able to write with technology and think as experts about the concepts, procedures and strategies for improvement in writing through the creation of new learning tasks (RQ2 and RQ3). While this study did not determine the causal effect of instructional procedures analysed through the lens of the TPACK theoretical framework, the teachers did explicitly teach and model a diversity of skills and strategies within the context of reading and writing experiences that Mohan et al. (2008a) promote as effective practices.

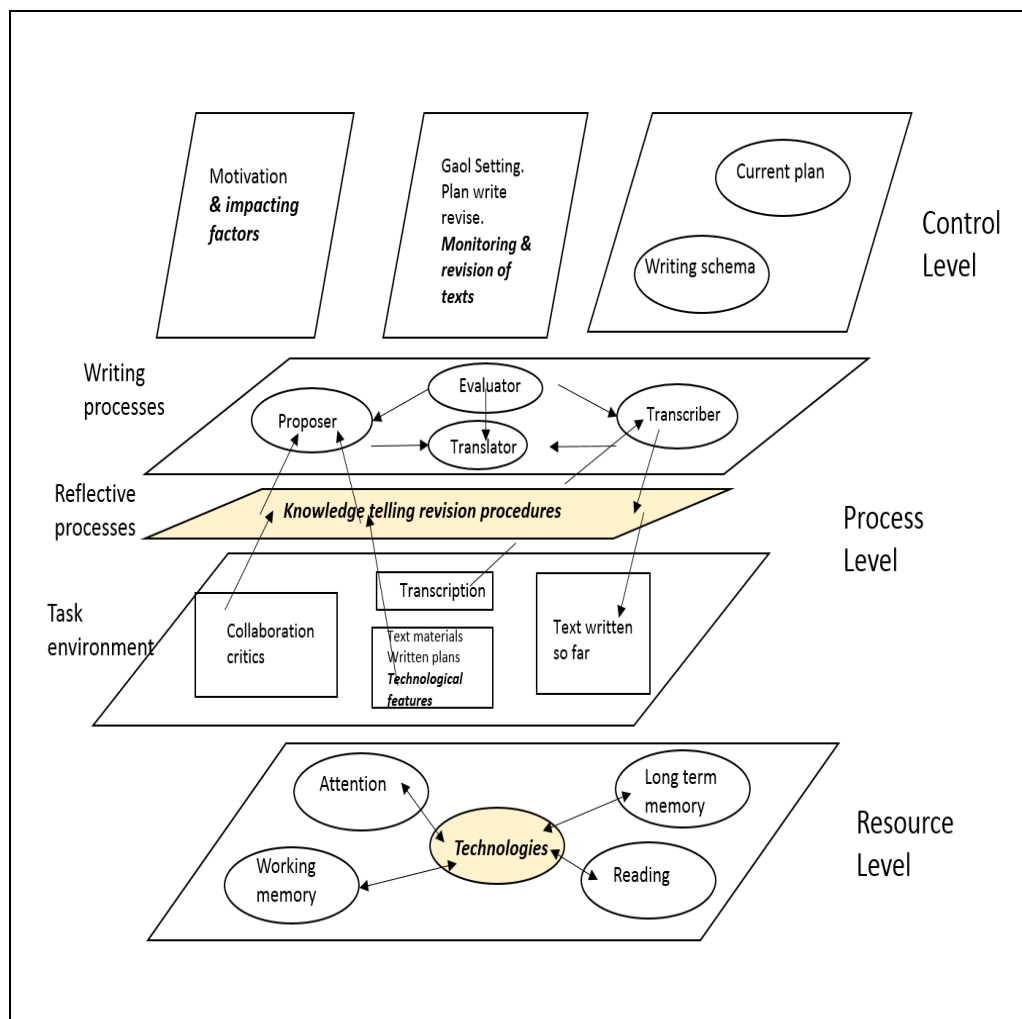
**Aligning technology integration to process writing theory.** The Hayes (2012b) writing model represents writing processes as understood from a control, process and resource level (p. 375) to represent adult writing. The teachers' experiences in this study when teaching primary school students to write, have highlighted how the integration of text-to-speech technology also impacted on their teaching at the

control, process and resource level as understood in the Hayes (2012b) model. This adds to the field of research for understanding the relationship between text-to-speech technology and established writing process models. When teachers gain a better understanding of knowledge telling reflective processes they may be able to individualise student learning to progress novice writers to using more elaborate expert approaches to writing.

Figure 19 below shows how the integration of technology from this study can be included within the structure of the Hayes (2012b) cognitive process model of writing to represent primary school students' writing with technology.



Figure 19 The integration of technology to represent primary school students writing displayed within the Hayes (2012) model, (Andrew, 2016).



The knowledge-telling revision procedures and technologies are made explicit at the process and resource level of model. The revision procedures represent specialised activities for the purpose of composing texts, which can be read by others.

**The control level.** At the control level the addition of technology to motivation and goal setting reflects how the teachers combined their prior knowledge to create new instructional procedures with technology. The study also confirms a range of other factors which were important for impacting on teachers' ability to think creatively. The inclusion of monitoring and revision of texts to the goal-setting element, confirms how a focus on the potential of technology adds value to the design of writing experiences and the creation of new instructional procedures (Lovell & Phillips, 2009; Pressley et al., 2007; Rowe, 2006; Sutherland et al., 2004; Yates, 2008), (RQ1, RQ2 and RQ4).

**The process level.** Technological tools and skill development are integral elements of the planning framework for students writing development within a task environment,

at the process level of the Hayes (2012a) model. A focus on informed pedagogical practice with text-to-speech technology at the process level, promotes opportunities for engaged primary school student listeners to develop digital fluency, organisational processes and knowledge building and collaborative procedures to become as other researchers promote as independent writers (Brunelle & Bruce, 2002; Lovell & Phillips, 2009; Pressley et al., 2007; Rowe, 2006; Sutherland et al., 2004; Yates, 2008), (RQ1).

The inclusion of a separate reflective process for writing with technology for the revision of texts, makes explicit how learning to write with text-to-speech technology will not necessarily compete with other cognitive processes when students are writing. Knowledge-telling revision procedures illustrate how teachers such as Olivia, Stephanie, Brandon, Hayden and Paul changed their pedagogy when integrating technology to enhance and/or redefine how students construct new understandings about themselves as authors of socially constructed texts, confirming that teachers do think about and change instruction when learning is reflected through cognitive psychology (Biggs, Kember, & Leung, 2001; Elshout-Mohr et al., 1999; Hakkarainen, 2009; Hattie, 2009; Mayer, 1981), (RQ2 and RQ3).

***The resource level.*** The integration of technology into the writing process provided an additional load on the teachers' and students' thinking about their traditional writing experiences. At the resource level of the model, the inclusion of 'Technologies' connects the resource [technology] potential to the teaching and learning process to enhance and/or redefine writing instruction. 'Technologies' can act as a catalyst to understand how to increase the link between acquiring knowledge and how that knowledge can be retained. The Wattle Creek cases suggest that teachers and students can reflect on the impact of technology as it interacts with their teaching and learning as others have suggested in relation to the adoption of technology (Hofer & Swan, 2008; Hollender et al., 2010; Kervin & Mantei, 2009; Mishra & Koehler, 2011; Puentedura, 2008; Russell et al., 2006), (RQ3 and RQ4).

**Reflecting on the suitability of TPACK and SAMR as theoretical models to understand the integration of technology.** The TPACK Framework (M. Koehler, 2014) and SAMR Model (Puentedura, 2008) provided a lens for understanding how the study teachers attended to students' writing goals. This adds to the field of research by showing how the theoretical models were used to analyse a new technology as an instructional writing tool. The study also adds to the field of

research by showing how the TPACK Framework and SAMR Model were used as guides for reviewing instructional writing strategies.

The TPACK Framework was a useful guide to explore teacher knowledge required to teach writing instructional procedures with technology. The SAMR Model provided the lens for understanding how the level of technology use within instructional procedures either enhanced or redefined teacher pedagogy. The TPACK Framework and SAMR Model also provided insights into the interactions between the potential of technology and the instructional approaches the teachers used for monitoring and revising texts. This research provides insight into how teachers could use the SAMR Model to reflect on the level of technology use to consider if the technology is to accommodate learning rather than to redefine the writing experience. They could also consider if they and their students have the skills, knowledge, resources and structures necessary to sustain motivation to write with technology in the writing process. To provide a rich technological learning experience through the creation of instructional procedures, teachers can consider their combined technological, pedagogical and narrative writing knowledge through the lens of the TPACK Framework. This will enable them to understand how they can capitalise on the potential use of technology to create a socially-orientated learning environment, students' organisational and digital fluency skills and a diversity of instructional procedures for all students within every writing activity to write with technology in the process of writing (RQ1, RQ2, RQ3 and RQ4).

The use of the SAMR Model (Puentedura, 2008) has also highlighted inadequacies in how these models have been used to facilitate an understanding of the complex relationship between teaching and learning to write with technology in the context of the writing classroom. While Paul worked to develop students technological skills to a fluency level (RQ1), he also realised the technology the students were learning today was not going to be the technology they would use in the future. Paul's case illustrates how it is essential that a teacher prepares students to view the use of technology as a stimulus to think differently about their learning. The learning process as Paul suggested, is an 'absolute must' (see Paul, Chapter 7, Teacher Interview, 2012) and is to remain the focus on learning and not levels of technology use as being more important. When Paul scaffolded a novice student to write with technology, his case illustrates how an effective teacher could consider the developmental learning needs of a student and relevant teaching approaches to determine learning outcomes with and/or without the use of technology, as suggested

by others (Mavers et al., 2002; Sutherland et al., 2004; Yates, 2008). Paul suppressed technological distractors so the novice student could think about composing rather than the technological features that could be used to determine the learning process (RQ2).

The second inadequacy of the TPACK Framework (M. Koehler, 2014) and SAMR Model (Puentedura, 2008) provides insight into understanding how ‘Technologies’ reflect the complex relationship between teaching, learning and technology. When Hayden and Jessica focused on the functionality of text-to-speech technology rather than considering the relationship of the potential use of the technology to their writing pedagogy and student learning, they were unable to design instructional procedures with technology to enhance and transform student learning. This was in contrast to the LDWT who did understand how technologies could reflect the complex relationship between teaching, learning and technology. While TPACK and SAMR provide insight into teacher knowledge and levels of technology use to teach with technology, they do not reflect the importance of focusing on the process specific to the teaching focus, such as learning to write. Additionally these models do not explicitly consider opportunities for promoting student voice and teacher collaborations before technology can be integrated into writing pedagogy, (RQ1, RQ2, RQ3 and RQ4).

Thirdly the TPACK Framework (M. Koehler, 2014) and SAMR Model (Puentedura, 2008) could give more emphasis to teacher knowledge and levels of technology use as a means to provide a rich technological learning experience. Teacher mentoring, integration factors, challenges and teacher pedagogical choices are not accounted for. The leadership provided by Nicole was an essential factor in the LDWTs ability to transform their ongoing learning and skill development with technology. The TPACK Framework and SAMR Model did not account for the leadership structures, time and ongoing mentoring and technical support that the case of Nicole exemplifies as being essential for supporting teachers to adopt and sustain teaching with technology (RQ3 and RQ4).

Effective teaching and instructional design techniques cannot be evaluated through the use of the TPACK Framework (M. Koehler, 2014) and SAMR Model (Puentedura, 2008). The literature review highlighted how technology alone is insufficient to enable students to write effectively (Warschauer, 2007). When Brandon and the LDWT considered the steps required for students to write with

technology in the writing process, they made learning to write with technology meaningful for their students. The students not only learnt how to write with technology, they also learnt from the process of using instructional procedures. This enabled some students to be successful at creating their own instructional procedures with technology. As suggested by Sweller et al. (2011a), the students came to know the process at the same time as learning the steps required within the process. TPACK and SAMR cannot be used as guides by teachers for making effective instructional decisions where students can learn and recognise how to use instructional procedures within the writing process (RQ1, RQ2 and RQ4). Table 45 outlines the advantages and disadvantages of using the TPACK Framework (M. Koehler, 2014) and SAMR Model (Puentedura, 2008) as conceptual tools.

Table 45 Advantages and disadvantages of the TPACK Framework and SAMR Model

<i>Advantages</i>		<i>Disadvantages</i>
TPACK	SAMR	TPACK & SAMR
Assesses teacher expertise for integrating content, technological and pedagogical knowledge for the design of student learning experiences	Identifies four types of technology use that can have a greater or lesser effect upon student learning.	Technology use can be viewed as more important in the learning process being represented to determine the learning outcome. Understanding how ‘Technologies’ reflect the complex relationship between teaching, learning and technology. Do not account for conditions of learning, the teaching methods or collaborations. Could place teacher knowledge and levels of technology use as a means to provide a rich technological learning experience. Teacher mentoring, integration factors, challenges and teacher pedagogical choices are not accounted for. Effective teaching and instructional design techniques cannot be evaluated.

As you can see the disadvantages highlight how the advantages of TPACK and SAMR can place the technology use as a determinant of writing success with technology. Student representations of writing with technology are also not represented within the TPACK Framework and SAMR Model

The TPACK Framework (M. Koehler, 2014) and SAMR Model (Puentedura, 2008), could also be understood as ensuring that teacher knowledge prepared students as being ‘digitally savvy’ (Jordan, November 2011, p. 426), as more important than the writing outcomes to be achieved. The teachers in this study who did not have prior knowledge, experiences or mentoring opportunities to reflect on how to teach with the new technology, faced greater challenges than those who did (RQ4).

While the basic skills and knowledge the teachers acquired could be understood through these models, the integration process, outcomes and challenges they faced could not. The combined TPACK Framework (M. Koehler, 2014) and SAMR Model (Puentedura, 2008) did not show the factors that impacted on the choices the teachers made to integrate technology into their writing pedagogy. Neither did reflective insights into teacher practice using TPACK and SAMR show how the teachers integrated text-to-speech technology to shape, what Bosco (2006) suggests as being effectively responsive to individual learner differences. The stages of instructional competencies that promote a teacher’s ongoing learning and skill development with technology (Russell et al., 2006) were useful guides for understanding teacher awareness and use for teaching with technology, to support their existing practice and to understand if the technology use acted as a catalyst for significant change towards transforming the design of learning experiences.

This research confirms that a combination of this study’s theoretical models, principles of effective learning design and associated teaching practices could be evaluated for how they shaped the teaching of writing with technology (Hayes, 2012b; M. Koehler, 2014; Puentedura, 2008; Russell et al., 2006).

A literacy learning system, defined as ‘Redefining Pedagogy with Technology’ (see Appendix J) has been developed to frame the interconnected relationships between the theoretical models. Transforming learning was complex for Hayden, Jessica and Brandon. The challenge was due to factors beyond their control. The software and technological features, the adoption of the different pedagogical methods, changes to their own teaching practices and factors beyond teachers’ control impacted on how

all study teachers individually or with peers and students worked to overcome the challenges they faced (RQ4).

### **A final comment**

The research findings highlight how schools, teachers, and students can manage teaching and learning to write with text-to-speech technology. Teachers in this study who used the potential of technology as a stimulus to think differently about their pedagogy also promoted a range of instructional techniques to acquire a deeper understanding of the effect of their pedagogy on student learning. These teachers promoted an openness in the inter-relationships between the teacher and students for writing with technology, resulting in a de-privatisation of teacher practice. A new effective learning design principle emerged from the research showing that teachers need to consider, promote and acknowledge different pedagogical learning experiences within the learning to write process when designing differentiated learning experiences with digital and non-digital resources and tools.

Collaboration emerged as a critical factor amongst teachers, peers-to-peers and teachers-to-students for promoting teachers ongoing confidence, learning and skill development when collaborating with technology. When teachers had access to collegial support they could work collaboratively to overcome challenges that impacted on their ability to know how to consider, promote and acknowledge different pedagogical experiences for integrating technology into their pedagogy. Time and a positive organisational cultural within a school were also important factors for teachers to acquire the confidence and motivation to design instructional procedures to develop students' digital fluency skills and knowledge to write with technology. A lack of technical, administrative and collegial support impacted negatively on teacher ability to sustain teaching with technology.

Teachers' pedagogy in developing students' writing through the integration of text-to-speech technology has led to the creation of a Technology Writing Process Model. This model shows how the integration of technology to represent primary school students writing can be displayed within the Hayes (2012b) model. Transforming learning was complex for the teachers. Reflective insights have been documented to highlight inadequacies of the combined TPACK Framework (M. Koehler, 2014) and SAMR Model (Puentedura, 2008). These inadequacies show the factors that impacted on the choices teachers made when integrating technology to shape the

design of instructional procedures. The findings from this study provide insight into schools and particularly how individual teachers within schools can be innovative in their thinking and also be creative, even with negative impacting factors.

At a general level the findings from this study show there was variability between the cases for how the teachers integrated technology as a catalyst to build an understanding of what makes good writing. This also includes how students as authors gain meaning from texts through the integration of new instructional procedures. Some teachers seemed overwhelmed by the technology and the effect of the challenges they faced on their teaching and learning. Some teachers, especially the LDWT, and some students developed instructional procedures through the integration experience.

The leadership of Nicole and the use of her team approach stands out as a way to get value from the adoption and use of new technology. When the teachers and students were collaborating with technology they adopted organisational and formative assessment procedures to establish a writing environment. Instructional writing activities focused on introducing text-to-speech technology as an instructional tool. The Wattle Creek teachers, Brandon and their students developed digital fluency to acquire new skills and competencies for writing with technology and they shared their pre-writing experiences within a socially engaging environment. The integration of technology into the writing classrooms at Wattle Creek School de-privatised writing pedagogy, facilitating both teachers and students to design and critique the effect of new instructional procedures. The proactive approaches of some students highlights that researchers and teachers need to recognise the value to be gained from the major group of participants in a classroom, namely, the students. A significant finding from the research provides insight into the emergence of student voice. Time also emerged as a significant factor for students and teachers to consider, promote and acknowledge the effectiveness of their teaching and learning experiences.

Teachers' pedagogy to develop student writing through the integration of text-to-speech technology was complex. Innovative teachers could see the complex interrelationships between writing pedagogy, technology and learning. They understood how to create socially-orientated conditions and a collaborative culture where teachers and students could use the potential of technology as a catalyst to



think differently about instructional procedures to enhance and redefine the teaching of writing.

### **Limitations.**

This was an exploratory study in this field. While the review of literature identifies a body of literature on the integration of technology into a range of teaching settings, this study was designed to investigate how teacher pedagogy to develop student writing, integrating text-to-speech technology as a new instructional tool into the writing process where teachers carried out the integration. This was not a study of a researcher-led-intervention. The findings of which need to be interpreted within the appropriate context.

The purpose of the study was to theorise how teachers would integrate new text-to-speech technology into their pedagogy to develop student writing. The description was generated from a restricted range of classrooms with a small number of teachers. The case studies only looked at one piece of software (TextHelp Systems Ltd, 2012a). Nevertheless because text-to-speech technology was new to all the teachers it can be argued that the findings drawn from case studies can be expected to have application to situations where other new technologies are introduced in other curriculum areas.

The research frameworks, models, processes, instructional procedures and the emerging principle of effective learning design are all theoretically aligned through the ethnographic design methodology and analytical framework of this research (Fetterman, 2010; Hayes, 2012b; M. Koehler, 2014; Pressley et al., 2007; Puentedura, 2008; Russell et al., 2006; Yates, 2008). However, there is no evidence to ensure the same outcomes will occur if others choose to integrate text-to-speech technology into their own pedagogy.

### **Future Research.**

As this was a small scale study, the study needs to be followed up by further research. The contrasting environment in the different schools suggest that the impacts of these and other environments should be the subject of research. Future research could focus on the advantages associated with the LDWT being replicated in other sites.

The evidence of the development by students of their own writing knowledge and of their capacities to learn with digital technology in ways not directed by their teachers should also stimulate further research. How can these benefits of student action be extended?

While Australian education policy promotes the use of technology as a component of successful learning (Ministerial Council for Education Early Childhood Development and Youth Affairs, 2008), the teachers in this study provided insight into how they sought to reflect and assess the appropriateness of their own teaching methods during the integration process. It is through an understanding of the impact of their teaching and the creativity of their students' writing procedures that future teachers can reflect on the integration experiences within the writing classrooms of this study. To achieve the transformational teaching outcomes promoted by the Australian Curriculum, teachers and students will need to reflect on the instructional potential of digital technologies and develop the skills and competencies to ensure learners communicate successfully beyond schooling (Australian Curriculum, 2013). The findings from the study raise questions for future research. The interpretive data provides insight into the impact of text-to-speech technology on the teaching practices of seven teachers. With a small number of teachers, no conclusion can be reached about the associated appropriateness of how to redefine pedagogy with technology in the literacy classroom.

Further suggested research areas could include the following considerations.

***Does the theoretical representation for integrating technology into the writing process support Primary School teachers to integrate text-to-speech technology and implement writing instruction in their classrooms, particularly when they focus on the reflective process of using knowledge-telling revision procedures?***

The conceptualisation of teaching with technology to design writing experiences based on instructional design knowledge, provides insight into how the seven teachers designed instructional procedures where writers could integrate the potential use of text-to-speech technology as a revision tool to develop their differentiated learning goals. The Technology Writing Process Model was developed from the insights gained from the study. However, the examples provided by the instructional procedures with text-to-speech technology (see Table 44 and Appendix C) cannot be used for causal effect.

***What are the effects of the instructional procedures analysed through the lens of the TPACK theoretical framework within the Technology Writing Process Model to improve primary school students' writing?***

As teachers continue to teach and integrate digital technology successfully into their pedagogical methods, new assessments of writing with technology as aligned to National Standards may need to be considered. The results will need to be interrupted against pen and paper written texts for equitable writing outcomes. The product of writing using paper or the screen will need to be understood as students internalise their visual writing field (Glenn, 2007) and develop new genres as they move towards becoming authors who can communicate their ideas with digital technology within a global society.

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## Appendix

<i>Appendix A</i>	<i>Research Introductory Teacher Letter</i>
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## *Appendix A. Research Introductory Teacher Letter*

Dear Teacher,

Elizabeth Andrew is teacher and is currently undertaking research through her PhD in Education.

She is conducting research into teacher pedagogy to develop student writing through the integration of text-to-speech technology. The title of the research is ‘Teacher pedagogy to develop student writing through the integration of text-to-speech technology’. The research will be conducted in the Education Department schools in Year 3-Year 7 classes.

The research project involves understanding how teachers integrate technology to develop writing. The technology tool being used for the project is Read&Write Gold™ software, text-to-speech technology, which is a popular form of assistive software that students and adults can use to help their literacy development.

Read&Write Gold™ is being used in many schools, government websites and libraries both nationally and internationally to enable greater inclusive access to learning and information. Enclosed is a brochure and web address providing further information on the software– [www.texthelp.com](http://www.texthelp.com).

The research will focus on the teaching and learning outcomes:

- For how students and teachers adopt and use Read&Write Gold™ software when writing narratives
- For providing information on the Read&Write Gold™ functions or icons used to assist teaching and learning through the writing process
- For working with technology through a teacher and student questionnaire
- The provision of samples of student writing for research purpose
- Through a teacher/researcher discussion survey to review the benefits of using Read&Write Gold™ in your pedagogy to develop student writing using literacy based software.

Below I have answered some of the questions that may arise.

- The teacher and the student’s names, school and work samples and information provided will remain confidential with no possibility for individuals being identified. All Education Department and University protocols will be followed to ensure anonymity.
- The teacher and the students will be working with the software as part of your normal classroom learning and teaching. Together you will be exploring possibilities for how the integration of technology can make the teaching and learning more meaningful.
- The software has been provided to the school for no charge during the research project and students will have access to the software from their classroom

computers and the computer suite. As a research teacher you will have additional access to the software on your personal computer both at school, home or laptop. It is envisaged that after the completion of the research, the software will be made available for all students across the school.

- You will retain access to the software on your personal computer for future use as you desire
- Students are able to withdraw from the research project at any time without prejudice but must speak with you or the school Principal beforehand.
- Participation is voluntary and you can withdraw from the research at any time. However it is recommended that you inform the researcher and your school Principal of your withdrawal. Communication with the researcher is encouraged throughout the Research Project to address any concerns, misunderstandings or clarifications.
- After completion of the research, a report and information about the research findings will be shared with the school community and a copy of the report will be made available to interested educators.
- All records containing personal information will remain confidential and no information which could lead to identification of any individual, will be released. The researcher will take every care to remove responses from any identifying material as early as possible. Likewise individuals' responses will be kept confidential by the researcher and not be identified in the reporting of the research. However the researcher cannot guarantee the confidentiality or anonymity of material transferred by email or the Internet.
- Data storage in the form of written journals, field work observations, interviews, narratives and software usage from students or yourself, will be collated at the university and the information stored in electronic format on a CD disk. It will be kept in a locked filing cabinet at the University.

This research has been approved by the University's Human Research Ethics Committee. If you have any ethical concerns about the project or questions about your rights as a participant please contact the executive Officer of this Committee. Contact details are:

The research has also written approval from the Department of Education.

If you are prepared to participate, a Consent Form is attached for you to sign. Should you require additional information regarding this research, please contact Elizabeth Andrew. Contact Details are:

Elizabeth Andrew

Research Candidate

Date: \_\_\_\_\_

*Appendix B1 Collated findings of all teachers' information processing reflections*

Note. The framework reflects on how teachers designed instruction and the triggers and cues they used to prompt students' prior learning.

<b>Teacher</b>	<b>Designed instruction based on narrative writing with opportunities to practice. Technology instruct</b>	<b>Provided cues to trigger memory of previous learnt knowledge</b>	<b>Did new instruction have 3 items or less</b>	<b>Procedures teacher used. Model &amp; demo Explicit &amp; direct Listen use feedback</b>	<b>Encourage understanding by how for both novice &amp; expert learners</b>
Stephanie	instruction based on narrative writing with opportunities to practice Techno explicit	Narrative cues Techno cues Visual cues	Take, it, filter it.....; Watch & read need; Finger warming Look & think ahead	Model & demo Explicit and direct Listen use feedback	Novice; listen, COPS, white spaces etc. Expert: Think-aloud, global author teaching moments
Paul	instruction based on narrative writing with opportunities to practice Techno explicit	Narrative cues Techno cues Visual cues	Finger warming Have a go Knee to knee	Model & demo Explicit and direct Listen use feedback	How for novice writers
Olivia	Instruction based on narrative writing with opportunities to practice. Explicit	COPS Narrative genre, charts.	Finger warming Listen with eyes etc Have a go	Model & demo Explicit and direct Listen use feedback	Encourage understanding by how for both novice & expert learners
Nicole	Techno explicit to link with writing		Finger warming Listen and tell	Model & demo Explicit and direct Listen use feedback	
Jessica	Narrative and Practice at different stages of writing	Narrative	When using TTS		
Brandon	Exploratory Techno Narrative and Practice at different stages of writing. Exploratory Techno	Exploratory Motivation		Model - keyboard listening skills. Explicit & direct	
Hayden	Exploratory approach using writing concept.  Exploratory Techno	For writing purpose Introduce RWG When writing		Model TTS, Explicit for technol. Listen feedback	TTS play-back speed

*Appendix B2. All teachers instructional framework with technology*

*Note.* The framework summarises the teachers goal free problem solving approaches, the worked examples they used and the explicit teaching approaches they modelled.

<b>Teacher</b>	<b>Goal Free Used PS approaches that focuses on steps to achieve an individual outcomes</b>	<b>Worked Example Use TTS Work with distractor Split Mech/meaning Novice/expert</b>	<b>Explicit Teaching Visual/listening Guidance fading Imagining Enc self explan Missing knowledge</b>	<b>Collaboration Cog rehearsal TTS with scaffolds Peer to peer Whole class</b>
Stephanie	Watch & Read, Look & think Ahead A sentence is.....; When listening for meaning.....	Use TTS Work distractors Split Mech/mean Novice expert	Visual/listening Guidance fading Imagining Missing knowledge	Cog Rehearsal TTS with scaffolds Peer to peer Whole class
Paul	Toolbar overwhelming so taught bit by bit; Listen and sense	Use TTS Work distractors Split Mech/mean Novice only	Visual/listening Guidance fading Imagining Missing knowledge	Cog Rehearsal TTS with scaffolds Peer to peer Whole class
Olivia	Listening What are we looking for?	Use TTS Work distractors Split Mech/mean Novice expert	Visual/listening Guidance fading Imagining Missing knowledge	Cog rehearsal TTS with scaffolds Peer to peer Whole class
Nicole	Listen and tell		Visual/listening Guidance fading Imagining Self-Explanation Missing knowledge	Cog rehearsal strat TTS with scaffolds Peer to peer Whole class
Jessica	In both narrative and technology. - Narrative, vocab, sentences, white spaces,	Use TTS Distractors ( Friends names) Split mech/mean Novice/.expert	At different stages: Visual/listen. Guidance Fading Imagination Self-explanation Missing knowledge	TTS with scaffolds Peer to peer Whole class
Brandon	Listen for spelling, sentence or comma	Different stages: Use TTS Split,	Visual Listen, Guidance fading – typing, Imaging	Peer to peer
Hayden	Sentence focus Skim & scan	Split between print & screen	Written paragraph & listen. Image – what is in your readers head, new assess level	Peer to Peer Whole class listen

### *Appendix C. TPACK Instructional Writing Procedures from all teachers*

#### *TPACK Pre-Writing Activity: Redefined Practice*

Brandon designed a *TPACK Introduction Pre-Writing Strategy*, where he encouraged students to write short passages over a period of ten lessons and practice using the text-to-speech functionality while thinking about the meaning in their text and developing listening and typing skills at the same time. This TPACK pre-writing activity could be enhanced further if the writing was embedded within the text organisation strategies as defined by Jessica and Olivia in Chapter 4.

#### *TPACK Transcription Technology Finger Warming Exercises: Enhanced/Redefined Practice*

The Wattle Creek teachers designed Finger Warming exercises with freeware software to improve students typing skills and knowledge. The aim was to free student working memory through the use of skill development exercises, so students could focus on developing ideas in their stories while typing. If the teachers embedded the teaching of home keys, cap lock, punctuation and page organisation strategies into the Finger Warming exercises they would be refining their practice.

#### *TPACK Narrative Writing Activity No 1: Redefined Practice*

Paul redefined how his novice writers composed texts by developing revision procedures using text-to-speech. He combined Read to Self-strategies into novice Writer's Workshop questions and how text-to-speech could be set to read at a word and sentence level. This facilitated his novice students to self-regulate their writing.

The Read to Self-strategies facilitated novice writers to reflect on their finished stories. The strategy encouraged students to read the story through without the use of technology and then listen to the story using text-to-speech before reading again.

1. Listen for mistakes
2. Look for double spaces and green lines
3. Read first by yourself and then listen to your story
4. Listen and then add more.

The Writer's Workshop questions using text-to-speech included:



1. Have I started every sentence with a capital?
2. Have I ended every sentence with a full stop?
3. Have I left white spaces between my words?
4. Have I used joining words in my sentences, such as and, because and after?
5. Are there any words that I need to check?
6. Is my writing interesting?

*TPACK Narrative Writing Activity No 2: Redefined Practice*

Stephanie designed instruction for her students to read texts for information while composing by highlighting text, combined with self-reflection questions and text-to-speech set at continuous reading and print set to double spacing. The self-reflection questions facilitated student's listening skills so any changes they made to a text would not change the story or change the meaning of a story. The questions included:

1. Is this your Story?
2. Is this what you want?
3. Do you want to change it?
4. Does that sound right?
5. Is this what your story should say?
6. Is this what you meant?

*TPACK Narrative Writing Activity No 3: Redefined Practice*

The knowledge-telling revision procedures which included the Fixed, Flexible and Elaborate approaches to revising texts can be used for individual student writing and also within collaborative writing environments. The procedures can be used to focus on the meaning of stories being constructed or for the collaborative critiquing of sections or a whole text.

*TPACK Writer's Workshop Strategy No 1: Redefined Practice*

The three knowledge-telling revision procedures used in combination with the following strategies, inclusive of technical keyboarding and technical operational skills and knowledge. The knowledge-telling revision procedures can be combined with a Revise for Meaning strategy (refer below) for novice writers or a strategy suitable for all writers.

The Revise for Meaning Strategy for novice writers:

1. Listen to whole story to make senses
2. Choose where to start editing at sentence level and the ask the following questions
  - a. Have I started every sentence with a capital?
  - b. Have I ended every sentence with a full stop?
  - c. Have I left white spaces between my words?
  - d. Have I used joining words in my sentences, such as and, because and after?
  - e. Are there any words that I need to check?
  - f. Is my writing interesting?

Read for Meaning Strategies for all writers:

Narrative structure and author intent for a reader:

- a. Who is the main character?
  - b. Where and when did the story take place?
  - c. What did the main characters do?
  - d. How does the story end?
2. Retaining the author as the constructor of meaningful texts:
  - a. Who are you writing to?
  - b. Who are you writing as?
  - c. How do you want to make the reader feel?
3. Listen to whole story:
  - a. Then paragraph by paragraph;
  - b. Instruction on sentences;
  - c. Think-aloud strategies, question or prompts.

*TPACK Writer's Workshop Strategy No 2: Redefined Practice*

1. Listen for meaning:
  - a. Listen to whole story and then listen to paragraphs or a selected paragraph;
  - b. Whole class edit as determined by the author;

- c. Author makes final choice on edited suggestions based on meaning of the whole sentence. Listen to sentence;
- d. Correct for meaning sentence by sentence aware of spelling and homophones for each paragraph.

2. Conferencing:

- a. Collaborative questions to the author in relation to adding detail or how to improve the text;
- b. Brainstorming and discussions encouraged;
- c. Role of author is to listen, clarify or reflect on suggestions.

3. Edit for narrative structure and spelling:

- a. Reflect on structure and relate to the screen.
- b. Prompt use of technological and non-technological strategies.

*Appendix D. Principal Research consent letter*

I (name)

Hereby give consent for Elizabeth Andrew to conduct the research project entitled:  
*Teacher pedagogy to develop student writing through the integration of text-to-speech technology.*

I have read and understood the Information and Consent Sheets provided to my staff and student community on the above project. I have also been provided with a copy of the Education Department's letter of approval dated 23 September 2009 and viewed the University Ethics approval.

I will ensure that the researcher obtains informed consent as agreed by The Education Department and University and understand that:

- all individuals' confidentiality will be preserved and that all safety precautions are in place
- the researcher will be providing feedback to the school community on the research
- a final copy of the research report will be circulated to interested staff and made available to educators for future reference.

I understand that the research teacher has an opportunity to:

- attend a training workshop
- share their teaching and learning experiences with the researcher
- provide feedback to the researcher through a questionnaire
- be involved in the research, but may not directly benefit by taking part in the research

I understand that the research teacher and students may withdraw from the Research Project at any stage and that there will be no payment to them for taking part in the Research.

I consent for Elizabeth Andrew to conduct the research project titled: *Teacher pedagogy to develop student writing through the integration of text-to-speech technology*, being conducted on my school site and look forward to the research findings.

Signed:

Date:

*Appendix E. Teacher Research consent letter*

Dear Teacher,

Elizabeth Andrew is teacher and is currently undertaking research through her PhD in Education.

She is conducting research into how students can develop their writing by using technology, not to assist them to write but to create opportunities for them to think about the purpose for using technology. The title of the research is, ‘*Teacher pedagogy to develop student writing through the integration of text-to-speech technology.*’ The research will be conducted in the Education Department schools in Year 3-7 classes.

The research project involves understanding how teachers integrate technology into their pedagogy to develop student writing. The technology tool being used for the project is Read&Write Gold™, a popular form of assistive software that students and adults can use to help their literacy development. Read&Write Gold™ is being used in many schools, government websites and libraries both nationally and internationally to enable greater inclusive access to learning and information. The web address provides further information on the software– [www.texthelp.com](http://www.texthelp.com).

Students will be working with you, to use the Read&Write Gold™ software during regular classroom lessons.

The research will focus on the teaching and learning outcomes:

- For how students and teachers use the software when writing narratives
- For providing information on the Read&Write Gold™ icons used to assist teaching and learning through the writing process
- For working with technology through a teacher and student questionnaire
- The provision of samples of student writing for research purpose
- Through a teacher/researcher discussion survey to review the benefits of using Read&Write Gold™ to develop student writing

I have answered some of the questions that may arise;

- The teacher and the student’s names, school and work samples and information provided will remain confidential with no possibility for individuals being identified. All Education Department and University protocols will be followed to ensure anonymity.
- The teacher and the students will be working with the software as part of your normal classroom learning and teaching. Together you will be exploring possibilities for how technology can make the teaching and learning more meaningful.
- The software has been provided to the school for no charge during the research project and students will have access to the software from their classroom

computers and the computer suite. As a research teacher you will have additional access to the software on your personal computer or laptop at school and at home.

- You will retain access to the software on your personal computer for future use as you desire.
- Students are able to withdraw from the research project at any time without prejudice but must speak with you or the school Principal beforehand.
- Participation is voluntary and you can withdraw from the research at any time. However it is recommended that you inform the researcher and your school Principal of your withdrawal. Communication with the researcher is encouraged throughout the Research Project to address any concerns, misunderstandings or clarifications.
- After completion of the research, a report and information about the research findings will be shared with the school community and a copy of the report will be made available to interested educators.
- All records containing personal information will remain confidential and no information, which could lead to identification of any individual, will be released. The researcher will take every care to remove responses from any identifying material as early as possible. Likewise individuals' responses will be kept confidential by the researcher and not be identified in the reporting of the research. However the researcher cannot guarantee the confidentiality or anonymity of material transferred by email or the Internet.
- Data storage in the form of written journals, field work observations, interviews, narrative texts and software usage from students or yourself, will be collated at the university and the information stored in electronic format on a CD disk. It will be kept in a locked filing cabinet at the University.

This research has been approved by the University's Human Research Ethics Committee. If you have any ethical concerns about the project or questions about your rights as a participant, please contact the executive Officer of this Committee. Contact details are:

The research has also written approval from the Department of Education.

If you are prepared to participate, a Consent Form is attached for you to sign.

Should you require additional information regarding this research, please contact.

Contact Details are:

Thank you for considering this request.

Signed:

*Elizabeth Andrew Research Candidate*

*Appendix F. Student and parent Research consent letter*

I (name)

Hereby consent to my child .....

involvement in the research project entitled:

*'Teacher pedagogy to develop student writing through the integration of text-to-speech technology.*

I have read and understood the Information Sheet on the above project and understand that my child is being asked to:

- use Read&Write Gold™ software when writing stories and short texts
- provide information on the Read&Write Gold™ icons they use when writing
- answer a student questionnaire about working with technology
- provide samples of their writing for research purpose.

I understand that my child may not directly benefit by taking part in this research.

I understand that while information gained in the study may be published, my child will not be identified and all individual information will remain confidential.

I understand that I can withdraw my child from the study at any stage up until the end of the collection of field data.

I understand that there will be no payment for my child taking part in this study.

I am aware that I should retain a copy of the Information Sheet and Consent Form for future reference.

I consent to my child being involved in this project.

Signed:

Date:

Relationship to child:

Name of child:

Date:

*Appendix G. Teaching with technology reflective workshop agenda*

Teacher Pedagogy to develop student writing through the integration of text-to-speech technology

Research Teacher Reflective Feedback

Research Teachers Names.

Hi Everyone,

Thank you for your anticipated attendance for reflective feedback on the research. The aim of the day is to gather all research teachers together to share your experiences.

Before your attendance I ask that you reflect back over your time in the research and where possible share the following with us:

- Your personal reflections - brief overview of no more than 5-10 minutes.
- Case study – share a story about one of two students of interest in the research
- Humorous – a funny experience or situation during the research.

PERSONAL REFLECTIONS

- Your role in the school, context in which you work, about your class
- Your experiences for using technology in /out of school
- Computer access and environment
- Your teaching style and how it may have been challenged or changed when using technology?
- What you thought you wanted to achieve in or from the research
- Your reflections on using technology as a tool to develop writing
- Your beliefs about working with ICT and using it for writing
- Has your knowledge for using technology in the classroom improved?

AGENDA: The agenda for the day will then follow some questions where we can discuss and reflect together on specific topics.

MORNING TEA & LUNCH: I shall provide you with morning tea, lunch and coffee/tea/ etc.

Contact details.

Yours sincerely



Elizabeth Andrew Research Candidate

*Appendix H. Wattle Creek School pedagogical development tips list*

Wattle Creek School

Tips

- Spanner:
  - Pronunciation for having words read back correct.
  - Spanner. Hold down arrow at end of sentence for extended time and all suggestions are displayed.
  
- Press Pause to make a correction. Press Pause to start again. The text you were listening to remains highlighted. You can move anywhere in the document but when you press Pause again the voice will start where you originally left off.
  
- When to use Pause or Stop. Stop will take you back to the beginning of the sentence. Pause will stop where you are in the middle of a sentence and start from the middle.
  
- Forward or back icons-if you press backwards once you will go back one sentence. If you press the button twice then you will go back 2 sentences.

## **Knowledge Telling Procedures**

The three knowledge-telling procedures for revising texts with text-to-speech are explained as a flexible approach, a fixed approach or an elaborate approach as reflected through the research of Berninger et al. (2010); Hayes (2012b); Sweller et al. (2011b).

### ***Flexible Approach***

Text-to-speech is used by the writer/editor while writing/listening, to revise for meaning and editing with no fixed approach. The writer/editor attends to errors as they occur within a story, using a linear approach. The writer/editor knows they will hear or see errors as they are writing/listening. The editing processes of the writer/editor are related to the construction of the current and preceding or future words, sentences, paragraphs or genre structures. The writer/editor attends to the mechanics or meaning of the text within the linear process as they occur from the start to the completion of the text:

- The writer/editor may write/listen, pause and listen to a minimum of 2 or more sentences and may or may not decide to change the text before moving to the next sentence; or
- The writer/editor may pause, think and/or make a change or continue writing/editing without changing the text before moving forward through the section of text.
- The writer/editor revises the whole text and attends to meaning and editing errors as they occur using a linear process from the start to the end of the text.

An example of a flexible approach to editing texts can be understood by how Paul (see Chapter 4) provided instruction that enabled Tim to have the working memory capacity to achieve a specific writing goal as he reflected on what he had written (Sweller et al., 2011b). When Paul used text-to-speech using a flexible approach to revising texts, a novice writer, such as Tim was able to use a flexible knowledge-telling procedure to focus on the editing issues that arose in one sentence at a time before moving onto the next error and next sentence.

### ***Fixed Approach***

Text-to-speech is used by the writer/editor while writing/listening to revise for meaning and editing having made a decision for how and when to activate editing

strategies or tools. The writer/editor also decides on how text-to-speech as a revision tool will be used to facilitate meaning while texts are being composed or listened to. The writer/editor may choose to use text-to-speech knowing they will ignore the mechanical errors in the text and other technological tools that may act as distractors (such as red and blue lines under text). The writer/editor could also choose when to use the tools for editing purposes such as spelling and grammar. This may be after the composing process or composing section has been completed. The writer/editor uses Think-aloud strategies using text-to-speech to facilitate a revision approach;

- The writer/editor may decide to use text-to-speech only when the first draft of writing process is complete; or
- The writer/editor may use text-to-speech during the writing process, but decide to suppress distractors because chooses to focus only on composing text for meaning; or
- The writer/editor chooses when and how to use the suppressed distractors for editing purposes at different stages of the writing process. The choice of use may occur at the end of a paragraph, end of two sentences or at the end of a whole text; or
  - The writer/editor decides to reject or suppress the use of text-to-speech while writing and choose to activate it at any time.

Stephanie in Chapter 4, used a fixed approach to encourage her students to focus their attention on the meaning and editing of texts using her “Write, Edit and Print” procedure. Berninger et al. (2010) discusses how teachers can design writing instruction to support students to overcome the limits of their working memory. Using text-to-speech as a fixed approach supported Stephanie’s students to write creatively.

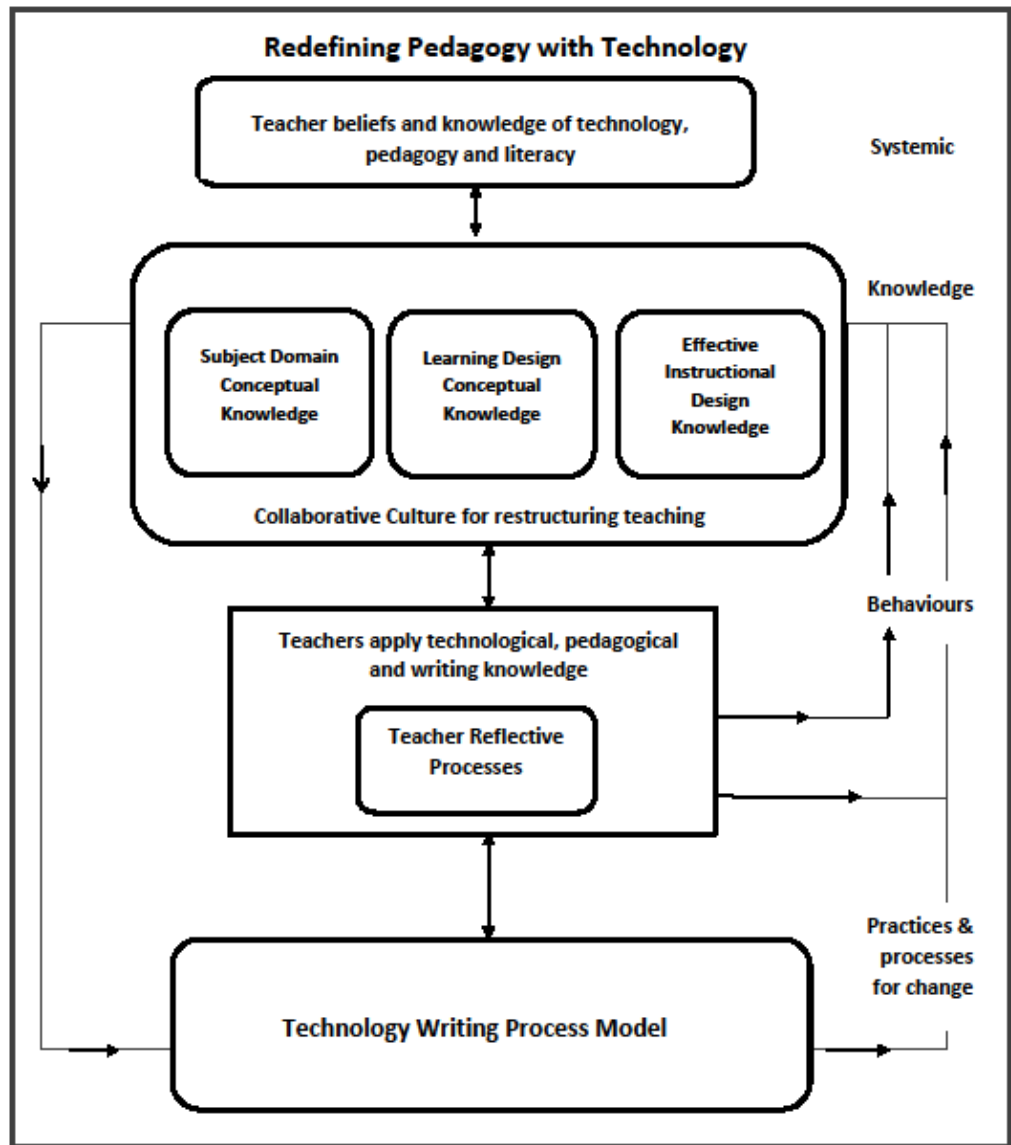
### ***Elaborate Approach***

This is a structured, global approach to using text-to-speech. The writer/editor specifically structures how they are going to revise the written text. The writer/editor uses a writing skill or writing competency to enhance or improve meaning in a text and/ or for specifically addressing the mechanics of writing. The aim of the writer’s/editor’s approach to using text-to-speech is to focus on the whole text, specific paragraphs or groups of sentences in order to improve the quality or compositional standard of the text. The writer/editor begins by listening to the whole text, before back-tracking to focus on a block of text or smaller groups of sentences

to address strategies within particular categories of the writing process. Think-aloud strategies may include:

- The writer/editor backtracks and refines the text by listening and in some cases re-listening to selected sections of texts until the preferred changes and standards are achieved;
- When focusing on textual meaning the writer/editor can write and listen for the purpose of elaborating or refining the text with a focus on developing either ideation, creativity, genre expansion and text generation;
- When focusing on editing the mechanics of the text, the writer/editor listens to the written text with the purpose of editing for full stops, sentence length, incorrect word use, spelling errors, grammar, and pronunciation, homophone use, typing errors, text organisation and white spaces.

An example of an elaborate approach to editing texts was demonstrated through the collaborative group editing procedures Stephanie used in her Writer's Workshop sessions as discussed in Chapter 4. Stephanie used text-to-speech to emphasise language development using four stages. This facilitated both writers and readers to focus on how a reader may respond to a whole text, the structure, organisational and editing of sections of a texts and then consider changes as critical authors. The elaborate approach provided a structure for Stephanie and her students to use a process in which they could develop more efficient approaches to improving the composition of texts. Sweller (1988) references how students can recall information to be used later to solve problems, if there are efficient structures to prevent them from using inefficient problem solving strategies. Elaborate procedures provided a structure which allowed novice writers to recognise how to solve writing problems (Sweller, 1988). The findings of Sweller (1988) are relevant for understanding how knowledge about writing processes can be understood. The modelling of elaborate procedures using students' texts as worked examples, was a meaningful way for Stephanie's students to know how to apply new learning (Hattie & Yates, 2014). This research showed how the teachers redefined their instruction to consider how text-to-speech could be used as an instructional writing tool, which Hattie and Yates (2014) would argue, facilitated the teachers to design differentiated writing experiences for their students.



## **Writing Design Conceptual Knowledge**

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Subject Domain: Writing Design for Writing Conceptual Knowledge

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### The purpose of the Writing Process Model

Teachers to understand how the plan-write-revise conceptual cyclic approach to writing can inform their practice.

Teachers to understand the differentiated process choices students make when writing.

Teachers to understand that they can design instructional approaches that can shape cognitive thinking to enable individual students to achieve engagement and improvement in writing.

### Sub-processes of plan-write-revise in each writing activity

Teachers to make a plan of each writing activity in the process of writing to plan and identify the skills to be developed as applicable for novice and expert writers.

Teachers to plan how to explicitly teach technological knowledge and writing knowledge.

Teachers to model to students how reflective processes can be used by writers when composing, by differentiating flexible, fixed or elaborate approaches as appropriate for novice and expert writers.

### Strategies

Teach strategies for how writers aim to convey meaning to readers.

Guide students to generate ideas, organise the genre structure and use knowledge-telling revision processes.

### Collaborative approaches and strategies that mediate between writing for global authoring and readers

Identify collaborative approaches that can be used during student's individual writing time.

Identify the collaborative approaches that can be used during Writer's Workshop communications.

### Developing mastery of technological tools

Develop student's skills for using text-to-speech to facilitate revision of meaning at differentiated writing levels.

Teachers to know which tools and how they can best be used for novice and expert writers for editing texts.

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## Skill development

Typing skills.

Listening skills and thinking skill to focus on the process of writing.

Text-to-speech technical use.

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## **Learning Design Conceptual Knowledge**

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### Learning Design for Writing Conceptual Knowledge

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Establish a Learning Design Writing Team to identify conceptual writing knowledge, technological knowledge and pedagogical knowledge.

Identify the thinking skills needed to integrate technology when focusing on writing conceptual knowledge.

Plan how to integrate technology during the learning process and the learning approaches that will be used for each writing activity.

Design the instructional procedures needed to review the meaning of texts, deliberate editing processes with or without technology and the collaborative learning processes.

Identify levels of use of the potential integration of technology for learning. Identify the explicit teaching approaches necessary to guide integration. Identify how to implement and manage collaborative learning for individuals and groups of students so they can generate knowledge.

Identify how to provide guidance to scaffold writing expertise and the collaborative learning procedures that promote expert learning.

Combine inquiry based and direct instructional scaffolds to improve learning and provide opportunities to reflect on the quality of texts as readers and writers.

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## **Effective Instructional Design Conceptual Knowledge**

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### Effective Instructional Design Knowledge

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Identify the effective writing strategies and how to use the most appropriate strategies for each writing activity within the writing process.

Identify what prior learning students' may have and how to cue students to think about using that knowledge for the creation of new learning.

Identify the skills and strategies to be learnt and how to scaffold learning using cognitive modelling, goal-orientated instructional strategies and practice

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Identify teaching practices that facilitate students to develop new understandings and how to apply those practices to sustain new learning.

Identify the procedural knowledge and how to apply the procedures to engage students in a process for the generation of new knowledge.

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# Tool Number 1: Speech




## INTRODUCTION

A toolbar is a group of pictures that are also called icons - each icon when clicked does something special!

How to use the Play icon and Stop icon

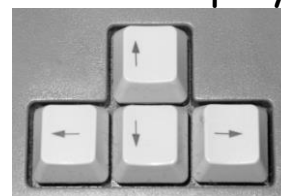


Press the **Play**  picture (icon) in the toolbar at the top of your screen and you will see the words change colour as you hear them being read. You can stop reading

the sentence by pressing the **Stop**  icon (picture) at any time.

You can slow the voice down or speed the voice up by

using your 'up'↑ and 'down'↓ arrow keys



1. Open the story **Trips to the Seaside** on your computer. If you need help with this ask your teacher.

2. Click anywhere in the story (text) and press the

**Play**  icon (picture) on the toolbar.

3. The story (text) will be read to you as it becomes highlighted (coloured).

4. To stop reading press the **Stop**  icon (picture).

5. Use the **Play**  and **Stop**  icons (pictures) to do the following exercises.

## THE OLD BICYCLE

Grandpa is very old; he has lived on this world about a hundred years already.

He likes to tell me the stories about when he was young and I like to listen as well. He is a good person, a good father, a good teacher, a good friend, a good husband and a very, very good grandpa.

Grandpa walked to me slowly. Finally he reached a seat which was behind me. "Good morning grandpa!" I said. "Good morning," he called back.

Just then, he told me another story. It was about a bicycle.

When I was young, he said, I used to ride a bicycle to school every day. I still can remember what my first bicycle looked like.

He stopped talking and thought for a bit.

"I was only 6 years old." "My father, your great grandfather sold our piggies and bought a new bike for himself and he gave me his old one." "It was all black." "Only the handle bars and the wheels were silver." "My father taught me how to ride the bike." "On the second day I rode it to school." "It was too big for me and I couldn't control it very well."

"Just then, I fell over a big bump with the old bicycle." "I sat up and started to cry loudly." "The lucky thing was, my friend was there as well and he picked me up and carried me home." "I stayed at home all that day and Mum tied my bleeding leg with some cloths."

As grandpa told me his story, a most happy smile appeared on his face. I asked him, "Where is the old bicycle now?" He replied, "It's in my heart, a part of my memory."

This is the story of the old bicycle. There must be some more stories about it, and I believe they will stay with grandpa forever!      Adapted from Jiaboa

## THE MOON MADE OUT OF CHEESE

One nice dark day when I just woke up I asked my mum, "What is for breakfast?" Mum said I don't know because we have run out of cereal. So I went outside to smell the roses and they smelt really weird. So I ran inside and said to mum "Why do the roses smell weird?" and then mum said, "I don't know".

I went back outside and smelt roses again and then I must have lent over a bit and fell of the edge. I was holding onto a rock and it felt really soft and so I had a little bit of a taste and I said to myself, "What?" "This is cheese", so I fiercely climbed back up. I went back inside and said "Mum, Mum the moon is made out of cheese. Then mum said "Oh really!" Then she said, "Why don't you have it for breakfast?" Then I said, "Yeah good idea".

So I went inside and got a bowl, then went outside and picked some cheese up and ate it for breakfast. It was really nice. After that I decided to go back inside and watch T.V. On T.V they had about that the first girl to try eating the moon and her name is "Nicole." When I heard my name I was so excited I was jumping on the walls.

I had become famous for ever.

By Nicole

### A TRIP TO THE MOON

One day there was a boy named Billy. Billy loved rockets and space. He loved spaces [space] so mach [much] that he wanted to make a rocket and go to space one day. So Billy got all the things he needs [needed] to make a rocket. By the next's [next] day Billy made his rocket and went to space.

By Billy