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**Word Level Literacy Skills of Adolescents
and their Teachers: An Exploratory Mixed Methods
Study**

A thesis presented in fulfilment of the requirements for the degree of

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Abstract

Poor adolescent reading comprehension is a persistent problem which is difficult to solve because of its complexity. The contribution made by the word level skills of decoding and spelling to skilled reading has been under-researched in New Zealand. Relationships between word level abilities and reading comprehension were investigated in an exploratory study of 301 adolescents aged from 12 to 14 from six secondary schools in the lower North Island of New Zealand. Word level knowledge was assessed through pseudoword and real word spelling tasks whilst vocabulary knowledge was assessed using a standardised reading vocabulary assessment and a morphological awareness task. Results demonstrated that spelling was more difficult than reading comprehension, and that whilst most adolescents in the sample had a grasp of the alphabetic principle, many had weak knowledge of English orthography and morphology. Regression analysis showed that vocabulary knowledge made the greatest contribution to reading comprehension. The contribution of spelling, although quite small, was significant. This finding suggested that an intervention focused on developing orthographical and morphological knowledge might have a beneficial influence on reading comprehension abilities.

An intervention focused on developing orthographic and morphological awareness, delivered by classroom teachers, consisted of bi-weekly word study sessions over 21 weeks. The intervention aimed to improve spelling and decoding skills for weaker students and vocabulary knowledge and word consciousness for all students. Moreover, the intervention also aimed to increase teachers' word level literacy knowledge by exposing them to interactive word study activities intended to engage students' interest. Post intervention assessments results showed no intervention effects for standardised spelling, vocabulary or reading comprehension. However, gains were found in pseudoword spelling and morphology tasks. Qualitative evidence supported the role of the intervention in developing word consciousness for a number of participants. There was evidence from a word level

knowledge task that most intervention teachers improved their word level knowledge when compared with control teachers' results.

The study has added to the existing body of knowledge relating to adolescent literacy because of the dearth of research into New Zealand adolescents' decoding and spelling skills. Furthermore, the study has contributed to a better understanding of secondary teacher's knowledge of word level literacy skills.

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Chapter 1 : Introduction

The Problem

Being literate matters. Whether a person is literate or not may have profound consequences for their personal, social and economic well-being. It could be argued that, along with numeracy, the most critical proficiencies that schools must teach are reading and writing. In international literacy tests, such as the Programme for International Student Assessment (PISA) which tests the literacy skills of 15-year-olds from OECD and partner countries at regular intervals, New Zealand students generally perform well. Results in 2006, 2009 and 2012 show that many New Zealand adolescents have advanced literacy skills (Ministry of Education, 2013; Telford & Caygill, 2007, p. 3; Telford & May, 2010, p. 7) but performance declined slightly between 2009 and 2012. The proportion of advanced readers was 19% in 2009 dropping to 14% in 2012. In these same tests, the number of students with poor literacy skills has increased, up to 16% in 2012 from 14 % in 2009. It is probable that this figure is an underestimation of the numbers of poor readers because many students who are poor readers or, who are not succeeding at school, leave school before the age of 15 when PISA tests are administered. The school dropout rate for New Zealand is 33%, twice the average rate of dropouts for the European Union (OECD, 2013).

The phenomenon of disproportionately poor literacy performance is sometimes referred to as the 'long tail' of student underachievement. Many students in this 'long tail' are from low socio-economic backgrounds which include large numbers of Māori and Pasifika students as illustrated in the PISA data. Despite a clear mandate from the New Zealand Ministry of Education (MoE) for schools to improve the literacy levels of Māori and Pasifika students over a number of years (Ministry of Education, 2003b, 2007b, 2008), there has not been evidence of an improvement in the literacy performance of low-achieving students in the latest rounds of PISA testing (Ministry of Education, 2013; Telford & May, 2010). The problem which prompted the

current study was poor adolescent literacy achievement in New Zealand secondary schools.

It is not easy to improve older students' literacy skills. Poor literacy achievement has the characteristics of a 'wicked problem' as defined by Rittel and Webber (1973). The challenge of tackling wicked problems was discussed in detail by the Australian Public Service Commission (Commonwealth of Australia, 2007). In the Australian Government report the authors explain that the word 'wicked' does not suggest that the problem is evil, rather the description indicates that the problem is complex and difficult to analyse because it has many possible causes and is not responsive to simple solutions. Poor adolescent literacy is a complex problem and this thesis attempts to examine one dimension of the issue: word level literacy skills. Word level literacy skills include decoding, spelling and vocabulary knowledge. Decoding is the fast, accurate, and silent reading of isolated words. Spelling is related to decoding and uses the same knowledge that is needed for decoding but it is the accurate writing of letters to represent sounds in words. Vocabulary knowledge is defined as knowing what words mean as well as having an awareness of the meaning of the morphemes which make up polymorphemic words.

In the next section of this chapter, which provides background to the problem of poor literacy achievement, some reasons as to why poor word level skills might be implicated in the incidence of poor adolescent literacy achievement are offered. This section provides a rationale for the focus on word level skills that underpins the present study. The importance of examining teachers' knowledge is also discussed in this section.

The subsequent section of the chapter on interventions to support adolescent literacy development describes the emphasis on reading comprehension instruction, generally to the exclusion of a focus on word level skills, which characterises many interventions for poor adolescent readers. The idea that the importance of decoding for adolescent literacy achievement has not been examined thoroughly is expressed in

the literature relating to future directions for adolescent literacy research (Pressley, 2004). Pressley asked the question “What do we need to know?” and then answered with “Basically everything, given the history of understudy of literacy development in secondary schools” (Pressley, 2004, p.430). He then proceeded to explicitly mention lack of knowledge about adolescents’ sight word knowledge and phonic knowledge as well as fluency. The lack of knowledge about the efficacy of word level interventions for adolescents influenced the second phase of the present study.

Background to the Problem

There are a number of possible reasons why some poor adolescent readers might be struggling with word level literacy skills, decoding and spelling in particular, most of which may be explained by earlier literacy experiences. One reason may be that for beginning readers, English orthography is difficult to master when compared to other more transparent orthographies with consistent sound-letter associations, such as German or Italian. Another reason might be that some teachers are not sufficiently trained to develop effective decoding and spelling skills in beginning readers who struggle to learn the code. Many of these less skilled beginning readers then grow up to become less skilled adolescent readers. A third possibility is that for many years the approach to reading instruction favoured by New Zealand teachers was the whole language approach which, among other things, does not advocate the explicit teaching of sound to letter associations out of context (Tunmer & Nicholson, 2011).

English is one of the most difficult languages to learn to read because, as well as inconsistent sound to letter associations, there are also inconsistent letter to sound associations. For example, it is possible to write the long /a/ sound in *gate* in at least eight different ways (*rain*, *they* and *eight* for example), and the /ow/ letter pattern can be pronounced in three ways (as in *cow*, *know* and *knowledge*). The long history of the language, which has been exposed to extensive influences from other languages, complicates the orthography (Kessler & Treiman, 2003) with words such as *yacht* presenting difficulties to beginning readers (Frith, Wimmer, & Landerl, 1998). The

difficulty for beginning readers learning English was demonstrated in a study comparing how long it took children to develop a basic level of literacy in a range of languages in the European Common Market (Seymour, Arro, & Erskine, 2003). They found that children learning in shallow orthographies such as German and Italian reached a foundation level of basic literacy after a year; it took English-speaking children between two and three and a half years to reach this level of proficiency.

Vowel sounds in English are the most difficult to learn to spell (Wimmer & Goswami, 1994; Wimmer & Landerl, 1997). Consequently, teachers in English-speaking countries need to be especially well trained so that they can understand exactly what it is their students need to learn in order to master English orthography. Nevertheless, there are many more orthographic regularities than exceptions in English, and no word is completely phonologically opaque; for example, the word *yacht*, which is difficult to pronounce correctly without some support, has transparent phonological initial and final phonemes (Venezky, 1967). Another factor influencing the complexity of English orthography is that some words are influenced by their morphological relationships: *heal* and *health* and *sign* and *signal* for example. English orthography can be described as morphophonemic because it is influenced by the sounds in the word and by the derivation of the word (Moats, 2010; Venezky, 1999).

It is likely that most New Zealand teachers do not receive sufficient explicit training to support students who struggle to learn to read. Recent research by Carroll, Gillon and McNeill (2013) indicates that New Zealand primary teachers are generally not well equipped to develop beginning readers' phonological awareness, which is an important component of beginning reading instruction. If beginning readers have difficulty isolating phonemes in words then this inhibits their ability to develop strong and efficient decoding skills. Phonemes are the individual sounds of which words are composed (Yule, 2010). For example, a beginning reader needs to be able to identify the phonemes /b/, /oo/ and /k/ to decode the word *book*. When beginning readers are experiencing difficulty with decoding it is important that teachers of reading understand how to develop phonemic awareness (Ehri, Nunes, Willows, et al., 2001).

Teachers' lack of preparedness to teach reading, or at least their perception that training has been inadequate, is suggested by some other New Zealand research. Lang (2001) interviewed seven beginning primary teachers and one of these teachers felt she had not had sufficient training to learn how to teach reading and language at all well. In a much larger survey of 405 primary teachers' knowledge about spelling instruction and assessment it was found that 69% of teachers felt they had not had adequate training to teach spelling effectively (McNeill & Kirk, 2014). What little research has been undertaken into secondary teachers' knowledge of teaching reading and spelling skills examined secondary English teachers' self-efficacy beliefs (Hansen, 2005). In this research several teachers claimed that they felt ill-equipped to teach reading and spelling. One teacher in the study commented that there were large numbers of year 9 students coming to secondary school with inadequate reading and writing skills, that secondary teachers are not trained to teach students how to read, and that there needs to be serious attention paid to this problem (Hansen, 2005).

One explanation for why some children may not have developed strong decoding and spelling skills when they learned to read may be that the whole language approach to teaching reading was adopted almost universally from the 1970s in New Zealand. The whole language approach is characterised by a reluctance to explicitly teach students about sound and letter associations in isolation from reading meaningful text (Goodman & Goodman, 1979; Nicholson, 2002; Smith, 1979). The embedded approach to teaching the alphabetic principle (the concept that letters are used to represent the sounds of spoken language) may not have been effective with some students who needed more direct instruction in phonemic awareness and sound-letter associations. When results from two cohorts of students from schools involved in two longitudinal studies were compared, those students who had been taught sound-letter associations explicitly had on average achieved significantly better than the students taught using the whole language approach, and after two years, the gap between Pākehā and Māori students had been eliminated (Tunmer, Chapman, & Prochnow, 2003).

Another feature of whole language instruction was that teachers were advised to encourage students to use multiple cues to work out how to read unfamiliar words, first focusing on the context clues such as the meaning of the sentence they are reading (Ministry of Education, 2003a). Teachers have been specifically encouraged to reduce to a minimum the students' focus of attention on print detail (Smith & Elley, 1994). As a result, many New Zealand reading teachers may not have thought phonics instruction was important and do not have the knowledge and skills to teach sound to letter associations well (Carroll et al., 2013). In a small study which analysed New Zealand teachers' support for beginning readers having difficulty with decoding words, Greaney (2001) found that teachers suggested using a variety of cues to students when selecting word identification prompts, but the most frequently suggested cue was the use of context to guess the word. Research has shown that competent, fluent, readers use word level cues, not context, to work out novel words (Stanovich, 1986; Tunmer & Chapman, 2002).

The difficulties with both the 'whole language' and the 'phonics' approach to teaching reading are described in detail by Tunmer and Nicholson (2011). There are problems with some of the whole language approach assumptions about how children learn to read. One assumption is that learning to read is natural and that children learn to read by being exposed to print in much the same way as children learn language. However, all children are biologically wired to acquire spoken language whilst written language is culturally manufactured and has to be deliberately learned. Another important limitation in the whole language approach to reading instruction is the focus it encourages on using identification of initial letters and final letters in a word to support students to 'guess' what the word might be depending on the context in which it is situated. This strategy is not generative and does not help beginning readers to form a complete mental image of a word; it encourages confusion between words with similar beginnings and is not a strategy adopted by successful readers (Liberman & Liberman, 1992).

There are also limitations to the phonics approach to teaching reading. Tunmer and Nicholson (2011) conclude that phonics alone is not an adequate approach to adopt because there are too many different sound to letter associations for them to be learned by direct instruction. They concluded that it is misguided to search for the 'best method' to teach reading because the most effective approach for each child will depend on what "reading related knowledge, skills and experiences the child brings to the classroom. . . ." (p.417). Furthermore, differences in pre-school experiences which lead to variable levels of oral language as well as knowledge and skills related to acquiring literacy, skills that Tunmer and Nicholson (2011) refer to as "literate cultural capital" (p.420), are more likely to disadvantage students from lower socio-economic groups entering school than children from more advantaged backgrounds. Māori and Pasifika students are over-represented in lower socio-economic groups.

Significant research evidence demonstrates that students from lower socio-economic backgrounds are more likely to be at risk of developing difficulties learning to read. There are many factors which contribute to this situation. Students from low-income families are more likely to live under varying levels of social and financial difficulties (Boston, 2013; Crooks & Caygill, 1999; Nicholson, 1997). Although New Zealand children are unlikely to experience the extreme poverty found in some third world countries, there are growing numbers of children living in relative poverty. Relative poverty exists when the family income is less than 40% of the median income or, if children are suffering from material hardship because they are deprived of some of the necessities of life such as a raincoat or winter shoes (Boston, 2013). Children from low income families are less likely to have access to books in their homes and their caregivers are less likely to have time to play with children to develop some of the skills which are related to early literacy development (Crooks & Caygill, 1999; Nicholson, 1997). One of the differences in early literacy development between children from high and low socio-economic backgrounds is that children from lower socio-economic backgrounds often have delayed acquisition of letter and sound association which are an essential component of decoding and word recognition (Duncan & Seymour, 2000). This delayed development of letter to sound association

knowledge is possibly linked to less developed phonemic awareness, which is often found in children from lower socio-economic backgrounds (Nicholson, 1997). Unless student differences in essential early reading skills are recognised and ameliorated by explicit teaching, it is likely that the disparity in literacy achievement between students from higher and lower socio-economic backgrounds will continue to widen (Tunmer et al., 2003).

It is probable that some adolescents who have poor reading skills have not developed strong word level literacy skills because of a lack of explicit instruction in the alphabetic principle when they were learning how to read. Lack of teacher knowledge may have contributed to this lack of explicit instruction. English orthography is complex and research suggests that New Zealand teachers do not feel confident that they know how to teach spelling well, and that they find it difficult to identify phonemes in words. In addition, New Zealand teachers have been influenced by the whole language approach to reading instruction which encouraged children to teach themselves to read by being exposed to the language of books and by using context clues and illustrations to guess unfamiliar words. The whole language approach did not suit all students, particularly those from lower socio-economic backgrounds, and it is probable that the embedded approach to teaching the alphabetic principle has contributed to the 'long tail' of poor literacy achievement (Tunmer, Chapman, Greaney, Prochnow, & Arrow, 2013).

Interventions to Support Adolescent Reading Development

Most interventions aimed at improving adolescent literacy skills have focused on teaching strategies for improving reading comprehension and written composition because it is assumed that by the time students reach secondary school they have mastered decoding (Schoenberg, Greenleaf, Cziko, & Hurwitz, 1999; Shankweiler, Lundquist, Dreyer, & Dickinson, 1996). In New Zealand, one example of this assumption is the Secondary Literacy Project (SLP) which aimed to improve literacy skills for Maori and Pasifika secondary students as well as other underachieving

students. In the last iteration of the project teachers were supported to use a set of guidelines for effective adolescent literacy instruction developed by the national coordinating team (Wilson & McNaughton, 2009). These guidelines focused on developing students' literacy strategies, such as summarising and questioning, as well as metacognitive skills. Apart from vocabulary, the guidelines lack any focus on the teaching of word level literacy skills such as decoding or spelling. This lack of attention to basic foundational reading skills for students who are not succeeding may have limited the efficacy of the SLP for some of the adolescents with poor literacy skills in the schools which took part in the initiative.

The assumption that adolescents will have mastered the code of English by the time they reach secondary school has an influence on the type of literacy assessments that are routinely carried out in Years 9 and 10. In one study examining the use of assessments in secondary schools eighty-six schools (including high and low decile, rural and urban as well as single-sex and co-educational secondary schools), were surveyed about the kinds of literacy assessments they administer to year 9 and 10 students (Craig, 2011). The results from the survey showed that, while all of the participating schools had collected data on reading comprehension, only two-thirds had collected and analysed writing samples, and approximately half of the schools tested vocabulary knowledge. Approximately a third of the schools reported that they had assessed spelling. However, only seven schools stated that they used specific spelling tests so it appears that for most of the schools who mentioned spelling, it was assessed as a component of the writing assessment and not as a separate skill. No schools reported assessment of decoding. This lack of attention to the assessment of decoding skills suggests that, in general, secondary schools do not consider that poor decoding might be a factor contributing to the poor reading comprehension skills of some students. In the course of a review of literature relating to adolescent word level skills no studies of New Zealand adolescents' spelling or decoding skills were located.

The Significance of the Study

The level of literacy in youth is a key indicator of social and economic well-being in a society. Willms (2003) argues that adolescent literacy is a measure of how effective parents, the community and schools have been in nurturing and developing a young person's literacy skills; literacy levels in a society are a predictor of the capacity for future economic growth. Youth with higher literacy skills generally have better prospects than those with poor literacy skills. Adolescents with poor literacy skills are more likely to suffer from depression, poor mental health, higher school dropout rates and higher suicide rates than those adolescents with typical literacy skills (Arnold et al., 2005; Daniel et al., 2006). Literacy proficiency is correlated with socio-economic status, as illustrated in the 1997 International Adult Literacy Survey where students from families with higher economic status performed well in all countries but there was a great variation in the performance of students from lower socio-economic backgrounds (Willms, 2003). PISA results show a similar pattern of correlation (Telford & Caygill, 2007; Telford & May, 2010). There is evidence that the disparity between the rich and poor is growing in New Zealand (Ministry of Social Development, 2012) which makes it all the more important to understand some of the educational factors which might be contributing to some of the poor literacy levels in a significant number of New Zealand adolescents. If we are to make progress in reducing the differences between very good readers and poor readers, it is important not to think about the failure of poor adolescent readers to learn how to read, rather we need to think about how to teach them what they need to know in order to read better.

Response to the Problem

The problem which prompted the current study was the relatively large number of adolescents who have poor reading comprehension skills. Whilst acknowledging that there are multiple causes for the problem several factors suggest that poor word level skills might be responsible for a proportion of the poor achievement. The study aimed to investigate the relationship between the word level

skills of a sample of adolescent learners and reading comprehension. A secondary purpose was to explore the efficacy of a word study intervention intended to improve spelling and decoding skills for weaker students and vocabulary knowledge and word consciousness for all students. The teacher delivered intervention was intended to support weaker students to develop reading comprehension skills through improving word level skills and to interest most students in learning more about words and their meanings. Associated with the intervention was a focus on teacher knowledge and understanding of word level literacy skills.

The Structure of this Thesis

In Chapter One the problem which prompted the study is described as well as some background information which might explain some of the causes of the problem. Poor adolescent literacy is acknowledged as a complex or 'wicked' problem with many possible causes and no simple solutions. A response to the problem is outlined. The parameters of the study are clearly delimited to a focus on the contributions that word level skills make to reading comprehension.

In Chapter Two the Simple View of Reading (Gough & Tunmer, 1986) which is the theoretical framework underpinning the study is described. Literature which explains several theories of literacy acquisition is explored and implications for adolescent readers are examined. Research into the role of word level skills in the development of skilled reading, as well as literature relating to word level interventions and the impacts of these interventions, are discussed and analysed. In addition, research relating to the word level literacy knowledge of teachers is examined.

The approach and design of the study is outlined in Chapter Three. A mixed-methods explanatory design was chosen because of the complexity of the issue. If both quantitative and qualitative data were collected the issue would be subjected to a deeper analysis than if just one method of data collection was used. The design was influenced by fairly recent developments in educational research which falls under the

umbrella term 'design research' (Bradley & Reinking, 2011). In this paradigm real world problems are tackled in authentic contexts, and the classroom-situated teacher-delivered intervention planned for this study broadly fitted this approach.

The results from the quantitative analyses of data are described in Chapter Four. Several word level literacy measures as well as reading comprehension assessments were used to collect pre- and post-intervention data in intervention and control schools. Teachers' test data were collected and analysed. Results were organised around the research questions that drove the data collection. Descriptive and inferential statistics were analysed to answer questions about the nature of adolescent word level literacy skills and the relationships between these skills, as well as questions about the efficacy of the intervention and about teachers' word level literacy knowledge.

Some of the questions around the impact of the intervention on teachers and students could not be answered using quantitative data, so teachers and students were interviewed to provide a 'thick' description (Geertz, 1973) of their experiences and interpretations of results. These data are analysed using Glaser's (1965) constant comparative method of data analysis to build up an understanding of themes arising from an interpretation of the data. These descriptive qualitative data are presented in Chapter Five.

Analysis of the quantitative and qualitative results is discussed in Chapter Six, which presents conclusions drawn from the study. Links to similar studies are made and limitations of the present study are acknowledged. The implications of the findings for educational practice and policy are outlined in this final chapter.

Chapter 2 : Literature Review

The problem that gave rise to this study was poor adolescent reading comprehension and the associated problem of secondary teachers not knowing how to address the problem. Most interventions into adolescent reading difficulties focus on teaching comprehension strategies but this approach has not worked for all poor readers. To find out why some adolescents have not developed reading proficiency this literature review examined key theories of reading acquisition. Literature relating to the critical question of how fast, accurate and efficient word recognition is developed in beginning readers was examined, and the debate about how best to teach beginning readers was briefly analysed to clarify the perspective adopted in the present study. The following sections deal with literature relating to the components of secondary students' reading skills and adolescent word level interventions. In the final section research inquiring into teacher knowledge is reviewed. The theoretical framework which underpins this study, and which might help to clarify thinking about the nature of reading and how to address reading difficulties, is the Simple View of Reading proposed by Gough and Tunmer (1986).

The Simple View of Reading

The Simple View of Reading (SVR) has been described as "a brief, abstract account of elaborate and complex phenomena" (Kirby & Savage, 2008, p. 75). In this framework reading is pared down to three elements where $R = D \times C$ (Gough & Tunmer, 1986). In the equation reading comprehension (R), or accurate independent reading for meaning, is the product of decoding (D) and language comprehension (C). Decoding, in this definition of reading, is not the rudimentary 'sounding out of words' that is slow and laboured; what is meant here is automatic sight word recognition which develops after several successful decoding attempts. As part of this process orthographic memories are built up of words and letter clusters so that, immediately when a familiar word is read, its meaning and phonological qualities are accessed (Ehri & McCormick, 1998; Neuhaus, Roldan, Boulware-Gooden, & Swank, 2006). Thus,

while decoding alone is not sufficient, it is a necessary component of reading. Some children have efficient word recognition skills but are poor at understanding text (Oakhill, Cain, & Yuill, 1998; Tunmer & Greaney, 2010), which suggests that these children are experiencing some difficulties with language comprehension.

Language comprehension, the 'C' in the equation, is the other necessary component of reading in the SVR. One should not expect a person to be able to read and understand something if that person would not understand the text if it was read aloud to them. Language comprehension involves vocabulary knowledge and the syntactical understanding of sentences and extended discourse. Language comprehension and decoding skills are dependent on other foundation cognitive components which enable the acquisition of reading and writing skills such as understanding of the alphabetic principle, knowledge of the alphabet as well as vocabulary, and syntactical knowledge (Bruning, Schraw, Norby, & Ronning, 2004; Wren, 2000).

Most reading interventions in secondary schools are concerned with reading comprehension strategy instruction, which is linked to the language comprehension side of the SVR, rather than word level skill development which is concerned with the decoding element of the SVR (Shankweiler et al., 1996). Reviews of adolescent literacy interventions report findings from far fewer word study interventions than strategy instruction or other reading comprehension interventions (Phelps, 2005; Scammacca et al., 2007; Snow & Biancarosa, 2003). Few reviews mention interventions which focus on spelling. Joshi and Aaron (2005) comment on the dearth of spelling research: " Even though good spelling is a prerequisite for being a literate person, it has not received as much attention as reading, both in terms of research studies and instructional recommendations that follow from research findings" (p. 1). It may be that some of the adolescents who are not reading well do not have good mechanical reading skills and may need to improve their skills at reading and spelling unfamiliar words. To understand why some adolescents may have not developed efficient word recognition or decoding skills several key theories of reading acquisition are evaluated.

Theories of Reading Development

To develop fluent reading all beginning readers must master the code, with the importance of learning to recognise words quickly and accurately for skilled reading well established (Arrow & Tunmer, 2012; Perfetti, Landi, & Oakhill, 2005; Pressley, 2000; Stanovich, 1986; Tunmer & Nicholson, 2011). However, there are a range of different theories of reading development. Many of the points of difference revolve around the relative emphasis placed on the explicit teaching and learning of the alphabetic principle (Byrne, 2005; Ehri & McCormick, 1998; Ehri & Snowling, 2004; Share, 1995). Two theories that have been the subject of significant research in the field of literacy acquisition are phase models and item-based models of reading development. Phase models focus on the growth of children's word recognition skills as a result of instruction as well as exposure to text whilst item-based theories explain the growth of children's reading skills as a function of exposure to more and more text.

Phase models of reading development. Understanding the phases of reading development, although usually applied to beginning readers, may help to explain where some secondary students who are struggling with literacy have become stuck. An influential phase theory of reading acquisition has been developed by Ehri and colleagues (Ehri, 1991, 2005a, 2005b; Ehri & McCormick, 1998; Ehri & Snowling, 2004). Ehri explained how efficient reading skills develop and she is keen to emphasise that rote memorisation plays no part in efficient word recognition which develops as a reader makes active associations between graphemes and phonemes (Beech, 2005). In spite of inconsistent phoneme and grapheme correspondences in English, words are almost always spelled the same way which makes them 'reliable' for processing and, in addition, words activate meanings so words are the basic units that readers' eyes process to make meaning from print. Research shows that skilled readers move their eyes over almost every word in a text (Ehri, 2005b; Rayner, Foorman, Perfetti, Pesetsky, & Seidenberg, 2001).

Word recognition of novel words develops after several successful decoding attempts and becomes automatic and rapid. Accurate and rapid word recognition frees up cognitive processing capacity allowing the reader to focus on the meaning of words and sentences (Perfetti, 1985). Thus, understanding how sight word reading evolves is critical for understanding reading development. Ehri (1991) describes three different ways to read novel words: decoding, or sounding out and blending phonemes, blending chunks like syllables; analogizing, for example knowing how to read *fountain* helps us read *mountain*; and prediction from context and letter clues. The fourth way to read words involves memory or sight which only applies to words which have been stored in memory.

The four phases of reading acquisition hypothesized by Ehri and colleagues (Ehri, 2005b; Ehri & McCormick, 1998; Ehri & Snowling, 2004) are not stages, which pre-suppose that one stage must be reached before you pass to the next stage. Phases may overlap and the word suggests that there are not rigid boundaries between phases. Moving from one phase to another is dependent on the acquisition of more knowledge. Phases are named to reflect the type of alphabetic knowledge used in each phase. In the pre-alphabetic phase the 'reader' uses the shape of the letters such as the M in the McDonalds' arches or the double /oo/ resembling eyes to 'read' the word *look*. Letter-sound knowledge and some phonemic awareness are needed to reach the next partial alphabetic phase. In this phase a child might read *house* for *home* using the first letter of the word and picture clues. Once the beginning reader can focus on all the letters of the word and begins to write words he or she will move to the full alphabetic stage, at which point unfamiliar words can be decoded with increased accuracy. Ehri stressed that spelling supports the reading acquisition process. Early on in this phase reading is slow and laborious because graphemes must be associated with phonemes and blended to form words so that a mental image of the word and its meaning is stored in memory. However, once sight word vocabulary increases, fluency increases.

When the full alphabetic stage has become strongly embedded, so that more and more sight words are stored in memory, a reader will achieve the consolidated

phase. At this phase, sometimes called the orthographic phase, reading involves recognizing chunks of words and letter patterns so word recognition is even faster than reading at the full alphabetic phase. Readers at the consolidated phase read most words automatically so they are able to focus most of their attention on the meaning of the text that they are reading. Deliberate decoding, analogizing and predicting take up mental capacity and reduce the reader's ability to focus on comprehension of text (Perfetti, 1985). Some poor adolescent readers do not move beyond the partial alphabetic stage and have difficulty decoding unfamiliar words and polysyllabic words (Ehri & Saltmarsh, 1995).

When words are read automatically they are not consciously sounded out but are rapidly identified. Once automaticity has been achieved it is hard to suppress it. In Stroop tests (which have the wrong words printed under pictures of objects) for example, even young readers tend to read the word instead of naming the picture, as they were instructed to do (Guttentag & Haith, 1978). Skilled readers read familiar words much more quickly than unfamiliar words (Ehri, 2005b). The faster reading of familiar words, when compared with the reading of pseudowords of a similar length, indicates that these words are processed as whole words. Decoding, analogizing, and prediction all take conscious effort, which disrupts comprehension at least temporarily, so building a sight vocabulary is essential for efficient text reading (Ehri, 2005b). In this view of reading development sight word learning is achieved through the process of making connections between the spelling of a word, its pronunciation and its meaning (Ehri & McCormick, 1998; Share, 1995). These connections are formed through knowledge of the grapheme-phoneme connections, the alphabetic principle, and phonemic awareness which is the ability to separate sounds in words. Beginning readers make links between the spelling of a written word, the way it is pronounced and its meaning. After several successful decoding attempts the word often becomes established in memory allowing immediate recognition (Ehri, 2005a). This process depends on knowledge of the alphabetic system which needs to be taught explicitly or deduced.

Item-based theories of reading development. In item-based theories of reading acquisition children learn to read novel words by using knowledge of grapheme-phoneme relationships that are stored in memory. Thompson and colleagues (McKay, Fletcher-Flinn, & Thompson, 2004; Thompson, 1999; Thompson, Cottrell, & Fletcher-Flinn, 1996) argue for a much greater role for deducing grapheme phoneme connections than is described in Ehri's phase model of reading acquisition with its focus on deliberate decoding to cement grapheme-phoneme associations (Ehri, 2005a; Ehri & McCormick, 1998). Thompson (1999) describes four 'sources of knowledge' that readers can use to read unfamiliar words. The first source is sub-lexical connections which are induced from the common orthographic and phonological components of words with similar letters such as *pig* and *pot*. Thompson and colleagues call this process lexicalised phonological recoding. Some words would have to be already known to a beginning reader before such inductions could be made.

Evidence that children are able to use their existing knowledge of sound-letter associations to deduce untaught associations was discussed in a study examining the links between learning to spell and learning to read. Beginning readers who had not been taught the /th/ digraph were able to decode this pattern in unfamiliar words, and they were able to read pseudowords with the letter /b/ and digraph /th/ in final positions even though these letters are infrequently found in the final position in words encountered in beginning reading material (Fletcher-Flinn, Shankweiler, & Frost, 2004). In contrast to these findings which related to children taught with a strong phonics approach, New Zealand students taught with little explicit sound-letter instruction were less skilled at reading the /th/ and /b/ letters in final positions because they had been exposed to few words with these phonemes in final positions in their reading books (Thompson et al., 1996). This finding seems to suggest that phonics instruction supports beginning readers to identify graphemes in unfamiliar words better than exposure to the graphemes without explicit instruction.

Other sources of knowledge described by Thompson and colleagues include independent grapheme-phoneme correspondences which have been explicitly taught,

analogy clues and the context of the stimulus words. This model of acquisition is not dependent on phases and all four sources of knowledge will continue to be used as readers encounter unfamiliar words. It is an item-based theory so learning is driven by grapheme-phoneme relationships that are stored in memory. The ease with which beginning readers are able to make use of lexicalised phonological recoding will vary and children with the most developed emergent literacy skills are more likely to take advantage of this process with little instruction from teachers. However, Tunmer and colleagues (Arrow & Tunmer, 2012; Tunmer & Nicholson, 2011) argue that some children will be less likely to have the pre-requisite level of phonological awareness and understanding of the alphabetic principle needed to independently induce many sound-letter connections and will need more explicit instruction before they reach a stage when they can exploit lexicalised phonological recoding.

A challenge to the role that sub-lexical connections play in Thompson and colleagues' theory of sources of knowledge is suggested by research reported by Byrne (1998). Byrne described a series of experiments which show that it is not easy to induce the alphabetic principle by experience and that if phonemic awareness and alphabet names and sounds are explicitly taught to young children they are likely to have much greater success than those who do not have such understanding. Many at-risk students can be taught this foundational literacy knowledge but some do not grasp the information even with quite intense training. In another set of experiments, adults found it difficult to deduce implicit information when they were learning an invented orthography (Byrne, 1998). Byrne's research suggests that it may be more difficult, at least for some learners, to work out the alphabetic principle than Thompson and colleagues appear to assume.

Thompson's argument that once beginning readers have some words in their sight memory bank they can then independently work out the pronunciations and meanings of unfamiliar words, has some similarities with Share's (1995) theory of self-teaching. However, Share does emphasize the need for prior knowledge of letters and phonological awareness which are not considered important to Thompson and

colleagues. Share defines decoding as 'phonological recoding' which emphasises the links made between graphemes and phonemes. Share sees this skill as the most important aspect of self-teaching because each time an unfamiliar word is successfully decoded an opportunity is presented for the reader to absorb the orthographic information, information that is specific to that particular word, into memory. This process of successful decoding is how a sight word vocabulary grows. Share's theory of self-teaching is also item-based, so exposure to appropriately challenging print is a significant factor in the variability of children's reading skills. High frequency words are acquired first and low frequency novel words may need to be decoded several times before they are included in the reader's memory for sight words or mental lexicon. Over time the process will become more complex, with orthographic and syllabic chunks of familiar letter clusters being processed rather than simple letter to sound connections.

One difference between Share's and Ehri's description of reading development is that Share's focus on self-teaching is item-based, dependent on increasing exposure to more and more text, but Ehri's phase-based theory explains reading development as a progression from partial use of alphabetic cues to the consolidated alphabetic phase which encompasses skilled adult reading. Ehri places more emphasis than Share, and Thompson and colleagues, on developing students' phonemic awareness and systematic phonics teaching that is needed to help students move from one phase to another, especially for readers who are experiencing difficulties (Ehri & Snowling, 2004).

Other factors influencing reading acquisition. Oral language skills influence reading acquisition. Ehri's phase theory does not examine the role of the readers' oral language development and vocabulary knowledge in the growth of sight word reading skills. However, Ehri and Snowling (2004) suggest that it is probable that children with Specific Language Impairment or low vocabulary levels may be unable to take advantage of the phonological recoding process which is the core of Share's (1995) self-teaching theory and Thompson and colleagues' lexicalised phonological recoding

process which readers use to induce grapheme-phoneme connections. Tunmer and Greaney (2010) explain how a poorly developed vocabulary might impede a reader's attempt to assign meaning to an unfamiliar printed word, particularly if the word has only been partially decoded or has an irregular spelling. Successful word recognition, which involves assigning meaning to the decoded word, is critical for the item-based reading development described by Share as well as Thompson and colleagues.

Although the role of vocabulary knowledge has long been recognised as important for reading comprehension (Beck, Perfetti, & Mckeown, 1982; Cunningham & Stanovich, 1997; Davis, 1968; Sternberg & Powell, 1983), its role in the development of word recognition is the subject of more recent attention. An exploration of the links between decoding, visual word reading (which involves reading of isolated irregular words), vocabulary breadth, vocabulary depth and reading comprehension of typically developing readers aged between 9 years and 5 months and 10 years and 5 months showed that vocabulary contributed to variance in decoding, visual word reading and reading comprehension (Ouellette, 2006). Ouellette made a distinction between vocabulary breadth, which is defined as the size of a person's mental lexicon or stored vocabulary, and vocabulary depth, which is the degree of understanding of the meaning of words. He found that receptive vocabulary breadth was important for decoding, expressive vocabulary breadth contributed to visual word recognition and reading comprehension whilst vocabulary depth made a significant contribution to variance in reading comprehension. Other studies which have explored the role of vocabulary in word recognition have not made a distinction between breadth and depth of vocabulary but have found that vocabulary generally contributes to the development of word recognition (Bowey & Rutherford, 2007; Ricketts, Nation, & Bishop, 2007).

The role of vocabulary knowledge is significant in the development of a 'set for variability'. Set for variability describes the disposition in readers to accept that there are a number of ways to pronounce graphemes and that there are inconsistencies and variety in the ways that some phonemes are written. Beginning readers who have

grasped this concept, learn to apply this acceptance of variability to their attempts to read unfamiliar words which may have irregular spelling rendering them difficult to decode (Venezky, 1999). An example of a partial decoding attempt influenced by set for variability is the word *stomach* initially pronounced *stow match* and then, after an examination of the context of the word in the sentence “The ball hit the boy in the _____”, corrected to *stomach* (Tunmer & Chapman, 2012a).

Set for variability plays an important part in the implicit learning described by Share (1995) and Thompson and colleagues (Fletcher-Flinn et al., 2004; Thompson et al., 1996; Thompson, Fletcher-Flinn, & Cottrell, 1999). Vocabulary knowledge has a particularly powerful role in supporting beginning readers with a firm understanding of the alphabetic principle, phonemic awareness, and comprehensive letter-sound knowledge, to identify irregular words. The ability to partially decode irregularly spelled words will usually enable beginning readers to work out the pronunciation of the word if that word is part of their lexicon. Several successful decoding events with the unfamiliar word enables the reader to add the word to their bank of sight words stored in memory which will facilitate rapid and automatic decoding (Tunmer & Chapman, 2012a). This process of enrichment will not occur as frequently for beginning readers who have access to fewer words in their mental lexicon and will contribute to the slower development or arrested development of fast and accurate word recognition that is one of the features of skilled reading (Perfetti et al., 2005).

The role of vocabulary knowledge in the development of word recognition skills, and the influence of set for variability in this process, was examined in a longitudinal study into the literacy skills of beginning readers (Tunmer & Chapman, 2012a). To measure set for variability children were asked to determine the correct pronunciation of irregularly spelled words which were presented in a phonetically mispronounced format. They found that there was a positive relationship between set for variability and word recognition skills after children had been at school for one year. In addition, set for variability was found to influence reading comprehension

through decoding and word recognition. Phonemic awareness and vocabulary knowledge both contributed to variance in the use of set for variability.

Beginning readers' emergent literacy skills, or 'literate cultural capital', (Tunmer, Chapman, & Prochnow, 2006) influence reading acquisition. Literate cultural capital includes knowledge of conventions of print, oral language, vocabulary, familiarity with story conventions and phonemic awareness. In a longitudinal study which examined the role of school entry variables in reading variance seven years after the participants had started school, Tunmer, Chapman and Prochnow (2006) found that children from lower socio-economic backgrounds had considerably less literate capital than children from high income backgrounds and that literate capital at school entry accounted for 50% of the variance in reading skill in year 7. This research was undertaken in schools which used the whole language reading approach to instruction, which is item-based with little explicit instruction to teach the sound and letter associations.

One important aspect of any reading theory is how theorists explain the development of word recognition in beginning readers. Ehri's phase based theory emphasises that a reader develops an orthographic memory of a word by actively linking the graphemes in a word with the phonemes they represent along with the meaning of the word. Item-based theories such as Share's self-teaching and Thompson's lexicalised phonological recoding rely on exposure to text and may be less effective for beginning readers with poorly developed vocabularies and weak emergent literacy skills. Vocabulary knowledge and set for variability contribute to the development of fluent reading. It is likely that some adolescents with weak reading comprehension skills have not developed fast and efficient word recognition when they were learning to read.

Word level skills and reading comprehension. The goal of reading is to understand the text. For effective comprehension a range of factors relating to the understanding of a text need to be integrated into reader's background knowledge in order for the reader to get a mental model of the situation that is described in the text.

Readers need to engage in problem solving and the use of strategies to develop a deeper understanding of a text (Kintsch, 2005). Obstacles for adolescent readers may include deficits in language knowledge or deficits from lack of experience, they may be English Language Learners, they may have developmental impairments, lack of background knowledge, or a lack of efficient strategies for relating the text to one's background knowledge and experience (Hock et al., 2009).

One other component of proficient reading comprehension is accurate word recognition (Perfetti et al., 2005). Word recognition, or automatic and rapid decoding, is a complex process in which awareness of phonology, orthography and semantics all play a part. Many beginning readers who struggle to become efficient decoders have issues with poor phonemic awareness and often use other sources of information to identify words, such as a reliance on the context or illustrations (Share & Stanovich, 1995; Stanovich, 1986). Unless beginning readers' decoding difficulties are addressed in some way, it is likely that some poor adolescent readers will continue to have poor decoding skills. Children with poor decoding skills, which make reading effortful and unsatisfying, are likely to read less than their more able peers. One consequence of reading less is an impact on the development of vocabulary and conceptual knowledge, with the gap in verbal skills between good readers and poor readers widening over time (McGuinness, 2005; Stanovich, 1986).

Summary of theories of reading development. The theories of reading development that underpin this study are best understood when reading development is considered as occurring on a continuum. A beginning reader with no alphabetic knowledge will likely be in the pre-alphabetic phase and will recognise words because of their shape or some other association. A skilled reader will have reached the consolidated phase and will have a large bank of words, syllable chunks and orthographic patterns to apply to decoding any unfamiliar words that are encountered. The level of explicit instruction in sound-letter associations, phonemic awareness and phonic rules that a beginning reader will need will depend on the reader's literate cultural capital (Tunmer et al., 2006; Tunmer & Nicholson, 2011). Literate cultural

capital includes knowledge of conventions of print, oral language, vocabulary, familiarity with story conventions and phonemic awareness. Set for variability is another important dimension of early reading skill. Children with lower levels of literate capital will need targeted explicit instruction because they are unlikely to be able to deduce the alphabetic principle independently and will be seriously disadvantaged in comparison with beginning readers who have high levels of literate capital (Byrne, 2005; Tunmer et al., 2006). Reading development is dependent on a foundation level of skills and reading exposure so reading skill develops with age in typically developing readers, with beginning readers starting at different points on the continuum determined by their prior knowledge and experiences.

Early individual reading differences in beginning readers may become more marked over time unless struggling readers receive targeted appropriate instruction. There are a significant number of adolescent readers who, for a range of reasons, have not developed efficient comprehension skills. Some adolescent readers who have weak comprehension skills are likely to have been caught in the downward spiral of worsening reading skills that has been called the Matthew Effect (Stanovich, 1986). It seems evident that a robust understanding of the alphabetic principle is essential for the development of strong decoding skills, which in turn lead to the development of an extensive sight word vocabulary and fast automatic word recognition. If decoding is effortful and frequently unsuccessful a beginning reader will not be motivated to continue to practice reading. Although word level skills are not the only factors in reading comprehension variability they should not be ignored. As Perfetti et al. (2005) argued: "word level processing is never the whole story in comprehension. However it is a baseline against which to assess the role of the higher level processes such as comprehension monitoring and inference making" (p.242).

Several studies of adolescent readers have examined the word level processing skills of students with weak comprehension skills, although an assumption is often made that by the time adolescents reach secondary school they will have mastered the decoding aspects of reading (Schoenberg et al., 1999; Shankweiler et al., 1996). Despite

this assumption, evidence that a poor understanding of the code might still be a factor in poor adolescent reading and writing achievement is present in the literature (Brasseur-Hock, Hock, Kieffer, Biancarosa, & Deshler, 2011; Cirino et al., 2013; Hock et al., 2009; Myers & Botting, 2008; Shankweiler et al., 1996). Several international studies will be examined in some detail in the next section of this review to show that it is probable that some students with poor literacy skills have an imperfect understanding of the code which manifests itself in poor decoding of unfamiliar words and poor spelling. In addition to spelling and decoding skills, vocabulary knowledge and skill at working out meanings of unfamiliar words are word level skills, albeit on the language side of the equation that underpins the Simple View of Reading. All adolescent readers benefit from becoming more efficient at working out what new words mean, so this review will explore the research around the importance of vocabulary knowledge and effective vocabulary teaching for skilled reading.

Adolescent Word Level Reading Skills

In this section of the chapter the literature relating to adolescents' word level literacy skills is examined. Word level literacy skills include decoding, spelling and vocabulary knowledge. Few studies focus on one word level skill exclusively so the findings relating to word level skills will be analysed in the context of other more global literacy skills such as fluency and comprehension.

Decoding skills in adolescents and older readers. Skilled readers are characterised by their ability to read fluently, and effortlessly, and by their ability to make sense of what they are reading. Decoding skills explain variations in fluency, spelling and reading comprehension in older students (Barth, Catts, & Anthony, 2009; Bell & Perfetti, 1994; Lundquist, 2003). Barth, Catts and Anthony (2009) investigated the contribution that naming speed, decoding and the ability to process meaning made to the fluency of 527 eighth grade, 13 year-old readers. They found that the ability to decode novel words in the form of pseudowords (invented words) made a large contribution to fluency, second only to the ability to retrieve phonological information

rapidly from long term memory. This retrieval is measured using Rapid Automatic Naming (RAN), which is the rate at which participants could name letters and colours. It is not clear why RAN makes such a significant contribution to adolescent reading fluency; it may be because it measures the rate at which orthographic information can be retrieved or because it is a measure of the rate of processing of non-linguistic or linguistic information (Barth et al., 2009).

The influence of decoding on reading comprehension in university students was examined in two studies. When skilled adult university students were divided into groups of relatively poor decoders and better decoders Lundquist (2003) found that decoding differences did not influence reading comprehension but reading rate was slower and spelling was less accurate in the group of relatively poor decoders. In a small sample of 29 university students Bell and Perfetti (1994) divided participants into three groups. The students were compared on several measures including information processing, language comprehension, decoding and spelling. The high group were skilled readers who performed well on all achievement tests, one low group had poor achievement on quantitative and verbal tests and the other low group had good quantitative skills but poor reading skills. They found that decoding skill remained a significant source of variation in reading comprehension skills in older readers. The students in their low groups exhibited difficulty decoding less familiar words, particularly if they were long.

In another study with a sample of 44 participants, aged between 16 and 24, deliberately drawn from groups of people who had struggled with literacy at primary and secondary school, assessment on a battery of tests showed that decoding skills were an important component of reading comprehension (Braze, Tabor, Shankweiler, & Mencl, 2007). These findings suggest that decoding of long unfamiliar words and spelling accurately, and, in some cases, comprehension, is likely to be problematic for some adolescent readers and even some university students.

Other studies examining the reading profiles of poor adolescent readers have found that poor decoding and spelling skills contribute to poor comprehension for

some of these students. Several studies challenge the assumption that only small numbers of adolescent reading failures can be attributed to poor decoding and spelling skills (Brasseur-Hock et al., 2011; Cirino et al., 2013; Hock et al., 2009; Shankweiler et al., 1996). Shankweiler and colleagues (1996) assessed the decoding and spelling skills of adolescents of average ability and below average ability in two related studies reported in the same article. They examined students' knowledge of how spelling patterns (orthography) represent sounds of words, or phonology, as this knowledge is essential for reading and spelling. In addition, they looked at students' morphological knowledge for links between words such as *heal* and *healthy*, *deep* and *depth*, *joy* and *enjoyment*, *glory* and *glorious* and *magic* and *magician* needed to aid accurate spelling.

Evidence that spelling and decoding weaknesses may be more prevalent than expected in 'normal' adolescent populations, was provided in two related studies of Shankweiler and colleagues (1996). The first study included groups of students from high schools in Connecticut. The first group consisted of 30 students in ninth grade, aged 15 years on average, in a demographically typical urban secondary school. The second group consisted of 35 ninth and tenth grade students from a private boarding school for students with learning disabilities (LD) but with at least average intelligence scores on IQ tests. The students were tested on measures of reading, spelling and component language skills including a test of morphological awareness, phoneme deletion, decoding of nonwords and orthographically regular words. The results for the LD students and the high school students were compared and, except for regular word reading, the LD group performed at significantly lower levels than the high school students, although scores from both groups overlapped considerably. Weaknesses in basic decoding and spelling skills for the learning disabled students were expected, but there was a large number of students from the high school group whose basic skills were unexpectedly poor. When the two groups' results were combined for analysis it was found that 53% of words of moderate difficulty were incorrectly spelled and both groups showed difficulties with phoneme deletion and nonword decoding. This study showed that large individual differences in spelling and decoding persist in secondary students.

In the second study Shankweiler and colleagues (1996) examined the links between the ability to decode isolated words, spelling ability and reading comprehension. A group of 86 students, aged 15 years and two months on average, from the same high school that participated in the study described above, were selected from seven ninth grade classrooms to provide a larger sample with a wider range of abilities. Measures of comprehension, decoding, vocabulary and spelling were administered as well as a magazine title recognition test as a test of print exposure. All correlations between the measures were significant. Vocabulary had the highest correlation with reading comprehension, followed by decoding and the spelling measures. In a regression analysis magazine recognition contributed most variance to reading comprehension, decoding was responsible for 10% of variance and spelling was responsible for a small but unique contribution of 6.9%. However, they did not include vocabulary knowledge in the regression analysis. This study demonstrates that word level skills remain a source of difference in reading comprehension ability in adolescents.

In a recent, much larger study, Hock et al. (2009) explored the component literacy skills of urban secondary students who were struggling readers. In this study the differences between struggling adolescent readers and proficient adolescent readers' word level skills, fluency, vocabulary and reading comprehension were examined. The study involved 345 late eighth grade and early ninth grade students. Using the standardised scores of the state reading assessment, the students were divided into two groups. The first group consisted of 202 'struggling' students who scored below the 40th percentile and the second group involved 143 'proficient' students who scored above the 40th percentile. Two measures each of word identification, fluency, vocabulary and comprehension were used to assess students individually. Word identification was assessed by one measure of nonword reading and one measure of isolated real word reading of lists of words with increasing complexity. Fluency, which is defined as the ability to read words in isolation and in context very quickly (Barth et al., 2009), was assessed by measuring the rate of accurate reading of isolated words in two lists and of a passage of connected text. A composite

score for each of the four components of reading was calculated. Of the struggling readers, 61% or 123 students scored low on every component. An additional 12 struggling students and 19 proficient students, 9% of the sample, had low word level skills. After comprehension, fluency was the component in which the most students scored below the mean standard score. The findings of Hock et al. (2009) challenge the commonly quoted figure of 9% of adolescents struggling with word level skills in reports on adolescent literacy (Berman & Biancarosa, 2005; Biancarosa & Snow, 2004) and suggests that the issue may be more widespread than is suspected. This study demonstrates that poor word level skills are a factor in poor adolescent literacy achievement.

In a further analysis of the data collected by Hock and colleagues (2009) Brasseur-Hock, Hock, Kieffer, Biancarosa and Deshler (2011) found five distinctly different profiles for struggling adolescent readers. The distinct groups were clustered around different achievement levels in a range of component skills that influence reading comprehension, namely decoding, fluency and language comprehension. One group had severe global deficiencies on all measures. Another group had deficiencies on all measures but their difficulties were not as severe as the first group. A third group had poor fluency, whilst the fourth group had poor language comprehension and the last group were strong in all measures except reading comprehension. This last group read fast and it was hypothesized that the speed at which they read might be affecting their ability to think carefully about what they were reading. Another hypothesis was that they were disengaged. This study further demonstrates that adolescent reading failures has no single cause, and that it is important to find out which components of reading may need to be the focus when designing interventions for adolescents.

A study investigating the diversity of reading skills in a population of 1,785 urban middle school students from Grades 6 to 8 found 1,025 students who had not met the criteria for proficiency on the state reading skills test. This group was labelled as 'struggling' (Cirino et al., 2013). Few of this group, (e.g., 12%), had difficulties with

comprehension alone. Most of the struggling readers had difficulties with more than one component of reading, 47% with decoding and 46% with fluency whilst 78% had difficulty with the timed reading comprehension factor which assessed a combination of the two skills, comprehension and fluency. This study adds to the evidence, already cited, which suggests that many adolescents who are struggling with poor comprehension have difficulties with word level skills and/or fluency and that this diversity needs to be considered when adolescents with reading difficulties are being assessed.

Similar findings have been reported in the United Kingdom. In a relatively small study focusing on the language and decoding skills of 11 year old students in an inner city mainstream secondary school in London, Myers and Botting (2008) found that out of the 36 participants from the general school population, 21 had low language proficiency, particularly evidenced by difficulties with spoken language. These 21 students had poor comprehension skills, and almost half of the students with comprehension issues had decoding difficulties manifested by an inability to read single words out of context.

Although research examining decoding skills in adolescent readers is not plentiful, there are common findings across those studies that have been carried out. These studies establish that poor decoding is a factor contributing to poor literacy skills in some, mostly urban, adolescent populations, often with high numbers of students from low socio-economic backgrounds. No studies of New Zealand adolescents' decoding or spelling skills were located.

The role of spelling in the development of literacy skills. The literature relating to spelling is discussed separately from the decoding literature in order to emphasise the role of spelling in the development of literacy skills. Various terms to describe spelling and the development of spelling skills are used in the research which can be confusing because of a lack of consistency (Apel, 2011). In this study the terms orthography and spelling are used interchangeably, however more specific aspects of terminology make use of Apel's (2011) definitions. The term, mental grapheme

representation or MGR, is used to describe the stored images of the graphemes and associated phonemes of a specific word. The term orthographic pattern knowledge refers to knowledge of the alphabetic principle, how long vowels and other phonemes requiring more than one grapheme are written, the legal combinations of letters and positions of letters in words. The term orthographic processing describes the ability to both store and use MGRs for spelling correctly and to aid decoding as well as the use of orthographic pattern knowledge to spell and decode novel words.

The contribution of spelling knowledge to the development of literacy skills is not confined to its role in writing composition; spelling contributes to the development of reading skills. Spelling and decoding are inversely related but not identical (Ehri, 2000). There are many competent readers who are able to decode words which they cannot spell correctly (Davis & Bryant, 2006). However, a reciprocal relationship exists between word recognition and spelling in which efficient decoding contributes to orthographic knowledge and improving spelling knowledge can improve decoding (Berninger, Abbott, Abbott, Graham, & Richards, 2002; Dennis & Kroeger, 2012). In a seminal study exploring the differences between good spellers and good readers, poor spellers and good readers and children who spell and read poorly, Frith (1980) argued that unexpectedly poor spellers probably use partial cues for reading. Whilst this process can lead to efficient reading it is not helpful for spelling because of a reduced opportunity to acquire knowledge about the sequence of letters in words or the orthographic chunks. Another finding by Frith (1980) was that the 'good' readers who were poor spellers had difficulty reading accurately when reading aloud and struggled when reading pseudowords.

Frith's findings are challenged by Carver (2009) who re-examined her data relating to good readers and poor spellers. Carver found that the 'good' readers in two of Frith's groups, who were supposed to be equally proficient with regards to reading, were not in fact equal. The 'good' readers in the poor spelling group were not as proficient as the 'good' readers in the 'good' spelling group. A similar difference between the poor spellers in two groups was found, which invalidated the description

of the group as 'good' readers and 'poor' spellers. However, support for Frith's detection of a group of people who are 'good' readers but 'poor' spellers comes from a study of 194 university students who were assessed on a battery of literacy tests, none of whom had been selected for participation because of poor reading scores (Jackson & Doellinger, 2002). Poor performance on three pseudoword reading tests revealed a group of 19 students who had poor decoding skills. Of these six had reading comprehension skills as good as, or better than, the sample population. These six students, who were described as 'resilient readers', had extremely weak spelling skills, could not read pseudowords well and were slow at processing text, but had good phonemic awareness.

Although most research attention has been focused on examining the relationship between spelling and reading in beginning readers (Davis & Bryant, 2006; Ehri & Wilce, 1987) research into the role of orthography in the development of adolescent reading skills has been undertaken (Bhattacharya & Ehri, 2004; Conlon, Zimmer-Gemell, Creed, & Tucker, 2006; Dennis & Kroeger, 2012; Maughan et al., 2009; Shankweiler et al., 1996). In addition, it appears that attention to spelling can contribute to learning vocabulary (Ehri & Rosenthal, 2007).

Studies which examine the role of spelling in the development of adolescent literacy skills have used participants that are either from a typical population or from groups of students who have been identified as being poor readers, or both. The two studies described by Shankweiler et al. (1996), with high school students, found that there was a high degree of spelling difficulty in the sample of students that included students with learning disabilities and average ability. They found a correlation of .70, between the ability to read pseudowords and spelling which they explained as expected, because pseudoword reading and spelling are measures of overlapping skills. Conlon and colleagues (2006) examined the contribution that family literacy history played in the development of literacy skills of 190 Grade 7 students aged between 11 and 13 in Australia. These students were not selected for any particular characteristics but were part of the general population of Grade 7 students from two

primary schools in the state of Queensland. Findings related to word level skills were that phonological processing skills made a significant contribution to word recognition, spelling and reading comprehension, but that orthographic processing skills accounted for even more variance in spelling and reading comprehension outcomes. These findings support the argument that phonological awareness becomes less important in proficient, older readers than it is for beginning readers and that orthographic skills become relatively more important for older readers. Poor adolescent readers are usually weak in both phonological processing and orthographic processing (Bowey & Rutherford, 2007) .

In order to investigate the links between reading comprehension and orthographic knowledge in poor adolescent readers, Dennis and Kroeger (2012) selected participants who had scored below proficiency levels in their state reading assessments. They examined the extent to which orthographic knowledge would impact on lower order skills like decoding and spelling, as well as higher order skills such as reading comprehension. The 94 participants from Grades 6, 7 and 8, were not typical of the general school population demographically because there were fewer white students, more black and Hispanic students and more students who were English Language Learners in the sample than in the school population. Participants were assessed on a number of measures of lower order and higher order skills including word identification, decoding, phonological processing, orthographic processing, spelling and reading comprehension. Developmental stages described by Bear, Invernizzi, Templeton and Johnston (2012) were used to categorize the participants' spelling levels. All of the participants were spelling at the Emergent, Letter-Name Alphabetic or Within Word Pattern stage, which are the lowest stages of spelling skill. It is likely that the participants had not reached levels of spelling proficiency to demonstrate that orthographic knowledge can significantly contribute to reading comprehension outcomes, so more research with typically developing adolescent readers with more advanced spelling skills would be useful. The study did show that orthographic knowledge "informs and is informed by decoding and related skills" (Dennis & Kroeger, 2012, p. 373).

Poor readers will almost inevitably continue to experience spelling difficulties throughout their lives. In a longitudinal study, participants who had been identified as poor spellers at the age of 14 or 15 were contacted about 30 years later and were reassessed and interviewed about their educational qualifications and about literacy problems they experienced in their daily lives (Maughan et al., 2009). For almost all of these poor readers, spelling difficulties had persisted into adulthood and poor literacy skills had limited many participants' career choices. In a study of students who had been identified with specific language impairments at the age of eight, poor spelling contributed to poor writing skills when they were assessed later at the age of 16 (Dockrell, Lindsay, & Connelly, 2009). Tsismeli and Seymour (2006) found that dyslexic students aged 13 who were matched with two other groups of students by age and by reading ability, had a profound spelling impairment in comparison with the control groups. This evidence suggests that it is likely that a proportion of poor adolescent readers will have spelling difficulties that persist throughout their lives. It is probable that poor readers will not make progress with spelling unless they participate in targeted interventions that focus on improving spelling skills.

Spelling has not only been found to be reciprocally related to the development of decoding skills but has been shown to support vocabulary acquisition. Ehri and Rosenthal (2007), using a sample of students from fifth grade, found that directing students to focus on the spelling of new vocabulary words to be learned improved their memory of the meanings and pronunciations of the new vocabulary. It is likely that the process of noticing the spelling of words would activate connections in the brain between semantic and phonological processors to create a specific mental grapheme representation for each new word. This effect was more pronounced for good readers than for poor readers and it was suggested that the superior mental orthographic representations of known words in good readers' memories enabled them to more easily acquire new words.

The research into the role of spelling in reading development has shown that spelling is not only a component of writing. A focus on spelling, which leads to an

increase in grapheme-phoneme correspondences being stored in memory, supports readers to become more familiar with orthographic patterns. This increase in familiarity with orthographic patterns contributes to the decoding of unfamiliar words and strengthens orthographic representations of words in memory. Additionally, it contributes to vocabulary learning. Vocabulary development in adolescents, including the role of morphological awareness in literacy development, is discussed in the next section of this review of literature.

Vocabulary, morphological awareness, and reading comprehension.

Vocabulary knowledge is an important element of word level literacy skill. The link between understanding vocabulary and reading comprehension is firmly established in the research literature (Braze et al., 2007; Cain, Oakhill, & Bryant, 2004; Ricketts et al., 2007). Generally it is agreed that proficient readers increase their knowledge of vocabulary through wide reading (Nagy & Anderson, 1984; Stanovich, 1986) but, two different types of vocabulary acquisition instruction are suggested for less proficient readers. One method includes the morphological awareness aspect of vocabulary acquisition and the other involves teaching students how to use context clues to facilitate an understanding of the meanings of unfamiliar words. Both are recommended methods of increasing students' vocabulary knowledge (Ebbers & Denton, 2008; Fukkink & de Glopper, 1998). Morphological awareness involves the development of an awareness of the structure of words, and this awareness is an important aspect of word level literacy knowledge.

Morphology, the study of the structure of words, is complex so it is important to define what is meant by morphological awareness. A morpheme is "a minimal unit of meaning or grammatical function" (Yule, 2010, p. 67). A free morpheme is one that can stand by itself and make sense, for example the word *dog*. A bound morpheme does not make sense unless it is attached to another morpheme. Tense and number markers, such as *ed* at the end of a verb such as *talked*, or the */s/* at the end of *dogs*, are bound morphemes. They do not make sense by themselves but they carry meaning. Bound morphemes can be divided into two main categories: inflectional and

derivational (Yule, 2010). Inflectional morphemes relate to grammatical aspects of morphology. Derivational morphemes change the meanings of words to create new words. The addition of *pre* to *view* to make *preview* or the *ness* in *kindness* are examples of derivational morphemes. Derivational morphology is concerned with the study of the structure of words with related meanings such as *heal* and *healthy* or *predict* and *dictator*. In this study morphological awareness is concerned with derivational morphology rather than inflectional morphology. Thus morphological awareness is “awareness of and access to the meaning and structure of morphemes in relation to words” (McBride-Chang, Wagner, Muse, Chow, & Shu, 2005, p. 417). The role of the development of morphological awareness in the development of adolescent literacy skill is receiving increased attention in the research literature.

English vocabulary is morphologically complex; more than half the words in the language consist of multiple morphemes (Nagy & Anderson, 1984) and the number of novel morphologically complex words that readers encounter increases with age. If novel words can be separated into morphemes, some of which are known, this should help readers understand unfamiliar words. The role of morphological awareness, especially with regard to older readers, has been examined quite widely (Baumann et al., 2002; Carlisle, 2000; Carlisle, 2010; Carlisle & Stone, 2005; Nagy, Berninger, & Abbott, 2006). Some of these studies will be discussed in the section of the chapter dealing with word level interventions but the role of morphological awareness in reading development will be examined next.

Vocabulary acquisition has been associated with the use of morphological knowledge to work out the meanings of new words containing known morphemes, and several studies suggest that morphological awareness is related to vocabulary knowledge. In a study examining literacy skills of Grade 2 and Grade 4 students, Nagy and colleagues (2003) found a positive correlation ($r = .78$) between vocabulary knowledge and morphological awareness in fourth grade children. This finding was present for fourth and fifth grade students in another study (Nagy et al., 2006). In this study the literacy skills (including phonological and morphological knowledge as well

as reading vocabulary, decoding, spelling and reading comprehension) of 607 students in grades four to nine in a suburban school were assessed. Morphological awareness made a unique contribution to both reading comprehension and reading vocabulary across all grades, after controlling for phonology.

Morphological knowledge, decoding and spelling. Morphological awareness has been found to be instrumental in the development of decoding and spelling skills (Mahony, 1994; Nagy, Berninger, Abbott, Vaughan, & Vermeulen, 2003; Nagy et al., 2006; Singson, Mahony, & Mann, 2000). Several studies have examined the role of various forms of morphological awareness in relation to the development of reading skills in older students. Mahony (1994) conducted a range of morphological sensitivity tests to assess the relationship between morphological sensitivity and reading comprehension skills. Mahony worked with four different samples of older students: a group of 26 undergraduates aged about 20 years and two months on average; a group of 26 volunteers from a grade nine high school writing composition class aged 14 years and two months on average; and two groups of grade 12 students, high achievers and low achievers. Both grade 12 groups were, on average, aged about 17 years. Mahony (1994) could not establish strong evidence that poor morphemic sensitivity had a causal relationship with weak literacy skills, because of the possibility that poor decoding might have influenced the scores for this group of students. However, she did find that all proficient readers had high levels of morphological sensitivity.

Nagy and colleagues (2006) found that morphological awareness contributed to decoding accuracy in grades four and five and to decoding rate in grades eight and nine. There was a high correlation between morphological awareness and pseudoword decoding in grades six and seven as well as a strong contribution to spelling skills. The link between well-developed morphological awareness and efficient decoding skills has been found in other studies. Singson, Mahony and Mann (2000) explored the relationship between morphological awareness, more specifically of derivational suffixes, and decoding. In the first study 96 children were almost evenly divided between grades three through to grade six. Morphological awareness

improved as students aged, and morphological knowledge was found to be a unique predictor of decoding skill. A second experiment with 101 grade three to grade six students, found that morphological knowledge was a predictor of decoding skill and that, by grades five and six, morphological knowledge is more important for reading ability than phonological knowledge.

The findings from a study involving children from grade two to grade five suggests that the role of morphological awareness is unlikely to diminish for adolescent students (Deacon & Kirby, 2004). In a longitudinal study involving 143 grade 2 children over four years, Deacon and Kirby assessed the children's phonological and morphological awareness, as well as verbal and nonverbal intelligence in grade 2. In the subsequent three years they measured children's pseudoword reading, reading comprehension and single word reading. Morphological awareness had an impact on reading comprehension and pseudoword reading but not on single word reading, and the contribution to reading skills made by morphological awareness increased over time. Roman and colleagues (2009) found that phonological awareness was important for 10 to 14 year old students for them to be able to decode and spell pseudowords, but that orthographic knowledge and morphological awareness were more important for spelling and decoding of real words.

Older children, particularly fluent readers, become aware of the connections between words which have similar patterns or word parts and they use this knowledge to derive the meaning of words. Templeton (1989) explored the links between morphological awareness and orthographic awareness and argued that English spelling often points to a semantic or derivational relationship between words. This links to Ehri's consolidated or orthographic phase of reading acquisition in which readers notice familiar patterns or chunks in novel words. Templeton suggests that exploiting the links between spelling and meaning, by using words that are known to students to generate meanings for new words that have prefixes, root words or suffixes

in common, will develop vocabulary knowledge as well as improve understanding of English orthography.

Poor readers are likely to have less knowledge of morphemes and how prefixes and suffixes change the meanings of root words than competent readers because they generally have less exposure to print, and therefore less experience of morphemically complex words. Increased morphological awareness develops through exposure to oral and written language, so students who do not read often or who do not engage in conversations with others who use a rich vocabulary, may be lacking in morphological awareness (Carlisle, 2004; Fowler & Liberman, 1995; Reichle & Perfetti, 2003).

Explicit teaching about root words and affixes is particularly relevant for students with language disabilities. A study conducted by Fowler and Liberman (1995) that involved assessing vocabulary, reading comprehension, spelling and morphological production of 48 children aged between seven and ten years old, with a range of reading abilities, found an association between reading skill and morphological awareness. This association is consistent with the view that exposure to written language increases morphological awareness. Fowler and Liberman found that students with weak reading skills had difficulty seeing the relationships between words that are not obviously derived from a common root, for example *crux* and *crucial*. However these readers were sensitive to the more transparent links between morphemes in words such as *final* and *finality*. Such morphological sensitivity could be used as a starting place to build up an understanding of derivational morphology which would assist these readers to work out the meanings of some of the polysyllabic words they meet in text books and literature studied at secondary school.

Summary of findings on relationships between word level skills. The literature concerned with the relationships between word level literacy skills and the development of skilled reading has shown that decoding, spelling and vocabulary all make contributions to adolescent literacy skills. Both sides of the reading equation in the SVR remain significant causes of variance in reading comprehension. Vocabulary is the most significant word level component of reading comprehension but decoding

and spelling contribute to variations in comprehension skills. It has been shown that in groups of urban secondary students decoding and spelling skills were unexpectedly low (Cirino et al., 2013; Hock et al., 2009; Shankweiler et al., 1996). Improving older students' morphological awareness is likely to improve vocabulary acquisition (Nagy et al., 2003; Nagy et al., 2006; Templeton, 1989) as well as decoding (Singson et al., 2000). Interventions which focus on developing word level skills, including morphological awareness, are discussed in the next section of this review.

Word Level Interventions

Studies concerned with the development of word level skills to improve reading comprehension for adolescents are not as numerous as word level studies for beginning readers. Many of the interventions designed for struggling adolescent readers tend to combine some aspect or aspects of word level skill development with other components of literacy such as fluency or text processing and reading comprehension strategies (Berninger et al., 2010; Berninger et al., 2008; Lovett, Lacarenza, De Palma, & Frijters, 2012; Vaughn et al., 2010). This section of the review will focus on the word study elements of interventions. In view of the fact that there are limited numbers of word study interventions involving adolescent participants, some of the studies report findings for slightly younger students who are in grade 5 in the United States or year 6 in New Zealand. The age of students in grade 5 will typically range from 10 to 11 years of age.

Interventions to improve decoding. Struggling adolescent readers aged between 10 and 16 years who were given explicit individual instruction in components for beginning word recognition, made significant gains on reading measures, including decoding and comprehension assessments, after only four weeks of training (Abbott & Berninger, 1999). In this study skills related to phonological and orthographic awareness, understanding the alphabetic principle, phonological decoding and oral reading of specific words were taught. In another short intervention involving individual tuition, students who were taught how to pronounce syllables and how to

divide words into syllables improved their pseudoword decoding skills as well as their spelling skills following this instruction. These struggling readers developed a new sensitivity to subtle changes in words so that they took notice of all the letters used to write a word, and this in turn ensured that their habit of guessing the word from a partial reading of some of the letters was reduced (Bhattacharya & Ehri, 2004).

A more comprehensive intervention was described by Penney (2002). Poor adolescent readers participating in remedial reading classes received individual tuition in a syllable decoding approach which was successful in raising students decoding and reading comprehension scores. The intervention involved teaching analogies to assist reading of multi-syllabic words that students had misread when reading extended text. These particular students had made little progress during the course of their schooling prior to the intervention, so the reading comprehension improvement of three grades on average was particularly significant. Penney (2002) suggests that although these students had been able to decode many words, they had not generalized their understanding of the words they could read to the decoding of other new and unfamiliar words. By encouraging students to notice the spelling patterns in multi-syllabic words and to use these patterns to decode words they had misread, they began to apply their knowledge to new words. Students in the control group remained in their regular reading classes which focused on reading for meaning, with no work on isolated words or drills to improve students' decoding abilities. Control students, who had focused on text comprehension, made improvements of 1.6 grades on the standardised comprehension test but not as much progress as the tutored group. Once students' decoding problems had been addressed they were able to take advantage of the reading comprehension instruction offered in their reading classes. This study indicates that poor decoding skills limit the usefulness of teaching comprehension strategies to struggling readers if their poor decoding issues are not addressed. Penney (2002) reached the conclusion that it is possible to improve the reading ability of struggling secondary students by focusing on decoding skills instruction.

Another New Zealand study suggests that if students have poor decoding skills, these issues need to be addressed to improve comprehension skills. Research findings from a study by Knowles (2012) led her to conclude that poor decoding skills are a barrier to the use of comprehension strategies. In an intervention which focused on teaching reading comprehension strategies to struggling year 9 and 10 readers, those students who had poor decoding skills did not make progress with reading comprehension, whilst students with competent decoding benefited from explicit metacognitive strategy instruction. Two small scale interventions in New Zealand lend support to the explicit teaching of the code to improve reading comprehension for some struggling adolescent readers (Craig, 2008; Smith, 1999).

Explicit teaching of orthographic patterns and morphology resulted in improved reading comprehension and decoding skills for a small group of very poor adolescent readers (Smith, 1999). A linguistic phonics programme devised by McGuinness (1997, cited in McGuinness, 2004) was used to develop students' decoding skills. The participants were five students aged between 13 and 14 years. All of the students had severe reading and spelling difficulties and there was a large discrepancy between their listening and reading comprehension scores on the New Zealand based standardised Progressive Achievement Tests (Darr, McDowall, Ferral, Twist, & Watson, 2008). Each student was individually tutored in sound-to-letter mapping as well as common Latin suffixes. Such students are usually difficult to remediate but even considering the short duration of the intervention, which consisted of 12 individual sessions twice a week, over six weeks, gains were made on all measures but particularly with decoding and reading comprehension. On the Woodcock Reading Mastery subtests and the Test of Written Spelling (TWS-3, Larson & Hammill, 1976, cited in McGuinness, 2004) students showed average standard score gains ranging from 18 points for word attack, to 12.8 points for reading comprehension and 9 points for spelling regular words. These gains moved students into the 50th percentile. One problem with this study is the small sample size, another issue is that there was no control group, students' baseline scores acted as controls in this single-subject design.

A small scale phonics intervention with ten year 9 Pasifika students in a low SES secondary school to improve decoding skills supported students to improve their reading comprehension (Craig, 2008). As a result of screening students for a larger study that focused on reading comprehension instruction, it was discovered that 10 students, from a group of 55 students, had serious decoding deficiencies when they were tested on a standardised pseudoword reading test (Martin & Pratt, 2001). A short intervention was developed to teach students how to read and spell words with the spelling patterns that they had been unable to read on the pseudoword test. They received small group tuition once a week for 40 minutes over 9 weeks. Most students made significant gains when they were re-tested on the pseudoword reading test but, even more importantly, most students' reading comprehension scores showed quite large gains on a standardised test, the average gain was 71 points when the expected gain over a year was 50 points (Hattie, Brown, & Keegan, 2004).

Interventions to increase morphological awareness. Increasing the levels of morphological awareness of struggling adolescent readers may be a way to improve these students' spelling and reading skills. Several studies conducted with readers in grades three to six have shown that morphological awareness is linked to reading ability and that growth in morphological awareness increases with age (Carlisle, 1988, 2000, 2004; Roman, Kirby, Parilla, Wade-Woolley, & Deacon, 2009). In a longitudinal study designed to explore the links between morphology and literacy development, morphological skill predicted spelling skills one year later (Nunes & Bryant, 2006).

As readers begin to encounter more complex vocabulary, an understanding of morphemes becomes more important for skilled reading and spelling. Because many of the new words that students encounter as they progress through the grades are derivations from root words (Nagy & Anderson, 1984) the ability to work out word meanings through structural analysis is helpful for readers. An example used by Nagy and Anderson (1984) is the word *drama*. An understanding of the word would facilitate an understanding of the words *dramatic* and *dramatist*. Another issue, alongside the exposure to more complex vocabulary, is that there are too many words

in the texts that older students are expected to read for vocabulary to be taught one word at a time. Readers must learn to use the context and to use analysis of the structure of the words to work out meanings.

Several interventions with older students have focused on word study or morphological analysis rather than phonics or decoding instruction to build up word level reading skills in adolescents. Lenz and Hughes (1990) describe an intervention with 12 learning disabled adolescents who were taught a problem-solving approach to word analysis in small groups. This strategy involved structural analysis of words; identifying morphemes, prefixes, root words and suffixes as well as applying some syllabification rules. Use of the strategy reduced the number of oral reading errors made by all of the participants and improved reading comprehension for most of them. Henry (1988, 1993) developed an intervention, delivered by classroom teachers, for older readers with poor decoding and spelling skills, based on the origins and structure of words. Students in this programme were taught how English orthography has been shaped by Anglo-Saxon, Romance and Greek influences. Each layer of language is characterised by a set of orthographic patterns and explicit teaching of these patterns helped students to make more sense of words that they were attempting to decode or to spell. Spelling and decoding were taught at the same time. A feature of the intervention that made it appealing to adolescents was that it involved direct instruction, problem solving and discussion rather than a skill and drill approach to teaching word level reading skills. Henry describes how the students “begin to take on the task of learning Latin and Greek word parts with enthusiasm and understanding” (Henry, 1988, p.274). Henry’s intervention is an example of a combination of decoding, spelling and morphological awareness instruction.

Another aspect of the intervention was that students learned a set of technical words to help them to talk about how to analyse words (Henry, 1988) . The words were grouped under three sub-headings: *Linguistic Terms*, for example *morpheme*; *Sound-letters correspondences* such as *vowels* and *consonants*; and *Morphemes* which included terms such as *compound word*, *prefix*, *suffix* and *root*. The shared set of

technical words about language facilitated conversations between teachers and students and helped students to organise their thinking around some important metalinguistic concepts. In interviews, following the special decoding instruction, the students were able to analyse and describe the structure of words and talk about their decoding strategies with far more detailed technical accuracy than they had been able to prior to the intervention. Students who were in classes that learned about the layers of language (Anglo-Saxon, Romance and Greek) and who practised decoding and spelling words which illustrated the different layers of language, improved both their knowledge of sound-letter correspondences and their decoding and spelling significantly more than students in the control group.

The role of teaching morphemes to improve literacy was systematically explored in a series of studies conducted by Nunes and Bryant (2006). The purpose of their research was to find out how to teach children about morphemes in order to improve spelling and vocabulary. They wanted to teach spelling principles based on morphology. The research was based on three premises; the first premise was that there are some important connections between spoken and written language at the morphemic level, in that the spelling of words is often determined by their morphemic structure. Secondly, although children's knowledge of morphemes is implicit, an association between explicit knowledge and literacy success exists. The third premise was that it is possible to enhance students' implicit knowledge with explicit instruction which will lead to improved performance in reading and spelling.

Nunes and Bryant (2006) initially established a link between knowledge of morphemes and the development of spelling skills by conducting a longitudinal study over three years with children aged between six and nine years old at the start of the study. They found that knowledge of morphemes predicted spelling skills eighteen months later and that there was a reciprocal relationship between knowledge about morphemic spelling rules and awareness of how morphemes combine to build words (Nunes, Bryant, & Bindman, 1997). A series of related studies are described by Nunes and Bryant (2006). Initial studies involved working in tightly controlled conditions

with small group of students taught by the researchers. The intervention consisted of the explicit teaching of morphemic principles accompanied by problem solving and discussion. Students' spelling and vocabulary knowledge improved significantly at the end of the interventions.

Success from the first set of interventions encouraged Nunes and Bryant to transfer the same interventions to classroom settings with significant input from the researchers to ensure programme fidelity. Again, the interventions were successful, with students in the intervention classes making more progress on literacy tasks than control students. The last set of classroom experiments involved the handing over of their resources to teachers to use independently. Students who had been taught through the use of the materials developed by Nunes and Bryant learned how to spell and analyse specific words. They learned about the ways words are formed through the addition of morphemes which helped them understand the meanings of new words and helped them work out the spellings of the novel words. Vocabulary gains were achieved by students who had the least morphemic awareness at the start of the intervention although students who had more morphemic knowledge at the outset made even greater gains. This finding suggests that morphology awareness training can contribute to literacy growth for students with a range of literacy skills.

The interventions were designed to help primary students to develop a set of higher-order principles to use when spelling words. There were several key features to the tasks which contributed to their efficacy. They did not take explicit knowledge of morphemes for granted so there were no assumptions about what children would know. They engaged students in problem-solving activities that did not involve the application of the same rule over and over again. Examples of the types of problem-solving tasks used by Nunes and Bryant (2006) include the instruction to complete a set which involved thinking about the element of a word which signifies a person (for example *read* - *reader*, *magic* - ____?____), or counting the morphemes in a polymorphemic word such as *unforgettable*. Systematic repetition of tasks often becomes boring so a variety of tasks which children completed in pairs or small groups

were developed. Children were required to think about the morphemic structure of words, not to apply a set of rules.

A study into morphological generalization undertaken by Wysocki and Jenkins (1987) found that older students were more likely to use morphological information and surrounding context information to infer the meaning of untaught, unfamiliar words than younger students. There were 135 participants from Grades 4, 6 and 8. Students were randomly divided into two groups who were each taught six different words in three sessions lasting 15 to 20 minutes over two weeks. The two groups were taught different words to test how well they were able to work out words that were related to the taught words, for example whether students who had been taught the word *melancholia* could transfer this knowledge to interpreting the word *melancholic* used in a different context. Post-testing took place three weeks after the intervention to reduce the chance that students would assume they needed to use morphological analysis to work out meanings because they had been taught to break word into morphemes in the intervention. Students in Grades 6 and 8 were better able to use weak context clues to infer meanings of words than students in Grade 4, but all students could use strong context clues to understand unfamiliar vocabulary. The older students were able to generalise meanings of taught morphemes to transfer words more efficiently than Grade 4 students. Although the study appears to offer strong support for the role of morphological generalization and the use of context to increase students' vocabulary knowledge, the study had limitations. There were no separate control classes. Furthermore, the intervention was of short duration and only six root words were taught in the intervention. Finally, only researcher-developed assessment measures were used to assess morphological generalization.

Other more recent studies have explored the role of morphological knowledge and the use of context to support vocabulary growth. Baumann and colleagues (Baumann, Edwards, Boland, & Olejnik, 2003; Baumann et al., 2002) designed two studies using participants from Grade 5 to investigate students' use of morphological awareness and context to foster vocabulary learning and reading comprehension. In

the first study (Baumann et al., 2002) 88 participants from four separate fifth grade classes were assigned to four different conditions: a morphology-only group, a context-only group, a mixed group (taught morphology and the use of context clues), and a control group. The results showed that for both single-focus and mixed groups, the students learnt the strategies and vocabulary they had been taught, outperforming the control group on these measures. The students who had learnt to use morphological clues to work out meanings of unfamiliar words were better at this than the control group and context-only group. Conversely, the students in the context-only and the mixed group outperformed the morphology group and the control group when using context to work out unfamiliar words. The results indicate that teaching students to use morphological and context clues to work out word meanings can help with vocabulary learning.

No effects on reading comprehension were found in the Baumann et al. (2002) study, which was surprising because of the strong correlation between vocabulary knowledge and reading comprehension. This may in part be due to the intervention lacking sufficient power because it was taught in isolation from instruction in other reading comprehension skills. Another reason might be that the measure used to assess reading comprehension may have relied on skills other than vocabulary knowledge. Lastly, the duration and scope of the intervention may have been too short and narrow to influence reading comprehension. The study had other limitations. These were that the morphology intervention was confined to the teaching of prefixes rather than root words, and researchers had carried out the teaching rather than classroom teachers. Another possible limitation was that the intervention sessions were stand-alone and had been taken in isolation rather than as part of the students' general curriculum.

To address the limitations of the first study Baumann and colleagues (2003) used classroom teachers to teach two separate interventions. One focused on teaching students to use morphemic and context clues and the other taught the vocabulary from the Social Studies text book used in the classroom. Eight grade 5 Social Studies classes

with 157 students took part in the study. The intervention was integrated into 33 Social Studies lessons of 45 minutes each. The vocabulary element of each lesson lasted 15 minutes and students were either taught the meanings of the words they encountered in the text, or words from the text were used to teach morphemic analysis and the use of context to infer meanings. Post-testing showed that students in the direct vocabulary instruction group were better at defining the specific vocabulary studied in the text, but the morphemic and context clue group were better at inferring meanings of words that could be worked out by using morphological and contextual cues. There were no differences in the students' reading comprehension scores. These studies provide support to the proposition that teaching generative skills, such as morphological knowledge and the use of context clues, can help students learn the meanings of more words independently.

A recent New Zealand study has reported promising effects from a brief morphology intervention aimed at improving literacy skills of Pasifika Intermediate¹ students aged from 11 to 13 years (Beaumont & Erlam, 2010). Participants were 34 Pasifika students who had been identified as having poor literacy skills. These students were born in New Zealand but English was not the first language spoken by their parents and they had low receptive English vocabulary scores on a standardised assessment measure. Seventeen students, who remained in class with no intervention, formed the control group. The intervention, delivered to 17 students withdrawn from the same class as the control group, consisted of eight 20 to 25 minute lessons three times a week where students were taught 42 affixes and about 30 high frequency Latin and Greek root words found in the Intermediate curriculum. Pre-testing showed that there were no significant differences between the two groups of students, but at post-test the intervention group were better able to identify taught words and work out meanings for unfamiliar words with taught affixes and root words. However, as in

¹ Intermediate schools are stand-alone schools for students in years 7 and 8 in New Zealand, the equivalent of Grades 6 and 7 in the United States.

both Baumann studies, there were no differences between the reading comprehension results for intervention and control students.

Another recent study with older adolescents has found a link between the teaching of morphological awareness and the ability to work out the meanings of untaught words. Harris, Schumaker and Deshler (2011) compared the efficacy of teaching vocabulary using a morpheme analysis strategy with a mnemonic vocabulary learning strategy. The participants were 230 ninth grade students, aged between 14 and 15 years, in nine classes. Three classes were assigned to the morpheme analysis intervention, three classes were taught the mnemonic vocabulary strategy and three classes received their regular English programme and acted as controls. Both intervention groups learned how to use the strategies they had been taught, and both performed significantly better than the control group on a test of taught vocabulary. However, only the morpheme analysis group was able to define the meanings of word parts and work out meanings of untaught polymorphemic words such as *prediction*. The authors suggested that the morpheme analysis strategy should assist students to work out meanings of unfamiliar words in assessments and reading comprehension tests but they did not measure them.

In contrast to the previous studies, a small-scale Danish study with younger dyslexic students describes an intervention to develop morphological awareness which had a positive impact on spelling and reading comprehension (Arnbak & Elbro, 2000). In this study 33 Grade 4-5 students with dyslexia received morphological awareness training for 15 minutes three times a week as part of their remedial teaching programme. Twenty-seven students who received the same remedial programme without the morphological awareness training acted as controls. The intervention lasted for 12 weeks. Although a few students were taught individually in both the intervention and control groups, most instruction was offered to small groups of three or four students. The trained group did not outperform control students to a statistically significant level on as many measures of morphological awareness as had been predicted, but there were clear results in favour

of the intervention for spelling and reading comprehension. Arnbak and Elbro suggest that the reasons for this difference might be that the intervention helped the students to develop a facility with breaking morphologically complex words into smaller linguistic units which they already knew how to spell. The reason for improved reading comprehension might be that knowledge of the morphological structure of words could enhance students' ability to work out meanings of complex words.

One other possible reason why the morphological training may have had an effect on reading comprehension could be related to the thoroughness of the intervention. Students were trained in a carefully planned series of tasks of increasing complexity. Another reason could be that they were taught through the use of engaging problem solving tasks with lots of discussion in small groups. For example "What is the difference between a *murdering* man and a *murdered* man? Who is doing what to whom?" or "Reading relates to read as writing relates to _____? (write)". Arnak and Elbro (2000) recommended morphological awareness training and noted that some of the less convincing aspects of the intervention may have been linked to a lack of teacher knowledge. They suggested that it was possible that some of the teachers' lack of morphological knowledge might have made it difficult for these teachers to support the dyslexic students to develop morphological awareness, even though the teachers had received some training to implement the intervention. Teacher knowledge of word level literacy skills is discussed at the end of this review.

Summary of findings from word level interventions. Findings from a range of word level interventions have indicated that improving students' phonological awareness, understanding of the alphabetic principle, and use of a syllabification strategy as part of decoding instruction, can improve reading accuracy and reading comprehension (Abbott & Berninger, 1999; Bhattacharya & Ehri, 2004; Penney, 2002). Interventions which have included a focus on teaching adolescent students about the structure of language, the origins of English words, sound-letter correspondences, and decoding, have had a positive impact on literacy development (Henry, 1988, 1993; Lenz & Hughes, 1990). Training in morphological awareness has been shown to improve

students' vocabulary acquisition skills (Baumann et al., 2003; Baumann et al., 2002; Beaumont & Erlam, 2010; Harris et al., 2011), vocabulary and spelling skills (Nunes & Bryant, 2006) and reading comprehension (Arnbak & Elbro, 2000). However, effects of training morphological awareness on reading comprehension were rare.

In the majority of intervention studies which report positive literacy growth for participants, instruction was delivered to individuals (Abbott & Berninger, 1999; Bhattacharya & Ehri, 2004; Penney, 2002; Smith, 1999) or in small groups (Arnbak & Elbro, 2000; Craig, 2008; Lenz & Hughes, 1990). No studies in which the intervention was teacher delivered to a whole class, report any improvements to students' reading comprehension (Baumann et al., 2003; Baumann et al., 2002; Beaumont & Erlam, 2010; Harris et al., 2011; Henry, 1988, 1993; Wysocki & Jenkins, 1987) although other literacy skills have been improved in these types of interventions. The case for using word level interventions with adolescents to improve literacy appears to have support in the research literature. Another dimension to word level literacy skills, which has not been discussed thus far, is word consciousness. Word consciousness might be useful to enhance word level knowledge.

Word consciousness. Word consciousness is a disposition that can be fostered through a love of words, possibly modelled by a teacher. It is not easily categorized and itemised so that it can be taught explicitly; rather it is a collection of various types of knowledge and skills related to an awareness and interest in words and how they work. Scott and Nagy (2004) define word consciousness as "the knowledge and dispositions necessary for students to learn, appreciate and effectively use words" (p. 201). Word consciousness is more than the deliberate teaching of specific vocabulary as it involves students becoming increasingly able to work out the meanings of new words for themselves and finding interest in the process. Word consciousness has an element of metalinguistic awareness and includes the ability to identify and manipulate morphemes as part of this metalinguistic awareness (Scott & Nagy, 2004). It includes an understanding of the syntactic structure of sentences, because an understanding of sentence structure helps students infer likely meanings of words. In

recent research into vocabulary learning, word consciousness is beginning to be recognised as an important element of developing vocabulary acquisition (Baumann et al., 2003; Blachowicz, Fisher, Ogle, & Watts-Taffe, 2008; Scott, Miller, & Flinspach, 2012; Scott & Nagy, 2004) but, according to Scott and colleagues (2012), teachers are not generally aware of the concept. An intervention with primary teachers to enhance the teachers' own understanding and awareness of words, assisted students to develop word consciousness (Scott et al., 2012). They report that teachers "told us about becoming more aware of words, beginning to reflect on their own knowledge and use of words and connecting their own process of word learning to how their students were learning" (p. 171).

Creating a classroom environment in which students are prepared to take risks and to play with words is a complex process. It involves teachers scaffolding students in their vocabulary learning so that they experience success. Furthermore, it involves teachers modelling a genuine fascination with words and how to learn more about them and celebrating students' use of interesting words (Scott & Nagy, 2004). Developing word consciousness in students requires teacher knowledge because teachers cannot develop word consciousness without knowing about words, which includes knowledge of orthography and morphology. Enhancing teacher knowledge is therefore a key element of developing word consciousness in students.

Teachers' Knowledge of Word Level Literacy Skills

Teacher practice, knowledge and beliefs all have an impact on children's learning in many curriculum areas but would seem to be particularly crucial for teachers who are responsible for teaching children to read. In the last few decades there has been a growing consensus between researchers in the field of reading acquisition about what children need to know in order to develop into good readers (Byrne, 2005; Ehri, 2005a; McGuinness, 2004; Perfetti et al., 2005; Shankweiler & Fowler, 2004; Share, 1995; Tunmer & Nicholson, 2011). What is less clear is whether teachers know what they need to know in order to teach beginning readers effectively. Most of

the literature which explores teacher knowledge of effective literacy teaching is, quite naturally, focused on teachers of beginning readers. Adolescent readers with word level reading difficulties need teachers with some knowledge of the reading acquisition process, so a brief review of research into primary teachers' knowledge has some relevance to the present study for two reasons. Firstly, if primary teachers do not have detailed phonological knowledge it is possible that this might be a cause of some adolescents' failure to develop strong decoding skills. A second reason is that secondary teachers will need to understand the process of reading acquisition if they are to meet the needs of students struggling with word level skills.

A growing body of literature suggests that teacher knowledge in the literacy domain is variable (August, 2011; Bell, Ziegler, & McCullum, 2004; Bos, Mather, Dickson, Podhajski, & Chard, 2001; Carroll et al., 2013; Cunningham, Perry, Stanovich, & Stanovich, 2004; Hurry et al., 2005). These studies demonstrate that in-service primary teachers and teacher trainees showed a lack of understanding about the role of phonological awareness, more specifically phonemic awareness, in learning to read. In addition there was evidence in several studies that many teachers had a poor understanding of the structure of English (August, 2011; Bos et al., 2001; Cunningham et al., 2004). The findings were similar when a large sample of adult literacy teachers were surveyed about their understanding of teaching phonological awareness, letter to sound associations and morphology (Bell et al., 2004).

It seems self-evident that the literacy knowledge of teacher educators will have an impact on the knowledge they impart to their students. Two recent studies investigating the literacy-related knowledge of teacher educators underscore how important it is that those responsible for teacher education are highly knowledgeable about research into effective literacy teaching (Binks-Cantrell, Washburn, Joshi, & Hougen, 2012; Joshi et al., 2009). In the first study Joshi and colleagues (2009) examined the linguistic knowledge of a group of 78 teacher educators through the administration of a survey of linguistic concepts. They found that while the teacher educators were able to identify syllables in words, they had difficulty with concepts

relating to phonemes and morphemes. In the same study the authors report on interviews held with 40 educators about the research evidence with regard to teaching word level literacy skills. The interviews revealed that the teacher educators did not have a strong understanding of some key concepts such as phonological awareness and effective methods of teaching phonics.

Their findings were reinforced in a follow up study (Binks-Cantrell et al., 2012) in which they used the term 'the Peter effect' to illustrate the importance of teacher educator knowledge and how it is impossible to teach what you do not know. The Peter effect is a reference to the biblical story of Peter the apostle who replied to a beggar's request for money by saying that he could not give what he did not have. Binks-Cantrell et al. (2012) compared the literacy knowledge of a group of 48 teacher educators, who had been involved in a programme of professional development related to literacy acquisition, to a group of 66 teacher educators who had not yet participated in the professional development promoting research-based reading instruction. They examined the literacy knowledge of the teacher candidates taught by each group of educators. These included 55 teacher trainees in the first group whose instructors had experienced the professional learning and 118 in the second group. The first trained group of educators and their students outscored the second group of students and their educators who had not had the professional development in all measures except for syllable counting. Syllable counting has a low level of difficulty so it did not discriminate between the knowledgeable and less knowledgeable candidates effectively. It is important to note that these are primary school teacher educators but it seems likely that these findings would be similar for secondary school teachers and teacher educators.

Several New Zealand studies have investigated the phonological knowledge of teachers and found varying degrees of understanding of this meta-linguistic skill. Nicholson (2007) conducted a study with 83 trainee teachers in their first year of a three-year Bachelor of Education degree. Pre-testing revealed considerable weakness in the trainees' knowledge of grammar, orthography, morphology and phonology.

After some teaching related to the topics covered in the tests, scores in most areas improved but the participants continued to find it difficult to count the number of phonemes in a word. The ability to count phonemes in a word is a measure of phonemic awareness which is an important foundation skill for reading and spelling. Therefore these results further demonstrate that some teachers may not be well equipped to teach reading and spelling effectively.

Carroll, Gillon and McNeill (2012) report on a large study that investigated the phonological knowledge of New Zealand educators and paraprofessionals. The 699 participants consisted of groups of Speech and Language Pathologists, Resource Teachers of Literacy, Resource Teachers of Learning and Behaviour, Classroom Primary teachers, Teacher Aides, Early Childhood Education teachers, first-year students in a Bachelor of Teaching degree and third-year students about to complete their Bachelor of Teaching degree. The relative strengths of each group's phonological knowledge were investigated through a group test with some items presented orally and some in writing. Two of the sub-tests, syllable awareness and rhyme detection, had less power to discriminate between the groups, but test items involving the identification of phonemes showed great variance both between and within groups. It was hypothesized that Speech and Language Pathologists would have the greatest phonological knowledge and this proved to be the case. Specialist teachers had more knowledge than classroom teachers. However, first-year teacher trainees, teacher aides and early childhood educators had similarly low levels of phonological knowledge. The great variability in primary classroom teacher knowledge about the phonological structure of the language was of concern to the authors who suggest that unless a teacher has an explicit and detailed understanding of this level of language, they will not be able to give appropriate feedback to beginning readers who may be having difficulties associated with a lack of phonemic awareness.

Early reading instruction is of critical importance because the consequences of inadequate initial instruction are severe and may be almost irreversible (Carreker et al., 2007). In a longitudinal study investigating reading comprehension skills of children

in grades 3 to 5 it was found that those children taught by teachers who had been trained to teach a linguistically enhanced programme were significantly better at reading comprehension than students taught by teachers who did not use the linguistically enhanced programme. The linguistically enhanced programme included the teaching of phonemic awareness, sound to letter associations, and orthographic patterns as well as decoding skills. The students who had a poor start got progressively worse in grades 3 to 5 in relation to their peers who had experienced more effective teaching in the early grades. It is likely that many adolescents who have difficulty with spelling and decoding in secondary schools may have had inadequate instruction when they were learning to read; not through any deliberate action or lack of action, but possibly because their teachers did not have a deep knowledge of effective literacy instruction.

A study conducted with teachers of older primary school children explored the teachers' ability to analyse typical spelling errors when the analysis would be enhanced by an understanding of morphology and some principles of orthography. Hurry et al. (2005) interviewed 50 primary teachers in London schools to find out how to support teachers to understand how teaching about morphemes improves literacy. They showed the teachers a set of words and asked them to describe the sorts of errors their students might make when spelling these words. Eight of the 12 words would be likely to have errors associated with morphology such as *ed* endings and suffixes like *ment* and *tion*. They asked teachers to explain how they would help the students to overcome their errors. Many of the teachers in the study had difficulty explaining their students' likely errors precisely and were not able to use technical terms accurately. For example, no teacher mentioned the word *morpheme*, even though the term is used in the National Literacy Strategy policy documents that these teachers had been implementing. As a follow-up, a group of teachers were invited to attend a course on morphology and reading comprehension on the condition that they would agree to teach their students specific spelling skills using resources that had been developed by Nunes and Bryant (2006). An evaluation after the course showed that the teachers' understanding of morphology had increased significantly. In addition it was clear that

their students had made significant gains in spelling when compared to students in control groups whose teachers had not attended the course. Another outcome was that teachers reported that they would take the teaching of spelling skills more seriously and adopt a more structured approach to this instruction (Hurry et al., 2005).

Few studies include measures of secondary teacher knowledge about literacy acquisition. One study conducted by Lovett and colleagues (2008) describes an effective, intensive teacher professional development initiative to support secondary teachers to meet the needs of struggling secondary students with poor literacy skills. Teachers were taught how to implement a comprehensive literacy programme which included teaching elements of decoding, word recognition, reading comprehension strategies and metacognition. No measures of teacher knowledge were investigated prior to the professional development, but the authors discuss a survey held in 2001 by the United States Education Department: National Center for Education Statistics in which only 32% of teachers reported that they felt prepared for teaching students with disabilities, which includes reading disability. This finding suggests that these secondary teachers did not feel that they knew how to support struggling adolescent readers. After the professional development, which continued for three years, and had included the successful implementation of the comprehensive literacy teaching programme, teachers reported greater feelings of confidence and a significant increase in their own literacy knowledge. Students with literacy difficulties made much greater progress with decoding, word attack and phonological skills than the students who were waiting to participate in the programme. Students who were taught by teachers who had already implemented the programme for one year, in other words teachers who were more familiar with the elements of the programme and more confident with its implementation, made significantly more progress with decoding of polysyllabic words and reading comprehension than did the students who had been taught by teachers in their first year of implementation. Student outcomes from this initiative suggest that teacher knowledge about literacy teaching can have a significant impact on student achievement.

Studies related to adolescent literacy instruction refer to the difficulty secondary teachers and teacher trainees have with the idea that all teachers need to be teachers of literacy (Fisher & Ivey, 2005; Ratekin, Simpson, Alvermann, & Dishner, 1985; Stewart & O'Brien, 1989). This difficulty might arise because secondary teachers are considered to be subject specialists (Shanahan & Shanahan, 2008). In addition secondary teachers are unlikely to have had any training to teach literacy in the context of their content instruction (Lewis & Wray, 1999). Secondly, they may think that students should be able to read efficiently by the time they reach secondary school (Lewis & Wray, 1999). Thirdly, while they may be willing to undertake responsibility for teaching students to read and write in the context of their specialist subjects, they may not have the expertise to address their students' needs (Lewis & Wray, 1999). An Australian study investigating teachers' work in reading across the curriculum examined the teaching practice of a group of 15 teachers of year 11 students with poor literacy skills who were involved in a reading strategy programme (Harreveld, Baker, & Isdale, 2008). Although the teachers became more aware of these students' needs after they were shown some achievement data, they seemed reluctant to change the way they were teaching. Only five teachers agreed to post-intervention interviews and of these five, three teachers made some small changes to include the reading strategies the students were learning into their teaching practice. The authors conclude that even when responsibility for literacy across the curriculum had been mandated by government agencies, it was difficult to change teacher practice and beliefs. Unless secondary teachers can change the way they think about literacy in their subject area, they are unlikely to adopt a positive attitude to engaging in literacy instruction (Fisher & Ivey, 2005).

It is often assumed by secondary teachers of other subjects that English teachers will know how to teach reading and writing. However, a distinction needs to be drawn between the type of teaching required for someone who does not know how to read grade level texts and write efficiently, and teaching students how to read or write a response to a literary text or a piece of creative writing. In support of this distinction, Hansen (2005) investigated the self-efficacy beliefs of 126 in-service and pre-service

New Zealand secondary English teachers through a survey to assess perceptions of efficacy across a range of competencies and tasks identified in the New Zealand English Curriculum. Although she does not give specific numbers, Hansen indicates that several teachers in her study said they felt ill-equipped to teach spelling and reading. One respondent, who had high levels of self-efficacy for most aspects of teaching English, wrote: "Aside from 'sounding out' and rote learning I am clueless as to how to teach spelling" (p.93). Some of the teachers reflected a concern with the lack of support from the Ministry of Education to help struggling readers and writers in year 9 and one commented on the lack of relevant research in this field. Another respondent to the survey expressed the opinion that the number of students with poor literacy skills was increasing. The present study was an attempt to address some of these concerns.

Summary

The literature reviewed in this chapter provides an overview of the theoretical framework for reading adopted in this study, the Simple View of Reading. This framework helped identify that insufficient attention may have been paid to adolescents' word level skills as a factor contributing to poor literacy. The first section of the review described the development of reading which occurs on a continuum over time. From an analysis of the literature relating to the development of word recognition it became clear that some poor adolescent readers are likely to have had problems with developing fast, accurate word recognition skills when they were learning to read. Furthermore, this lack of development may be causing ongoing issues with fluency and decoding.

The second section examined the literature which suggests that adolescents' decoding, spelling and morphology awareness all contribute to literacy achievement. A review of the literature relating to the word level components of literacy has led to the identification of a gap in the New Zealand research literature concerned with adolescent literacy skills. The word level literacy skills of adolescent readers in terms

of decoding, spelling and morphological awareness require more research. In the third section, literature describing interventions involving word level skills was examined to identify what elements should be included in a word level intervention as a means of improving students' reading comprehension skills. No literature was found which combined an analysis of the word level components of literacy with an associated intervention aimed at influencing reading comprehension. Literature relating to the development of word consciousness as a means to engage students in thinking and learning more about words was described. This literature proposes that a deliberate focus on growing word consciousness can build links between teachers and students as they learn more about the structure of the language together. In the final section, research relating to the impact of teacher knowledge on students' literacy achievement was reviewed. The research highlights the importance of teacher knowledge for literacy growth. This review of the literature has underpinned and refined the questions addressed in the current study; additionally the review has shaped the intervention described in the next chapter on methods.

In the light of this literature review several issues relating to the development of skilled adolescent reading have emerged. The importance of rapid and accurate decoding, which depends on a thorough knowledge of the code of English, was clearly identified in the literature. Unexpectedly poor spelling was also identified as a problem for some adolescents. Further investigation of students' understanding of the code seems warranted given the poor achievement of a significant number of New Zealand adolescents identified in PISA testing (Ministry of Education, 2013; Telford & May, 2010). The literature suggests that increasing adolescent students' vocabulary knowledge, by raising morphological awareness and encouraging word consciousness, should assist in the development of literacy skills. Teacher knowledge was also identified as an important factor in students' literacy growth. Although most of the literature relates to primary school teachers rather than secondary school teachers, some studies identified concerns with secondary teachers' knowledge of literacy acquisition. This study attempts to answer questions related to adolescent word level literacy skills whilst acknowledging that there are many other elements which

influence the development of proficient reading and writing. The overall aim of this study is to find out how adolescent word level literacy skills are related to reading comprehension. Sitting within the overall aim are three research questions:

1. What are the word level literacy skills of adolescents as they start secondary school and what are the relationships between these skills?
2. Can an intervention aimed at improving spelling and the understanding of morphology develop a sense of word consciousness and increase students' reading comprehension skills?
3. What do teachers know about word level literacy skills and how does this knowledge influence students' reading achievement?

Chapter 3 : Methods

The first aim of this study was to investigate the word level skills of adolescents at the start of their secondary schooling and to examine factors which contribute to poor reading comprehension. The second aim was to evaluate the influence of a morphological and code-based classroom intervention on comprehension. In addition to the focus on students with poor reading comprehension a goal was to find out if teaching students about morphology would improve the vocabulary knowledge of all participants by creating an interest in the meanings and the structure of words, or word consciousness. A third aim was to examine teachers' knowledge of word level literacy skills and to discover if such knowledge had an impact on students' literacy achievement. The methods and design considerations are discussed in the first part of this chapter. A description of the quantitative methods used follows the discussion of design, and the chapter ends with a discussion of the process used to analyse the qualitative data collected from teacher and student interviews.

The Research Design

The purpose of educational research is to inform instructional practice but frequently what researchers have discovered about effective instruction is not matched by what teachers do in practice (Bradley & Reinking, 2011). Traditional 'scientific' literacy research relies on strictly controlled interventions, often in laboratory-like conditions and often implemented by researchers not teachers. Frequently, the results are not easily transferred into real-life classroom settings. Reaction to these challenges has given rise to the development of a more flexible, responsive research paradigm which has a number of labels such as 'design experiments', 'formative experiments', 'formative evaluation', 'engineering research' and 'design-based research' (Bradley & Reinking, 2011; Deshler, Hock, Ihle, & Mark, 2011). Bradley and Reinking (2011) use the terms 'design research' or 'design-based research' as broad encompassing terms for this type of research, and they use the term 'formative experiments' to refer to the way the approach has been used in literacy research.

Design research. One way of understanding the design-based approach is to explore the ways in which it differs from experimental research which is sometimes described as 'scientific' or 'quasi-experimental'. A key difference between the two approaches is that design research can be adaptive to changing conditions, unlike conventional experiments in which intervention fidelity is of great importance (Bradley & Reinking, 2011). Another difference is that scientific experiments must be confined to a limited number of variables whilst design research can take a wide range of factors into consideration and acknowledges the complexity of a teaching context. Bradley and Reinking (2011) describe seven methodological characteristics of design-based research which are used to examine the design of the current study. These are that the research is based on theory, its goal is educational improvement, it takes place in authentic settings, the researcher collaborates with the teachers, the intervention is not constrained by the researcher, its intention is transformational, and it uses multiple methods of data collection.

The first characteristic is that design research is theoretical, in that theory plays an important role in framing the research. The theory is used to shape the research intervention to make it effective, workable and appealing to participants. The Simple View of Reading (Gough & Tunmer, 1986) and theories of reading development described by a range of literacy researchers (Byrne, 2005; Ehri, 2005b; Perfetti, 1985; Share, 1995; Thompson et al., 1996; Tunmer & Nicholson, 2011) have influenced the focus of the present study on the assessment of word level literacy skills such as decoding, spelling and morphology because they are important dimensions of skilled reading. The work of Henry (1988, 1993) and Nunes and Bryant (Bryant & Nunes, 2004; Nunes & Bryant, 2006) has shaped the form and content of the intervention in an effort to make the word study sessions appealing to teachers and students. It was intended that the principles underpinning the intervention, which emphasise a small group problem-solving approach to discover some of the conventions of spelling and meanings of prefixes, root words and suffixes, would make the intervention engaging for students and teachers.

Goal orientation is important in design research. Goal orientation refers to the explicit articulation of the desire for educational improvement that drives the research. In the present study the goals articulated to teacher participants were to improve literacy skills for students with poor comprehension skills and to increase vocabulary knowledge for all participants.

Another characteristic of design-based research is that it takes place in an authentic instructional context. The setting for the word level intervention in this study, which was delivered by classroom teachers, involved four secondary schools, so the criterion for authenticity was met. An additional dimension to the authentic instructional context was the link between the study and the key competencies of the New Zealand Curriculum (Ministry of Education, 2007a). Key competencies are defined in the curriculum as being more complex than skills because they “draw on knowledge, attitudes and values . . . They are not separate or stand alone. They are the key to learning in every learning area” (p.12). Several features of the intervention are congruent with the key competencies which are: ‘Thinking’, ‘Using language, symbols and text’, ‘Relating to others’ and ‘Participating and contributing’. The key competencies were referred to explicitly in the invitation to teachers in an attempt to encourage teacher participation.

An aspect of the authentic instructional context characteristic is that the natural instructional environment should not be constrained by the researcher. Variations to the intervention should be allowed to occur naturally and should be documented and analysed as they arise. Although variations were allowed to occur naturally in this study they were not analysed at the time of the intervention so that changes could be made to make the intervention more effective. The characteristic of authenticity of context is linked to the next feature of design research described by Bradley and Reinking (2011), which is that the research should be adaptive and iterative. The current study did not involve collaboration with teachers in the sense that design research would recommend. Most of the data to monitor the effectiveness of the intervention were not collected by the researcher until the intervention was completed,

so no carefully planned alterations to the intervention were made whilst it was being implemented. However there were some adaptive responses made on the part of the researcher. When it became clear that some teachers found it difficult to plan differentiated word study sessions, models of activities were suggested by email. The use of these unadapted resources had not been intended as part of the intervention but this is what occurred in many instances.

Design research is intended to be transformational. It is intended that teacher practice will change for the better as a result of the intervention. The degree to which that happened in the current study will be discussed in a later chapter but it was hoped that the intervention would help to create a climate of word consciousness that teachers would want to replicate with other students after the end of the intervention.

Another aspect of design research that was present in part in the current study was that it used both quantitative and qualitative methods of data collection. Decisions about the kind of data to be collected were made before the study commenced so data collection was not adaptive in the way that design research would suggest is important. However, after Time One testing it became clear that one of the assessment tasks was too short to be of much value. In response to this deficiency in the task the Time Two version of the task was extended. This extension increased its value in that it yielded some interesting information about differences in the word level knowledge of intervention students when compared to control students. The mixed methods design will be described in more detail in the next section of this chapter.

The underlying philosophical position in this study was a pragmatic one. Pragmatism in this context is more than just 'a concern with what works' but includes a view of the world as changing and 'becoming', as well as a belief that learners must adapt to each other and to their environment and that "research always occurs in a social, historical, political and other contexts"(Creswell, 2003, p. 12). The study was designed to investigate the problem of poor adolescent literacy in the context of

secondary schools, to see if an intervention could improve literacy skills for all students in the study and to support teachers to learn how to teach word level literacy skills more effectively. It is best described as an exploratory intervention using mixed methods.

Mixed methods research. A mixed method approach was used in this study for several reasons. The first reason was that the questions in the study could not be fully answered using quantitative methods alone. The quantitative results, in isolation, cannot explain how the intervention was received by teachers and students and how, or if, it has influenced the teaching and learning about words. Qualitative methods, in the form of interviews, were needed to further explore the effects of the intervention on both students and their teachers. Qualitative research can provide ‘thick description’ of the context (Geertz, 1973), which involves an analysis of social interaction which goes beyond the superficial reporting of the interaction. Another reason for using qualitative data was that sometimes unexpected results occur which cannot be fully understood by analysing the quantitative data. Unless interviews of participants are included as part of the design of the study it is more difficult to establish why such results have been found. The use of mixed methods combines the rigorous analysis of quantitative and qualitative data to develop a deeper understanding of a phenomenon (Creswell & Plano Clark, 2011; Johnson & Onwuegbuzie, 2004; Teddlie & Tashakkori, 2006).

One of the decisions needed in a mixed methods study is how to position the researcher and the use of personal voice. An examination of academic writing in the field of linguistics (Hyland, 2005), which explored the way the authors engaged with their audiences and how they positioned themselves as authors, revealed that in the ‘hard’ sciences (such as biology and physics) authors downplayed their role in the research so that readers may focus on “the phenomena under study, the replicability of research activities, and the generality of the findings, subordinating their own voice to that of unmediated nature” (p. 181). In contrast, in academic papers in the ‘soft’ sciences such as linguistics, sociology and philosophy, authors routinely use the first

person pronoun to clearly indicate the perspective from which phenomena have been interpreted. Hyland (2005) does not discuss mixed methods research but the matter of personal reference is examined by Creswell and Plano-Clark (2011) in their seminal text on mixed methods research. Creswell and Plano-Clark discuss the conventions regarding the use of first person pronouns in quantitative and qualitative research and suggest that there are two choices the researcher can make, either “to write the mixed methods report using one consistent voice throughout or to write the report by varying the voice, with the objective approach used in the quantitative sections and the subjective voice in the in the qualitative sections” (p. 253). I have decided to keep as much of a neutral position as it is possible to adopt in most chapters which deal with quantitative material, so will not use first person pronouns in these chapters. However I recognise that I am a participant in the study and in the chapters and sections of chapters which deal with qualitative data, and in the qualitative sections of this chapter, I will use first person pronouns.

The primary quantitative method used in this study involved the collection of literacy data from pre- and post-intervention group testing of students and teachers. In addition to the group testing, a smaller sample of students was assessed individually shortly after the intervention had commenced. The individual assessments were undertaken to assess students’ decoding skills. Qualitative data were collected from interviews and observations of 16 participating teachers in the intervention schools, interviews of 35 students (24 from intervention and 11 from control schools), as well as 7 teachers in control schools. The interviews aimed to find out about the impact of the intervention for both teachers and students and to explore the reasons for the positive achievement of some of the students.

The intervention has been described as an exploratory intervention to capture the idea that it was not designed as a rigid, tightly constrained set of expected actions. However, in terms of the designs described by Creswell and Plano Clark (2011), it fits the description of a mixed methods ‘explanatory’ model. In this model data collection occurs in two distinct interactive phases. The first phase consists of the collection and

analysis of quantitative data, followed by the second phase, which is the collection and analysis of qualitative data. The researcher then interprets how the qualitative results help to explain the initial quantitative data results. In the second phase of data collection for this study, teachers and students were interviewed to gain a deeper insight into the impact and experience of the intervention (Creswell & Plano Clark, 2007; Johnson & Onwuegbuzie, 2004; Teddlie & Tashakkori, 2006).

It was planned to interview all teachers in the intervention schools. One of the reasons for interviewing all intervention teachers was to find out how confident they had felt about implementing a word study intervention. Another reason was to investigate their views on any positive or negative effects of the intervention. Teachers in control schools were selected for interviews if they had students who had made significant gains in Time Two testing. They were asked to identify what they thought might be some reasons for the positive progress of some of their students.

Students who had made gains of one or more standard deviations were asked to participate in interviews. Students who had made gains of this size were selected for two reasons. Firstly it was considered that it would be more likely that successful students would have more insight into the experience of the intervention and what had made it work than students who had not made progress. The purpose of the interviews was to explore students' experiences of the intervention and successful students were more likely to offer rich information than unsuccessful students (Onwuegbuzie & Collins, 2007). A second, ethical consideration influenced the decision to use purposive sampling. A focus on failure and lack of progress might be demoralising for students who had not benefited from the intervention.

In spite of the challenges posed by this approach there are benefits from the use of mixed methods. The challenges involve extensive data collection and two types of analysis, both of which are time consuming. The benefits are that it is likely that a better understanding of the issues relating to the intervention will emerge from the study than if just one method of data collection was used. Although mixed methods are relatively new, their use is becoming more common in educational research. The

paradigm offers a pragmatic solution to the problems inherent in single method designs. Results from purely quantitative research in education are sometimes difficult to interpret and may not capture the complexity of a situation; consequently, more understanding of a phenomenon may be gained by using qualitative methods (Creswell & Plano Clark, 2011; Nagy Hesse-Biber, 2010). The study design is illustrated in a diagram (see *Figure 3-1*).

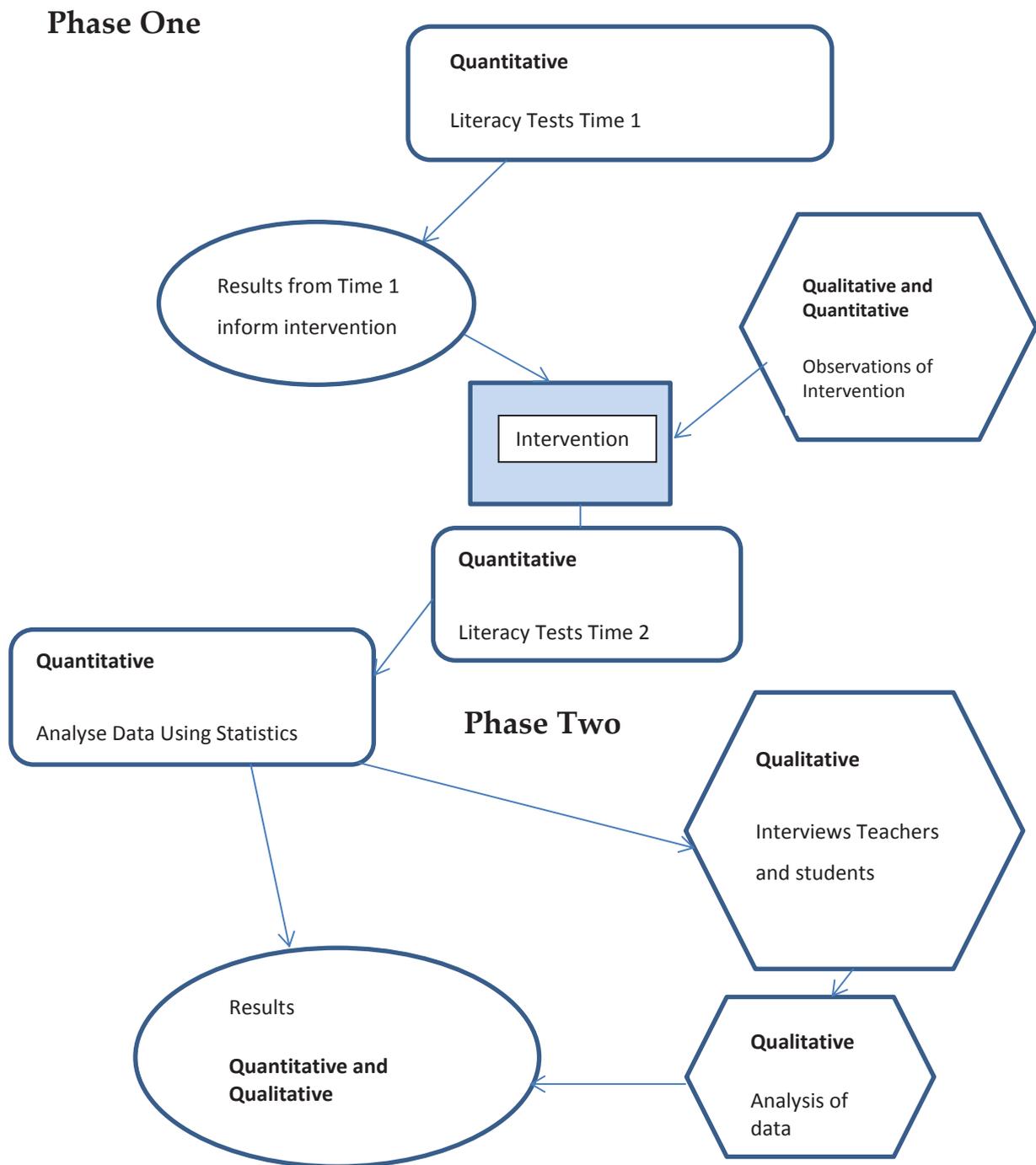


Figure 3-1. A diagram of the sequential mixed methods model of data collection used in the study

Note: Oblong = quantitative, hexagon = qualitative, and ellipse = results

Participants

Schools. All state secondary schools in the lower North Island of New Zealand classified at Decile 6 or below were invited to participate in the study. Deciles indicate the extent to which a school draws its students from low socio-economic communities. Decile 1 schools are the 10% of schools with the highest proportion of students from low socio-economic communities. Decile 10 schools are the 10% of schools with the lowest proportion of these students. Schools classified at Decile 6 or below were selected because it was hypothesized that more students at these schools would be likely to have poor reading comprehension skills than students at higher decile schools. Six schools expressed an interest in taking part in the study and all were selected. All of the schools were co-educational. The schools were from a range of deciles. From the four intervention schools, three were Decile 2 and one was Decile 5. One control school was Decile 3, and the other, Decile 6. The intervention schools volunteered first and expressed a strong preference for being part of the intervention. The control schools' principals were keen to be part of the project but had no objection to acting as controls for the intervention. One of the control schools was concurrently involved in a Ministry of Education professional development programme known as the Secondary Literacy Project (SLP). Through this project the school had an ongoing relationship with the researcher who acted as the external literacy adviser. A similar relationship existed between the researcher and one intervention school through a literacy advisory role funded by School Support Services which was not part of the SLP. The focus of the intervention was quite different from the SLP so it was felt that these relationships would not interfere with the intervention.

Teachers. All year 9 teachers of English, Social Studies and Science at the six schools were invited to take part in the study. These core subjects are compulsory at years 9 and 10 so teachers of these subjects have contact with more students than the teachers of elective subjects. These subjects have high language demands thus making the intervention likely to be seen as relevant by these particular teachers. Teachers were recruited before students were approached because it was envisaged that teachers would distribute and collect consent forms from students and parents.

At the start of the project, 32 teachers volunteered to participate. During the course of the project three teachers in intervention schools withdrew, due to ill health and pressure of work, and one control teacher volunteer did not complete either of the teachers' tests (The Language and Meta-language Terminology Questionnaire), so data from 28 teachers is included in the final analysis. Three teachers were in their first year of teaching and one teacher was in his last year of teaching prior to retirement; however most teachers were very experienced. Details of teachers' years of experience are in Table 3.1. There were 14 teachers of English, five Social Studies teachers, four Science teachers and five teachers of an integrated curriculum, usually a combination of English and Social Studies. Six teachers were male and 22 were female.

Table 3.1
Teachers' Gender and Years of Experience at the Beginning of the Study

		Intervention	Control
Years of Experience	Under 2 years	4	1
	2 to 5 years	2	2
	6 to 12 years	4	4
	Over 25 years	6	5
Gender	Female	11	9
	Male	3	3

Students. The sample of student participants was drawn from a population of 701 year 9 students and one year 10 class of 23 students. The teacher of the year 10 class was keen to participate so a decision was made to include this group of students as they had achieved poor results on literacy testing in year 9.

A total of 301 students took part in the study which included 172 female students (57.1%) and 129 male students (42.9%). Seventy-seven participants were Māori (25.6%), 181 were New Zealand European (60.1%), 24 students were Pasifika (8%) and 19 students were classified as 'Other' (6.3%) The demographic data is shown in Table 3.2. Students were aged between 12 years and 10 months and 15 years and two months, the average age of year 9 students was 13 years and five months whilst the average age of the year 10 students was 14 years and six months. Not all students

were present for every test because of student absences. Numbers of participants are reported for each test in Time One and Time Two in the Results chapter. At the start of the project there were 197 participants in 18 classes in the four intervention schools, and 104 participants in 12 classes in the two control schools. By the end of the year the greatest number of student participants in Time Two testing was 271 which represents a loss of 30 students or 10% of the original sample at Time One.

Table 3.2

Student Participants' Gender and Ethnicity for Intervention and Control Schools at Time One

Ethnicity	Intervention		Control		Total
	Female	Male	Female	Male	
NZ European	63	51	43	24	181
Māori	34	24	10	9	77
Pasifika	8	9	4	3	24
Other	6	2	4	7	19
Total	111	86	61	43	301

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Sub-sample. A sub-sample of participants was selected for individual decoding assessment after the first phase of testing. Sixty-one students were tested individually. Thirty-three students in this group were female and 28 were male, 33% were Māori, 54% New Zealand European, 8% Pasifika and 5% were classified as "Other". The gender and ethnicity distributions are fairly representative of the whole sample (see Table 3.3). This decoding sub-sample was selected using two criteria. The first condition was that students needed to have consented to individual testing when they signed consent forms to agree to participate in the study. The second criterion was that they should have scored relatively poorly on the Time One Pseudoword Spelling test (Bhattacharya & Ehri, 2004; De Graff & Torgesen, 2005; Groff, 2003; Hock et al., 2009).

In this study it was not feasible to test every student individually because of pressure of time. More students with lower scores on the Pseudoword Spelling task were selected than students with high scores because it was hypothesized that students with high Pseudoword Spelling scores would be less likely to have difficulties with decoding than students with lower scores. It was important to include some students with high scores because it was likely the high scoring pseudoword spellers would read pseudowords well. Selection of students for individual testing was constrained because a number of students had indicated on their consent forms that they were prepared to allow the use of their assessment results in the study but they were not prepared to be tested individually. From the available pool of students, 45 with low scores on the Pseudoword spelling test and 16 with high scores on the Pseudoword spelling test were selected. Initially the Pseudoword Spelling tests were marked in a simplified way which identified students' understanding of the alphabetic principle, their knowledge of spelling patterns and their knowledge of conventions. This was useful for the professional development of intervention teachers and to assist all teachers to understand the pseudoword test results. Students who scored below 12 out of 20 for spelling patterns were considered to have poor knowledge of spelling patterns for the purpose of selection for individual testing.

Table 3.3
Gender and Ethnicity for Decoding Sub-sample

Ethnicity	Female	Male	Total
NZ European	17	16	33
Māori	9	11	20
Pasifika	5	0	5
Other	2	1	3
Total	33	28	61

Materials and Procedures

All the group assessment tasks were administered by the teachers who had volunteered to participate in the study. All of the assessment tasks consisted of written tests except for the decoding assessments which required oral responses. Teachers were given instructions on how to administer the tests, and written explanations stating exactly what teachers should say to students were provided for each assessment. Word level skills, namely spelling and vocabulary, as well as reading comprehension were assessed in the first phase of the study which took place in March and April of Term One. In addition, 61 students were tested individually on two measures of decoding. Individual testing was conducted by the researcher in a quiet part of school libraries in one session that took about 20 minutes. Students were tested on six measures in Time One and seven measures in Time Two when an additional reading comprehension test was used so that two measures each were used for comprehension, spelling and vocabulary. A request was made that the tests be administered in the morning rather than in the afternoon and teachers reported that this was common practice for testing. Schools were responsible for the administration of the e-asTTle Reading Comprehension tests. It was suggested that both spelling measures be administered in the same time slot and that the Reading Vocabulary and Understanding Morphology Task be administered sequentially within the same period to compress testing into fewer days. The Language Terminology Quiz, which was brief, was administered in the same period as the vocabulary measures. All tests used, except the asTTle tests, include an evaluation of reliability. All of the reported measures of reliability are greater than .8 which is considered to show good reliability (Field, 2009).

Spelling. Two measures of spelling were used: a pseudoword spelling task and a real word spelling test. Both spelling measures, which were administered to groups, were used to evaluate students' understanding of the phonological and orthographic properties of the English language. Although decoding is usually assessed individually, the pseudoword spelling test was used as an indicator of

students' decoding skills because it was not feasible to test all participants individually due to time constraints. For both spelling tasks words (and pseudowords) were dictated to students who were required to write them down.

Pseudoword Spelling. The assessment task was developed by the researcher (see Appendix One). It was piloted in several schools before its use in this study, resulting in the elimination of words that were too easy or too difficult. The final tasks had 20 items each. Two equivalent forms of the task were written for use in Time One and Time Two. Equivalency was achieved by altering the consonant phonemes and, in some items, vowels, to create a pseudoword that assessed similar knowledge that was assessed in Test A for use in Test B. For example in Test A the nonword *fradding* was used to assess knowledge of doubling consonants to preserve a short vowel sound and in Test B, the nonword *slodding* assessed the same knowledge. The purpose of using a polysyllabic pseudoword spelling task was to measure adolescent students' knowledge of the code of English. Pseudowords with multiple syllables were used because students are frequently exposed to many long, unfamiliar words when they reach secondary school. The spelling of pseudowords reveals knowledge of sound-letter correspondences (De Graff & Torgesen, 2005), orthographic knowledge and, in some cases, morphemic knowledge. Orthographic knowledge is information that is stored in memory and used to write down spoken language; it encompasses both knowledge of the patterns that are found in the language and the mental representation of specific words or word parts (Apel, 2011). Morphemic knowledge is an awareness of the way that bound and unbound morphemes are written. Test reliability was measured on 100 randomly selected scripts using Cronbach's alpha for internal consistency. The reliability score was $\alpha = .89$.

Pseudowords can often be written in more than one way but spellings must be phonologically plausible to be accepted as correct. For example, the pseudoword *squainful* could be spelt *skwainful* or *skwaynefull* to be phonologically plausible. However, because the combination of letters /skw/ is not present as an established pattern in English orthography, it is considered to be orthographically illegal (Kemp,

Parrila, & Kirby, 2009). The spelling of the suffix *ful* rather than the choice of *full* at the end of the word is an indication of morphemic awareness, because the writer has made a choice to use *ful* rather than the orthographically correct *full*. The *ful* version is the correct spelling of the suffix.

The marking system rewards more sophisticated use of orthographic knowledge and morphemic knowledge above phonological plausibility. Each syllable of each pseudoword was scored. A decision was made to mark syllables rather than phonemes for the sake of convenience and speed of marking. If the syllable was phonologically plausible but orthographically illegal it was worth one mark. For example: *skrayt* for *scrate/scrait* was worth 1 mark. If the syllable was orthographically correct, it gained two marks: *scrait/scrate* was worth 2 marks. A correctly spelt suffix such as *ful* gained 2 marks but *full* was worth 1 mark.

Examples:

<i>fradding</i> –	<i>fradd ing</i>	$2 + 1 = 3$
	<i>frad ing</i>	$1 + 1 = 2$
	<i>fard ing</i>	$0 + 1 = 1$
<i>gowmicious-</i>	<i>gow mi cious</i>	$2 + 2 + 2 = 6$
	<i>gow/gou mi shus/iss/</i>	$2 + 2 + 1 = 5$
	<i>go mi cious</i>	$0 + 2 + 2 = 3$
<i>choamscraited-</i>	<i>choam scrait ed</i>	$2 + 2 + 2 = 6$
	<i>chom skrat id</i>	$0 + 0 + 1 = 1$

For purposes of professional development, the Pseudoword Spelling task was marked in a simplified manner for ease of interpretation by teachers (see Appendix Ten).

Diagnostic Spelling Tests. Real word spelling was assessed using Test 4 from the Diagnostic Spelling Tests (Crumpler & McCarthy, 2006). This test was developed in the United Kingdom for students aged 11 to 15. The words were identified by secondary teachers as words causing difficulties for students in 'Key Stage 3' of the education system in the United Kingdom. This stage refers to the three years of schooling equivalent to years 8, 9 and 10 in New Zealand. Test words were drawn from general as well as subject-specific academic vocabulary, and include words such as 'allowed', 'parliament' and 'laboratory'. Test A was used in Time One and the equivalent Test B was used in Time Two. Each word was dictated firstly in isolation, then in a sentence and then it was repeated. Each word has to be accurately spelled, with no half marks awarded. The raw scores from this test were used to measure real word spelling ability. Test validity is assured with a close match to the National Literacy Strategy and *Framework for Teaching English Years 7, 8 and 9* in the United Kingdom, although it is possible that the test is less valid for New Zealand secondary students. Test reliability was measured using Cronbach's alpha to measure internal consistency which was $\alpha = .93$. Reliability was ensured by including 40 items, when only 30 items are considered to be necessary to achieve reasonable reliability (Crumpler & McCarthy, 2006).

Vocabulary. Two measures of vocabulary were used in the study. One was a standardised New Zealand test and the other was a task that assessed the understanding of morphology. The morphology task was developed by the researcher to assess students' knowledge of common prefixes, suffixes and root words.

The Progressive Achievement Test: Reading Vocabulary (Darr et al., 2008) is a multiple choice test with 40 items. Tests are designed to be used with certain year levels so Test 6, appropriate for year 9 students, was used in this study. The test involves silent reading and has a time limit of 25 minutes. The target words are used in sentences and students choose the word with the same or nearly the same meaning from a set of 5 options.

An example of a test item is:

“The doctor could not find any **symptoms.**”

- A. broken bones
- B. nurses
- C. signs
- D. cures
- E. drug

Raw scores were used to calculate scaled scores to measure students' vocabulary skills. Norms for this test were developed in New Zealand. The reliability co-efficient was calculated using the ACER Quest software package (Darr et al., 2008) and Test 6 had a Quest Test Reliability of .91.

The Understanding of Morphemes Task was the second measure of vocabulary (see Appendix Two). Knowledge of morphemes, particularly of prefixes, root words and suffixes, can contribute to the understanding of novel vocabulary which includes known word parts, so this morphology assessment task was classed as a measure of vocabulary knowledge. The task was developed prior to the start of the study and trialled with two year 9 classes. In the first instance, a list of 40 words that appeared in junior English, Science and Social Studies texts were sent to twelve secondary teachers of English, Science and Social Studies who were then asked to endorse or eliminate the words on the list depending on their views of whether the words were appropriate for year 9 students or not. The refined list of 20 words was then used to develop a trial assessment task. The task was further modified in response to students' test results with difficult items excluded. A second task of similar difficulty was used in Time Two. Words for the second task were taken from glossaries and vocabulary lists in Social Studies and Science texts used in years 9 and 10. Words were selected with prefixes, root words and suffixes that had been used in the first test but in different

configurations. For example in Test 1 the words *export*, *telephone* and *geology* were used and in Test 2 *import*, *television* and *biology* were used.

Teachers were given written instructions on how to explain morphemes and then asked to model how the test should be answered. An explanation was provided for teachers in their test administration instructions. There were 20 items in the task. In the first instance students coded the words according to whether they knew the words well enough to explain the meaning to a peer, were slightly familiar with the word but not confident about explaining it, or whether they did not know it at all. Students either used a colour code with coloured pencils (green for secure knowledge, amber if they were unsure and red for unknown, known as the 'traffic light' system), or they marked each word with a tick, question mark or a cross. For example if a student was confident about explaining the meaning of the word *recycle* the word would be coloured green (**recycle**) or marked with a tick (recycle ☑). The number of words that students self-identified as being known was recorded. Then students were asked to break the words into parts (morphemes) and to explain the meaning of the word parts and the whole word in a sentence. The number of correct morphemes and correct definitions of whole words were recorded as a measure of understanding of word parts and polysyllabic words likely to be encountered in year 9. An example from the test is the word *recycle*. The word had to be broken up into two parts: *re* and *cycle* with each of these defined. Then students needed to define the whole word.

re-cycle *re*= again *cycle* = a process (2 marks, one for each word part)

recycle – using things again to make them into something new so material is not wasted (1 mark)

The maximum scores for each section were 20 marks for Self-Identifying known words, 45 marks for explaining Word Parts, and 20 marks for explaining the Meanings of whole words. The three sub-test scores were recorded and a Morphemes Task total was calculated from the final two sub-tests, with self-identified words excluded, so the maximum score was 65 marks. Test reliability was measured on 100 randomly selected

scripts using Cronbach's alpha for internal consistency. The reliability score was $\alpha = .84$.

Decoding. One reliable way to evaluate decoding skills is to assess students' reading of isolated real words and pseudowords. Pseudoword reading tests are frequently used to assess decoding skills of beginning and older readers (Bhattacharya & Ehri, 2004; De Graff & Torgesen, 2005; Groff, 2003; Hock et al., 2009). Students were tested on two measures of decoding; a real word reading test and a pseudoword reading test. Two measures were used to assess decoding skills in accordance with good assessment practice.

Word Reading sub-test from the Wide Range Achievement Test. This test, the WRAT3, (Wilkinson, 1993) was used to assess real word reading. This sub-test assesses an individual's ability to name letters and pronounce 42 words out of context listed in four columns across a page in increasing levels of difficulty. Students were asked to look carefully at each word and read it aloud. Testing continued until 10 successive words were read incorrectly or not attempted. Scoring was based on the number of words read correctly. The reliability of this test for students aged between 13 and 14 years is $\alpha = .90$ and $\alpha = .92$ for 15 year olds, measured by Coefficient alpha as reported in the manual.

Nonword Reading (Martin & Pratt, 2001) was used to assess phonological recoding ability. The test consists of a booklet which has a range of pseudowords on each page. It begins with a practice page of single letters for which the student must give the matching sound. Then it progresses from simple digraphs such as /sh/ and /wh/ to pseudowords such as *yil* and *kig*. The final set includes pseudowords such as *stulsian* and *wedient*. Students are asked to read each nonword aloud and testing is discontinued when 8 words have been read incorrectly or not attempted. One mark is awarded for each nonword that is pronounced correctly phonetically. The maximum possible raw score on the test is 54. The internal consistency reliability of the test

using the Kuder-Richarson measure is 0.96 for forms A and B of the test. The test has been standardised using data from Australian students.

Reading comprehension. At Time One and Time Two, e-asTTle tests were used to assess reading comprehension. A PAT Reading Comprehension test was used in Time Two so that there would be two measures for each skill assessed.

Electronic Assessment Tools for Teaching and Learning, or e-asTTle (Auckland UniServices, 2010), is an online assessment tool developed to assess students' achievement and progress in reading, mathematics and writing. The asTTle bank of tests was developed by Hattie, Brown and Keegan (2004) at Auckland University for the New Zealand Ministry of Education. The test bank enables teachers to create and analyse literacy and numeracy tests for students at curriculum levels 2–6. Curriculum level 2 is the equivalent of Grade 3 in the United States and Curriculum level 6 would equate with Grade 9. The e-asTTle Tests are generated from a computerised bank of items which enables the focus and level of difficulty of the test to be selected by the user/teacher. The silent reading tests can be set to focus on various aspects of reading comprehension such as making connections, reading for information or making inferences, and can cover a range of up to three curriculum levels. A numerical scaled score and curriculum levels are generated. The numerical scaled score was used in this study. The tests have been designed using Item Response Theory, thus, a student who answers more difficult questions correctly will earn a higher score than one who answers easy questions correctly but who fails to answer the difficult questions. Difficulty, or ease, of test items are calculated from student responses when the test was developed. Therefore, an item which few students answered correctly will be deemed difficult and one which many students answered correctly will be classed as easy. There are no reported measures of reliability for the e-asTTle reading test.

The Progressive Achievement Test: Reading Comprehension (Darr et al., 2008) is a multiple choice test with 42 items. The test consists of a booklet with 10 passages of varying degrees of difficulty. Within each test is a range of text types and questions of varying levels of difficulty. For example in Test 6, recommended for year 9 students,

there are narratives, non-fictional explanations and a poem. Questions range from those that demand literal retrieval, testing straightforward comprehension, to questions which require the reader to comprehend implied information from large sections of text. The questions and texts are arranged in cycles of increasing difficulty to retain students' engagement throughout the test. The level of difficulty of a test item is evaluated using Item Response Theory. A Rasch Measurement scale has been constructed so that students' scores on different tests can be measured and compared by the test users. Reliability of the reading comprehension test is .91 on the ACER Quest software package (Darr et al., 2008).

Terminology. The *Students' Language Terminology Quiz* (two versions, see Appendix Three) was a questionnaire developed by the researcher to assess students' knowledge of phonological, orthographic and morphemic terminology. In Time One the questionnaire was short with only two sub-tests. The reliability of this measure was low, $\alpha = .52$. An expanded version was developed for the Time Two testing because the data collected at Time One from this questionnaire was found to be insufficient to evaluate what students knew about sounds, spelling patterns and word parts including prefixes, root words and suffixes. The reliability for the expanded measure used in Time Two was $\alpha = .84$.

In Time One, the first sub-test consisted of a task which involved students identifying terms related to language, decoding and spelling as well-known, slightly familiar or unknown using the 'traffic light' system explained in the test instructions. This is the same system that was used in *The Understanding of Morphemes Task*. The second sub-test required students to define six terms such as *syllable*, *blend* and *digraph*. In the second version of the test used in time two, students were required to count phonemes in words, count numbers of syllables in polysyllabic words, identify blends and digraphs and define prefixes, suffixes and root words.

The Language and Meta-language Terminology Questionnaire (see Appendix Four) was used to assess teachers' knowledge of terminology and ability to analyse words from phonological, orthographical and morphological perspectives. Teachers'

understanding of terminology and their ability to count phonemes and syllables in words, to identify blends and digraphs and to define common prefixes, suffixes and root words was assessed by using a questionnaire adapted from Allcock's Teacher Questionnaire (Allcock, 2012). The questionnaire consisted of a pen and paper task with 50 items. The questionnaire had high reliability, Cronbach's $\alpha=.92$.

Professional Development

After the Time One assessments were marked and analysed, a meeting was held at each school to explain the results to the teachers in intervention and control schools. All students' test papers were marked for teachers, even those of non-participants. Teachers completed the Language and Meta-Language Terminology Questionnaire at the start of these meetings. Each teacher was given a spreadsheet of individual students' test results for all measures. They were provided with a written explanation of what the scores signified to help them interpret test results (see Appendix Five). In addition, the researcher answered questions to clarify teachers' understandings of concepts such as standardised scores and raw scores. The purpose of the pseudoword spelling task and the understanding morphology task were explained. At this point the control teachers returned the test scripts to the researcher and their professional development was completed. For the control teachers the entire professional development (PD) session had focused on developing a deeper understanding of their students' test results and these meetings lasted approximately 60 minutes. After the intervention was completed control teachers took part in a professional development workshop to cover the content of the intervention. They were provided with the tasks that had been developed as models for intervention teachers and were encouraged to foster word consciousness in their future teaching.

Teachers in the intervention schools retained the students' pseudoword spelling assessment papers so they could make a closer analysis of results which would inform their foci in the intervention. Assessment papers were collected at the time of observations. Teachers were asked to identify any students who had poor spelling and

poor vocabulary skills, those who were poor spellers with good vocabulary skills, and those students who had both good spelling and vocabulary skills. Students who scored below the mean for spelling and vocabulary tests were considered to have poor spelling or vocabulary skills. Students who scored well above average were considered to be good spellers or to have good vocabulary skills. A small group of students had extremely low scores on all of the measures, but in most cases teachers were aware of the difficulties faced by these students. It was intended that teachers would differentiate the intervention according to the levels of skill demonstrated by students in Time One testing. The professional development meetings were longer in intervention schools than in control schools because teachers needed to understand the demands of the intervention in more detail. Most of the intervention school meetings were about an hour and forty-five minutes long. The intervention had been described in general terms in the recruitment meetings which took place at the start of the project but more detail in the form of a handout describing the principles of the intervention was supplied at this post-test meeting (see Appendix Six).

On-going support was provided to the intervention teachers through email contact. Model tasks for spelling and morphology were sent to intervention teachers once a week throughout terms two and three. One intervention school provided more frequent opportunities for contact with teachers because the researcher was working at the school under the auspices of School Support Services to give guidance to a new literacy leader. The three intervention teachers in this school were observed at least four times and delivery of the intervention was modelled in detail by the researcher. These teachers were assisted with the development of the topic word tests. Support to develop the topic word tests was offered to all intervention teachers and two other teachers availed themselves of this assistance (see Appendix Seven for an example of an email of support). In addition there was an embedded approach to the intervention in this school. Word study sessions were linked to reading and writing activities using the words that were analysed in word study sessions.

Intervention

The intervention was based on a set of principles, which can be summarised as follows. The word study sessions should be differentiated so that the topics of the sessions were meeting needs of students as identified in the pre-intervention testing. Secondly, students with spelling difficulties need to be assisted to see patterns and to work out some of the spelling 'rules' and conventions in a problem-solving activity rather than being told the 'rules'. Thirdly, all students need to learn about what Henry (1988) calls the 'layers of language', in other words the Anglo-Saxon, Romance and Greek influences on English vocabulary, orthography and morphology. All students need to learn common Latin and Greek root words, prefixes and suffixes to help develop vocabulary building skills. The word study sessions should be short and take place twice a week, and small groups should be used rather than whole class instruction. It was hoped that the word study sessions would engender an interest in the meanings of words as well as more awareness of how they are formed.

The intervention was not a pre-planned package of activities for teachers to present to students in a prescribed sequence. It was intended to use the first round of testing as formative assessment to show which students had difficulties with specific aspects of spelling and understanding of morphemes. Teachers were asked to identify students' spelling and/ or vocabulary issues evident from the analysis of test results. Teachers were then asked to select 20 words of importance in each topic that students were studying in terms two and three. They were asked to set pre- and post-topic tests with these key words. Students needed to spell and define these words before they learned about them in the context of a topic of study. The key words were then used to teach spelling patterns and morphemes that were illustrated in the key topic words. Teachers were expected to set aside at least two 15 minute lesson slots to teach spelling and vocabulary each week. These mini lessons were intended to be problem-solving group activities designed so that students could work out the patterns or principles of the spelling or vocabulary tasks that were set for them.

The intervention was modelled on a decoding intervention described in Henry (1988) and a series of studies to improve students' understanding of morphology designed by Nunes and Bryant (Nunes & Bryant, 2006). Key features of the intervention were that teachers were asked to teach students about the following: letter-sound correspondences; common ways to divide words into syllables; common morpheme patterns; conventions of written forms of English; and an elementary understanding of the history of the English language in order for students to be able to distinguish between words of Anglo-Saxon origin and those of Greek and Latin origin. A summary of this information was given to all intervention teachers at the start of the project (see Appendix Six).

In addition, it was emphasised that it was important that students with poor literacy skills were not singled out and removed from class for special instruction, but were included in groups to work collaboratively. Anecdotal evidence from secondary teachers in this study, and from students, suggests that adolescent students do not like to be removed from class and made to feel different from their peers, especially if the purpose of the removal is for remedial instruction. In a report on provisions to adolescents from speech and language therapists, several problems associated with withdrawal programmes are described (Larson, McKinley, & Boley, 1993). Withdrawal from class often means that students miss the teaching their peers receive in their absence. Another negative factor is that continuity between the intervention and the normal class programme is lacking, along with a lack of communication between the person delivering the intervention and the class room teacher. In addition, many adolescents do not want to feel different from their peers and they are sensitive about being seen to have problems that require individual or small group withdrawal from the class (Larson et al., 1993).

Teachers were expected to work out their own problem-solving tasks which used the key words students were studying in their topics of work. However models of appropriate tasks based on what had been found out in the first round of testing were provided to intervention teachers (see examples in Appendix Eight). In addition

to this support each school was given a copy of Allcock's (2009) spelling resource, *Spelling Under Scrutiny*, which covers the phonological, orthographic and morphemic knowledge needed for successful spelling. It was intended that this resource would serve as a reference book for teachers as well as providing some ideas for teaching activities for the word study sessions.

Fidelity measures. During the course of the intervention each intervention teacher was formally observed once in term three to see how closely the implementation of the intervention was congruent with the principles underpinning the intervention. At the end of each term the teachers were asked to complete a log describing the topics they had covered with their students, and at the end of the project, teachers completed a survey about how well they felt they had implemented the elements of the intervention. The survey used a four point Likert scale to indicate how closely teachers felt they had adhered to the principles of the intervention (see Table 4.19).

Interviews to Explore the Impact of the Project on Teachers and Students

The interviews contribute to the qualitative element of this mixed methods study. Intervention teachers were interviewed, and control teachers and student participants were selected for interviews on the basis of the quantitative data collected in the post-intervention testing. Interviews for teachers were conducted in teachers' classrooms, in small offices and in staff work rooms. Student interviews were conducted in school libraries or interview rooms. The interviews were semi-structured with 6-7 key questions (see Appendix Nine).

Sixteen intervention teachers, seven control school teachers and a selection of 35 students (24 from intervention schools and 11 from control schools) were interviewed individually and face to face. Two control teachers were absent on the day of the interviews so these teachers were sent questions and responded by email. One intervention teacher was not available for interviews and did not respond to an invitation to answer questions by email. Students were selected from the pool of

students who had agreed to be interviewed when they signed their original consent forms at the start of the project. From this group, all students who had made gains of at least one standard deviation above the average gains for each test, in at least two or more measures, were selected for interviews. Successful students were selected because it was considered more useful to find out why students thought they had done well when they had made progress than it would be to interview students who had not made any gains. In addition, it was considered that the interviews would be easier to conduct if positive achievement was the reason for the interview. Control teachers with at least four or five students who had made significant gains were selected for interview.

Intervention teachers were asked about their personal experiences of the intervention. Control teachers were asked about the ways they had taught spelling and vocabulary to students who had made good gains and the students were asked general questions about their school experiences and about spelling and vocabulary teaching that they had experienced. A similar sequence of questions was used for all intervention teacher interviews. A slightly modified set of questions was used for control teachers that excluded questions about the implementation of the intervention. A different set of questions was developed for students (see Appendix Nine). Some examples of the questions for the students about literacy learning are:

1. Can you think of anything your teachers have done to help you learn new words that worked particularly well?
2. When you are reading and you come across a long word you have never seen before and you don't know it, what do you do?

Two of the questions students were asked related to their understanding of the nature of intelligence and how they perceived success. These questions were asked because the literature relating to attribution theory (Anderman & Midgley, 1998; Weiner, 1985) suggests that if a person believes that success is a consequence of effort rather than luck, then that person is more likely to persevere when learning is

challenging. It seemed important to find out what students thought about their successes and failures so that this understanding could inform literacy teaching practices.

Interviews with teachers lasted between 45 minutes and an hour. Interviews with students lasted between 15 and 25 minutes. Interviews were recorded on a digital tape recorder and the responses were typed into word documents by a professional typist. The interview transcripts were analysed by manual coding into themes described in Chapter Five. There were no preconceptions about what would emerge from the analysis of the data. In this respect, some of the features of grounded theory (Charmaz & Henwood, 2008; Glaser & Strauss, 1967) were followed. Grounded theory explores participants lived experiences and “fosters viewing individual behaviour as embedded in situations and social contexts, fits either constructivist or post-positivist epistemologies, it can bridge qualitative and quantitative traditions” (Charmaz & Henwood, 2008, p.241). The data were analysed using the constant comparative method described by Glaser (1965). In this method each transcript is coded into thematic categories which are then compared with the next transcript to find similarities and differences.

The aims of the interviews were to find out how the intervention had influenced the intervention teachers’ teaching of spelling and vocabulary, and how control teachers had taught spelling and vocabulary, particularly when students had done well. The interviews examined how the students felt about their literacy skills in general, and, in particular, how they felt about spelling and vocabulary teaching and their achievements in the testing. Underpinning the analysis of the interviews was a desire to explore participants’ lived experiences and to understand the meanings they had derived from the process of being part of the intervention, with a view to finding out how to create situations in which teachers and students want to engage in learning about words.

Factors to consider with regard to interpretation of interview data. The purpose of carrying out research interviews is to develop knowledge or to gain a

deeper understanding of a situation. However, a number of factors which may have influenced the collection of data need to be considered when evaluating the knowledge that has been generated. Most of these factors cannot be eliminated as influences but need to be borne in mind when interviews are prepared, conducted and analysed (Wengraf, 2001; Willig, 2008).

Contextual factors. Some of the contextual factors which will impact on the outcome of the interview are related to the nature of the relationship between the interviewer and the interviewee and this relationship will determine the ambience that is created during the interview. Another factor to consider is the stake that the participants have in the interview. The researcher hopes to find support for some position or theory. In the present study the value of the intervention is being considered, and this will influence the tone of the questions and the response to answers (Willig, 2008). At stake for the teacher interviewees might be their professional standing, or feeling about their self-efficacy; students will have a range of feelings and thoughts about being interviewed by a relative stranger who is a teacher. It is possible that during the interviews teachers' responses were biased in favour of the project because of the good working relationships that already existed between the researcher and some of the teacher participants, and which developed between the researcher and other teacher participants in the course of the project.

Interview questions. In the present study most of the questions were open questions and some questions were improvised based on the responses received. On a continuum between unstructured and heavily structured, the interviews in this study could best be described as moderately structured (Wengraf, 2001). Questions were sufficiently open so that answers could not be predicted in advance. However, it is likely that there was an unspoken expectation that most intervention teachers would find some positive aspects of the intervention to discuss because they had agreed to take part in the study. This factor needs to be considered when interview data is discussed. The type of questions asked were descriptive, such as: "What sort of a year have you had?" and evaluative, for example: "What were some negative aspects of the

intervention?" A balance between questions focused on the aims of the research study and allowing space for the interviewee to respond freely to questions (see Willig, 2008) was attempted through the adoption of an encouraging and responsive demeanour by the interviewer, but not necessarily achieved.

Ethical considerations. Ethical considerations are highly important with regard to interviews. Although it might be comforting to view an interview between an educational research student, who is a teacher, and another teacher, as a conversation or dialogue between equal peers, an inescapable imbalance of power operates in a research situation (Kvale, 2006). The researcher decides on the topic of the interview, writes the questions, follows up on some answers and not others, and decides when to terminate the interview. In addition, the researcher has a monopoly on interpretation of the data generated by the interview (Kvale, 2006). With regard to student-teacher interviews, Kvale (2006) argues that it is not possible for a student to be on an 'equal' footing with a teacher; the nature of the relationship includes an imbalance of power, so the impact of power differences in the situation should not be minimised or ignored.

Ethical considerations in research are not confined to the way interviews are conducted or interpreted. Brinkmann and Kvale (2008) describe the ethical considerations that need to be explored from the inception of a research project, starting with the development of research questions, the conduct and analyses of interviews or observations, and carrying right through to publication of the study. They describe some key aspects of qualitative research that demand careful ethical consideration as 'fields of uncertainty' (p. 265). These fields of uncertainty are: informed consent, confidentiality, consequences and the role of the researcher. In a mixed methods study such as the present one, issues of consent and confidentiality are addressed through the University's Ethics committee approval process, but the consequences of the research and the role of the researcher are not explicitly explored in this process.

Thinking about the ethical considerations regarding the consequences of a research study is not confined to qualitative research. Messick (1988, 1989, 1995) has

written extensively on issues of validity in testing and test development, including the ethical conduct of testing. Messick is clear that the consequences of testing should not be detrimental for people being tested and that if the purpose of tests was to reveal some type of educational need in students then it was not ethical to conduct the test unless resources were available to meet the needs, or attempt to meet the needs, that had been identified. Other ethical considerations with regard to consequences in the present study include the danger of students being labelled as 'deficient' in some way as a result of poor achievement on the literacy tests. Students selected for interviews had achieved some success in the intervention so negative consequences were less likely for this group of participants. In addition, the interview questions included an exploration of why they thought they had done well in the tests.

Summary

This chapter has explained the mixed methods used in the study. The aim of the study was to investigate students' word level literacy skills at the start of secondary schooling. The study was designed to examine the degree to which a word level intervention could improve the decoding and spelling skills of poor readers, and improve vocabulary knowledge for all participants by creating environments in which word consciousness was raised. A secondary aim was to explore the word level knowledge of teachers and to find out if teachers' literacy knowledge influenced students' literacy achievement. A quantitative-qualitative explanatory design was chosen to answer the research questions. The quantitative aspect of the study involved a pre-test and post-test design. Year 9 and 10 students were assessed on a range of word level literacy assessments and reading comprehension. The intervention was designed to provide two 15 minute differentiated word level instruction sessions each week in terms two and three, a total of 21 weeks. The content of the word skill instruction was intended to be informed by test results from pre-intervention testing, whilst for students in control schools their instruction followed the customary curriculum without any special focus on word study instruction. After the post-intervention testing at the end of the school year, intervention teachers were

interviewed to find out how they had experienced the intervention. Some control teachers and a selection of students from both intervention and control schools were interviewed in the first term of the year following the post-intervention testing. The following chapter will present the key quantitative findings from the study whilst the findings from the interviews will be described in Chapter Five.

Chapter 4 : Results of Quantitative Analyses

This chapter presents a summary of the key quantitative findings in the study. Results are organised around the research questions that have directed the investigation. The first question concerns the word level literacy skills of adolescent students and the relationships between these skills. A key aim of the study was to find out the extent to which students with poor reading comprehension had a limited understanding of the code of English. It was hypothesized that poor knowledge of the code might be influencing the poor comprehension achievement of students. A second question was to see if a differentiated spelling and morphology intervention could support poor spellers to become better readers. The intervention was intended to assist all students to improve their understanding of English morphology, and thus, improve vocabulary skills. The third question examined the level of teachers' knowledge about word level literacy skills. The purpose of this investigation was to understand how much prior knowledge teachers had at the start of the intervention, and to see if the level of knowledge was linked to students' literacy achievement. The implementation of the intervention was examined by observing intervention teachers, by collecting and analysing individual teachers' logs describing teaching topics covered in the word study sessions, and through a teacher self-assessment survey in which teachers evaluated their implementation of the intervention.

Quantitative data were analysed to examine both student and teacher knowledge and the efficacy of the intervention. Results for the whole sample at Time One are presented first, followed by the findings for the sub-sample participants who were assessed on decoding. In order to examine the relationships between the variables, bi-variate correlations were analysed for the whole sample and then the decoding sub-sample. The relationships between student measures were further examined using regression analyses. The efficacy of the intervention was examined by presenting descriptive details of gains made by both the intervention and the control groups and the means of the gains were compared using an Analysis of Variance (ANOVA). Teacher knowledge was presented using descriptive data followed by an

ANOVA to examine differences in intervention and control teachers' knowledge after the intervention.

Standard or hierarchical regression analyses were performed to examine the contribution word level skills made to reading comprehension achievement. The standard method was selected in order to examine the influence of the selected variables and using forced entry or stepwise methods might have led to the exclusion of significant variables from the model (Field, 2009). A standard regression analysis was conducted to find out if teacher knowledge could be linked to students' literacy gains. In all of the analyses the alpha level was set at $p < .05$.

Effect sizes for significant differences in means were calculated using Cohen's d , which is the mean difference divided by a pooled standard deviation. The measure is useful to compare the difference in means in terms of the proportion of standard deviations the difference represents (Coladarci, Cobb, Minium, & Clarke, 2004). The use of Cohen's d is recommended in situations where there are large differences in intervention and control sample sizes (Field, 2009) which was the case in this study. Effect sizes should be evaluated in the context of the relevant research domain (Field, 2009; Hedges, 2008) which in this study is the context of quasi-experimental literacy interventions in secondary schools. Benchmarks developed to assist in the evaluation of such interventions suggest that effect sizes between .20 and .30 are what can reasonably be expected (Hill, Bloom, Black, & Lipsey, 2008).

Qualitative data were collected through interviews to further evaluate the impact of the study on teachers and students. The research questions that required investigation using qualitative data related to the development of word consciousness and teacher confidence to implement the intervention. The analysis of qualitative data is presented in the following chapter.

Literacy Skills for the Whole Sample at Time One

To investigate students' literacy skills the e-asTTle reading comprehension test and five measures of word level literacy skills were administered at the start of the

study. The word level measures consisted of two measures of spelling (conventional and pseudowords), two vocabulary measures (a general measure and one measure of morphemic knowledge), and a short language terminology quiz. Because some students were absent for some of the assessments the number of participants is reported for each assessment task. Results of Time One testing are shown in Table 4.1. The data in Table 4.1 show that the sample mean scale score for the e-asTTle reading comprehension test was 1490.30, which is close to the national mean of 1497 for year 9 students in Term One (Auckland UniServices, 2010). A one-sample *t*-Test showed that there was no significant difference between the sample and the national norm, $t(288) = -1.004, p < .32$.

Table 4.1
Results of Time 1 Testing

Test	N	Maximum	Mean	SD	Skewness	Kurtosis
e-asTTle reading	Scaled 291	1734	1490.30	93.40	-.396	-.251
e-asTTle reading	Level	>6A	4P			
Pseudoword Spelling	Raw 285	109	72.11	19.99	-1.242	1.658
Diagnostic Spelling	Raw 271	40	17.38	9.31	.065	-.869
PAT Vocabulary	Raw 274	40	21.70	8.25	.027	.293
PAT Vocabulary	Scaled 274	115.9	65.28	13.14	.566	.990
Morphology Self-Id	Raw 282	20	9.28	4.69	-.067	-.719
Morphology Meanings	Raw 284	20	6.34	4.23	.292	-.799
Morphology Word Parts	Raw 284	45	7.81	7.32	1.006	.479
Morphology Total	Raw 284	65	14.13	10.44	.859	.128
Language Terms Self-Id	Raw 257	14	3.94	2.60	.659	-.127
Language Terms	Raw 254	6	1.05	.88	1.201	.128

An analysis of the distribution of the sample curriculum levels (illustrated in *Figure 4.1*) shows that there were slightly more proficient readers than poor readers in the sample. The statistics for skewness and kurtosis did not indicate an unusual distribution in e-asTTle scores. The New Zealand curriculum is divided into eight levels and year 9 students are expected to work at Levels 4 of the curriculum. The curriculum levels are further differentiated in the e-asTTle tests with the letter B indicating a basic level of curriculum knowledge, and the letter P indicating proficiency at the level. An A indicates an advanced performance.

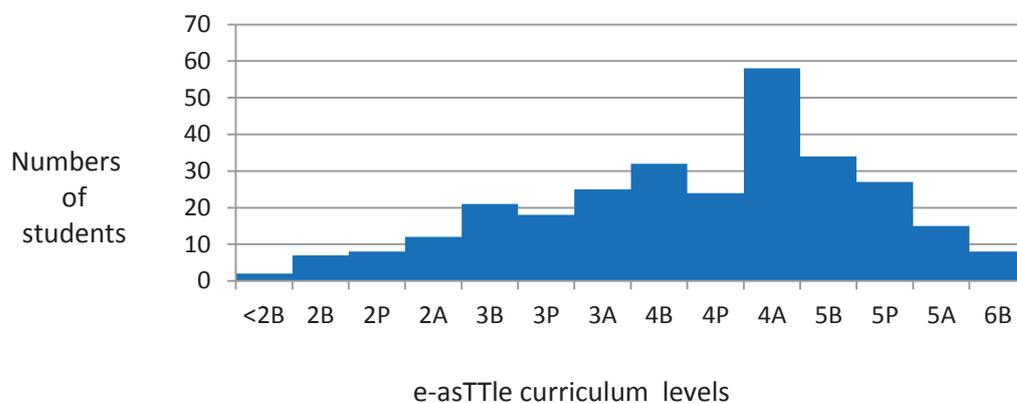


Figure 4-1 The distribution of curriculum levels in the e-asTTle reading test in Time One

Curriculum levels are an indication of proficiency. There were 50 students who were placed at Level 3B or below and 84 students who were at curriculum level 5B or above at Time One. Only two students scored so poorly that they did not reach curriculum level 2B. Another method used to identify struggling adolescent readers was described by Hock and colleagues (2009) who defined struggling readers as those who performed at and below the 40th percentile on a standardised state reading assessment. In the present study percentiles were calculated using e-asTTle scores and the Frequencies analysis on SPSS software. It was found that 117 students scored below the 40th percentile for reading comprehension in the e-asTTle reading assessment. However, the cut off score for the 40th percentile, for this sample, falls into curriculum level 4B which is probably not sufficiently below the national mean of 1497 (level 4P),

to label students as 'struggling'. If a more stringent measure is applied, counting students at or below the 30th percentile for e-asTTle reading, then 87 students in the sample would be considered to be struggling with reading comprehension and 202 could be categorized as proficient readers.

The Pseudoword Spelling task results show that most students were able to represent the sounds they could hear in polysyllabic pseudowords. The mean of 72.11 out of a maximum score of 109 with a relatively large standard deviation of 19.99 indicates that most scores were clumped towards the higher end of the range of scores. The high statistic for skewness of -1.242 is evidence of this. The high statistic of 1.658 for kurtosis indicates that the distribution has too many scores in the tail and is too peaked to be considered a normal distribution. The scores ranged from zero to 103 showing that some students had serious difficulties with phonemic awareness. An inspection of the frequency table showed that 52 students, 18% of the sample, could not write phonologically plausible representations for at least half of the pseudoword syllables in the task. More marks were earned for orthographically correct choices than for choices that were phonologically plausible but orthographically illegal. Most students were able to manage phonetically plausible spellings of pseudowords with few difficulties. Students' ability to choose orthographically acceptable patterns was not strong, as indicated by the mean score and relatively large standard deviation. An examination of students' errors revealed that long vowel sounds and vowel digraphs caused most difficulty for the students who were not able to choose orthographically correct representations.

The real word Diagnostic Spelling Test (Crumpler & McCarthy, 2006) had a normal distribution of scores with a mean score of 17.38 out of a maximum of 40 raw points and a standard deviation of 9.31. However, the relatively large standard deviation suggests that many students found this test challenging. The distribution of scores is shown in *Figure 4-2*. There are more students with very low scores on this test than students with high scores; seventy-nine students scored marks of 10 or less, whilst

only 20 students scored over 30 marks. Forty-three of the 79 weak spellers scored less than 7 out of 40 which is extremely low.

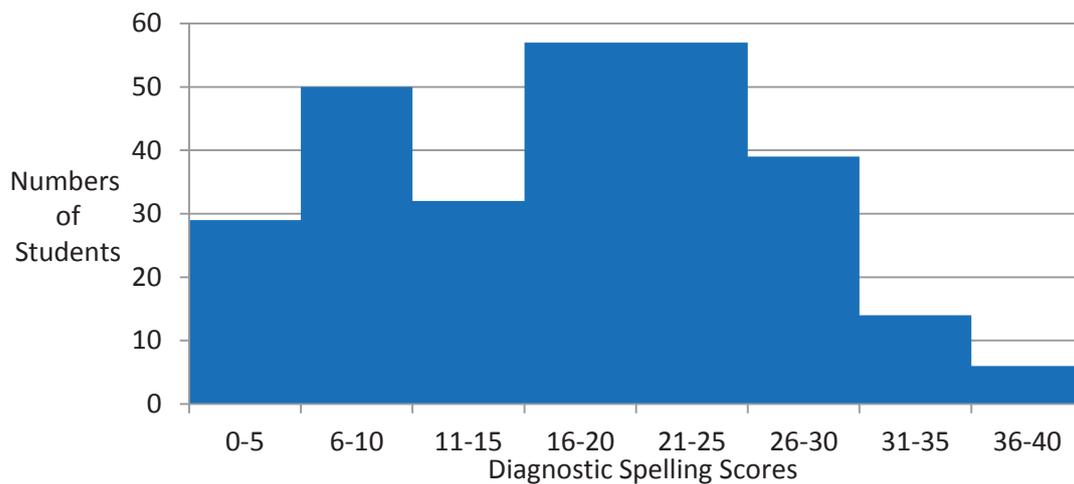


Figure 4-2 Raw scores from the Diagnostic Spelling test in Time One

When it came to the vocabulary measures, the PAT Reading Vocabulary Test scores show that the students' scaled score mean of 65.28 falls within the expected range between 62.2 and 68.8 for year 9 students tested near the beginning of a calendar year (Darr et al., 2008). Results from the first two sub-tests of the Morphology task (see Table 4.1) suggest that many students thought that they knew meanings of words they were subsequently unable to define correctly. The mean score for self-identifying known words is 9.28 whilst the mean of words correctly defined was only 6.34 (as shown in Table 4.1). The sub-test which presented the most challenge for students in this task involved identifying and defining meanings of word parts or prefixes, suffixes and root words. Out of a possible maximum score of 45 the mean score was 7.81 and there was a relatively high standard deviation of 7.32. The difficulty of the task is reflected in the positive skew of 1.00.

The final task at Time One was the Language Terminology Quiz. The first task in the quiz involved students identifying which terms they believed they knew well

from a list of words associated with spelling and morphology. The mean score for self-identification of terms was 3.94 out of a maximum score of 14. In the second task, in which students had to define six words, the mean was 1.05. The Language Terminology Quiz results indicate that most students were not confident that they knew the meanings of terms used to talk about language, and they were even less proficient at defining these words accurately.

In general, scores on measures of spelling, both pseudoword and real word spelling, revealed that the students had more difficulty with spelling than reading comprehension (e-asTTle) and reading vocabulary (PAT Vocabulary Test). Scores in sub-tests of the Morphology task and the Language Terminology quiz indicate that students also found it challenging to define words and to explain the meanings of morphemes.

To more closely investigate the word level skills of students with poor comprehension, the 'struggling' readers, results of the spelling, vocabulary and morphology assessments were compared with results of more proficient readers (see Table 4.2).

Table 4.2

Results of Word Level Assessments for Poor Readers and Good Readers

Measure	Poor Readers			Good Readers	
	Maximum	Mean (SD)	Range	Mean (SD)	Range
Reading	1734	1380.67 (53.66)	1201 - 1438	1540.23 (59.12)	1442 - 1669
Pseudo Spell	109	56.83 (22.1)	0 - 93	79.00 (14.17)	7 - 103
Spelling	40	10.95 (7.85)	0 - 29	20.14 (8.62)	0 - 38
Vocabulary	40	13.81 (5.36)	2 - 26	25.29 (6.57)	9 - 39
Morphology	65	6.81 (6.14)	0 - 26.5	17.4 (10.51)	0 - 47

It is evident that the 'struggling' readers are not a homogenous group with weaknesses confined to reading comprehension. The mean scores for the better readers are all greater than the mean scores for the weaker readers for each word level

assessment, but within each group there is a great deal of variance. Some poor readers have relatively good spelling and vocabulary skills but in general, their spelling and vocabulary skills are weak when compared to better readers. Within the group of stronger readers there is also a great deal of variation.

The scores of the 87 struggling readers were analysed more closely to find out how many students had poor spelling skills, poor vocabulary skills or both. Students who had not completed all of the assessments at Time One were removed from the 'struggling' sample which left a group of 68 students. To make comparison of scores more robust all scores were converted to z-scores. Scores were categorised as 'very low' if they fell below one standard deviation below the whole sample mean, 'low average' if they fell between one standard deviation below the sample mean and the mean, 'average' if they fell between the mean and one standard deviation above the mean, and 'high' if they were greater than one standard deviation above the mean. This analysis revealed that 12 students had very low scores in all measures, seven students had low scores for spelling and vocabulary, 9 students had average spelling and low vocabulary scores, whilst 27 students had low spelling and average vocabulary scores. Only 14 students in the struggling readers group had average spelling and vocabulary scores (see Figure 4.3).

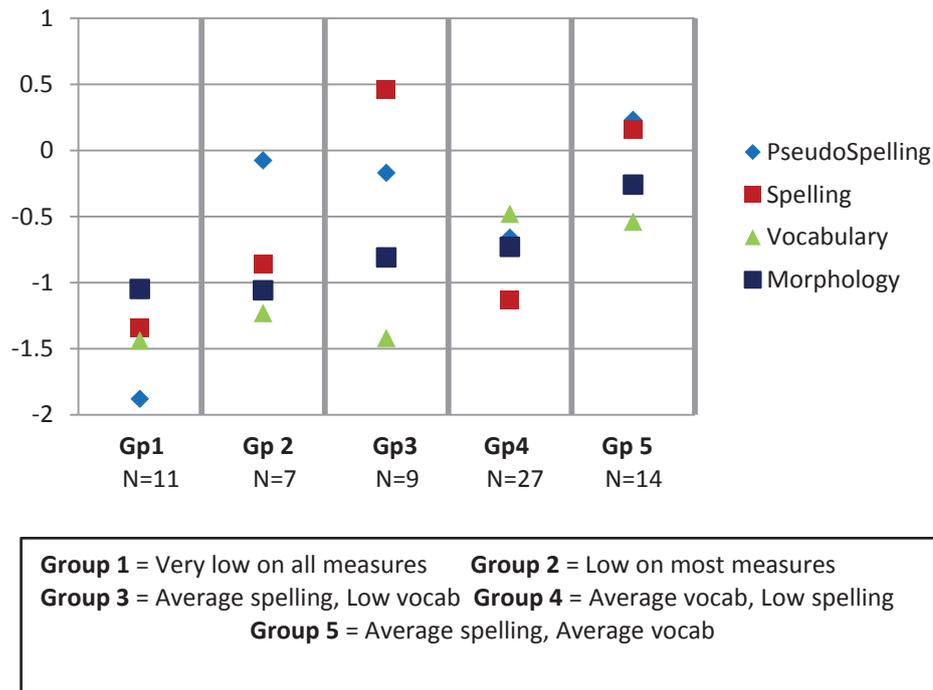


Figure 4-3 'Struggling' students grouped by word level skills

Spelling and Decoding Skills of the Sub-Sample

The sub-sample was selected from the group of students who had consented to be tested individually. The selection of this smaller group was necessary because it was not possible to test all of the participants individually. The purpose of testing students individually was to see if there were links between poor pseudoword spelling skills and decoding; such links would suggest that pseudoword spelling, which can be assessed in a group administered test, could stand as proxy for code knowledge and decoding. Test results for the 61 students in the decoding sub-sample are shown in Table 4.2.

It was expected that the sub-sample's mean e-asTTle reading score would be lower than the sample mean and it was, at 1467.26 which is 22.04 points below the sample mean. A one sample *t*-test showed that there was a significant difference in means, $t(60) = 4.432, p < .001$. More students with low pseudoword spelling scores than high scores were in this sub-sample, as they were deemed more likely to have

decoding problems than students with high pseudoword spelling scores. Thus, the mean pseudoword spelling score for this group was 66.9 compared to 72.11 for the whole sample and the mean for the real word spelling test was 14.39 which is lower than the mean score of 17.38 for the whole sample. Scores have relatively normal distributions except for the pseudoword spelling total score. The pseudoword spelling task was relatively easy for many of the participants which explains the negative skewness statistic.

Table 4.3
Means and Standard Deviations on Measures for Decoding Sub-sample

	Maximum	Mean	SD	Skewness	Kurtosis
e-asTTle Reading	1734	1467.26	84.57	.133	-.795
Pseudoword Spelling	109	66.9	19.9	-1.266	1.730
Diagnostic Real Word Spelling	40	14.39	9.1	.226	-.856
WRAT Raw Score	57	40.13	6.61	.143	-.755
WRAT Standardised Score	45 - 155*	99.2	16.24	.179	-.670
Pseudoword Reading Raw Score	54	34.36	11.79	-.484	-.583
Pseudoword Reading Standardised Score	27 - 136*	92.18	14.8	-.138	-.446

*These scores represent a range of standardised scores so are not maximum scores.

The mean for students on the isolated real word reading test standardised score was close to the normed mean of 100. An examination of the frequencies showed that 13 students had standardised scores between 80 and 89, which is considered low average according to the guide for the interpretation of scores in the test manual (Wilkinson, 1993). Another seven students scored below 79 indicating exceptionally poor decoding skills. A similar pattern was found in the standardised scores for the Pseudoword Reading test where 14 students had poor decoding skills and five were well below average with scores below 69 which suggests their decoding skills are especially weak. The mean score of 92.18 on this test was below the normed mean of 100. In the decoding group only nine students scored over one standard deviation

above the mean for isolated real word reading whilst only three students scored over one standard deviation above the mean for pseudoword reading. Further analysis of the relationships between the variables was needed to explore links between word level literacy skills and comprehension.

The Relationships between the Literacy Variables at Time One

Bivariate correlations between variables for whole sample. Bivariate correlations were conducted to examine the relationships between the variables at Time One for the whole sample. The results of these procedures are shown in Table 4.4.

Table 4.4
Correlations between Measures at Time One for Whole Sample

	e- asTTle	Pseudo Spelling	Diagnostic Spelling	PAT Vocab	Morph- ology	Language Terms
e-asTTle 1	~	.67**	.63**	.81**	.64**	.46**
Pseudo Spelling		~	.69**	.62**	.49**	.35**
Diagnostic Spelling			~	.50**	.52**	.29**
PAT Vocabulary				~	.63**	.39**
Morphology					~	.37**
Language Terms						~

* $p < .05$; ** $p < .001$

The strongest correlation is between reading comprehension, and reading vocabulary, $r = .81, p < .001$, which is to be expected because of the reciprocal relationship between vocabulary and comprehension. The more words you know the more you are likely to understand extended text, and the more you read the more words you are likely to learn. In addition, there are reasonably strong correlations

between reading comprehension and the other vocabulary task, for understanding morphemes, $r = .64$, $p < .001$. There are strong significant correlations between pseudoword spelling and real word spelling, $r = .69$, $p < .001$. Both spelling measures have moderately strong and statistically significant correlations with the reading comprehension scores. The weakest correlations are between the Language Terminology Quiz and the other measures; however these correlations are all statistically significant.

When a scatterplot of spelling scores and reading comprehension scores is generated (see *Figure 4.4*), it suggests that there are more good readers than there are good spellers in this sample; in other words it is possible to be a good or competent reader and a poor speller. No very good spellers had low reading scores but some poor spellers had relatively high reading comprehension scores.

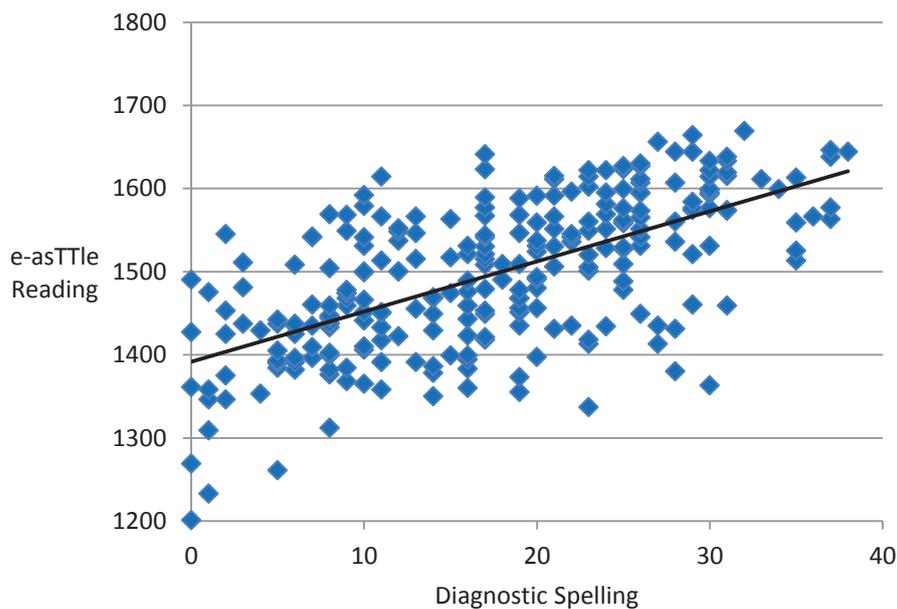


Figure 4-4 A scatter plot to show the relationship between e-asTTle reading comprehension scores and the Diagnostic Spelling test scores at Time One.

Bivariate correlations between variables in the decoding sub-sample.

Correlations were examined to explore the relationships between scores on the Time One reading comprehension, pseudoword spelling, real word spelling, isolated real word reading and pseudoword reading tests. Correlations between these measures are

shown in Table 4.5.

Table 4.5

Correlations between Spelling and Decoding Scores for Decoding Sub-sample.

	1.e-asTTle Reading	2.Pseudoword Spelling	3.Diagnostic Spelling	4.WRAT 3 Real Word Reading	5.Pseudoword Reading
1.	~	.45**	.53**	.45**	.39**
2.		~	.69**	.71**	.80**
3.			~	.69**	.77**
4.				~	.86**
5.					~

** $p < .01$

The highest correlation was between the real word reading test and the pseudoword reading test, $r = .86, p < .01$. Other strong correlations were evident between pseudoword spelling and pseudoword reading ($r = .80, p < .01$) as well as between pseudoword spelling and isolated real word reading ($r = .71, p < .01$). The correlation between real word spelling and the individual word reading scores ($r = .69, p < .01$), was lower than the correlation between the pseudoword spelling and the individual word reading scores ($r = .71, p < .01$). Another interesting result was that pseudoword spelling and real word reading had the same correlation, $r = .45, p < .01$, with reading comprehension.

Regression analyses of variables for the whole sample. To examine the nature of the relationship of word level literacy skills with concurrent reading comprehension at Time One, a multiple regression analysis was performed, with Time One e-asTTle scores as the dependent variable. The results of this analysis are shown in Table 4.6. Vocabulary was added first as it was expected to contribute the greatest amount of variance to reading comprehension. Accordingly, just over 60% of variability was explained by vocabulary. However, even after vocabulary was controlled for, both real

word spelling and pseudoword spelling contributed significant amounts of shared variance. Over both forms of spelling ability, morphological awareness explained a significant amount of shared variance, $F(4,222) = 159.85, p < .001$. This suggests that even for adolescent students, word-level abilities play a role in reading comprehension.

Table 4.6

Regression Analysis Using Reading Scores at Time One as the Independent Variable for the Whole Sample (N=227)

Step	Variable Added	R^2	ΔR^2	β
1	Vocabulary	.608	.606***	.500***
2	Pseudoword Spelling	.682	.074***	.202***
3	Diagnostic Spelling	.706	.024***	.175**
4	Morphology	.715	.009**	.128**

Note. Standardised beta values correspond to the variable in the complete model after all other variables have been entered.

($p < .05^*$, $p < .01^{**}$, $p < .001^{***}$)

This regression analysis examined concurrent relationships which does not account for prior reading comprehension abilities. Thus, a second multiple regression was carried out that examined the influence of Time One word-level abilities, and vocabulary, on Time Two reading comprehension. Time One reading comprehension was added first as auto-regressor. The results of this second regression analysis are shown in Table 4.7.

Table 4.7

Regression Analysis Using Reading Scores at Time Two as the Independent Variable for the Whole Sample (N=227)

Step	Variable Added	R^2	ΔR^2	β
1	Reading Comp. Time One	.742	.742***	.649***
2	Vocabulary	.760	.018***	.212**
3	Pseudoword Spelling	.762	.000	.023
4	Diagnostic Spelling	.762	.002	-.015
5	Morphology	.762	.000	.053

Note. Standardised beta values correspond to the variable in the complete model after all other variables have been entered.

($p < .05^*$, $p < .01^{**}$, $p < .001^{***}$)

When prior reading skill is entered as a variable, vocabulary is the only additional significant predictor of later reading ability. Time One morphology and spelling did not add any significant variance to Time Two reading comprehension.

Regression analysis of variables in the decoding sub-sample. A regression analysis was carried out to investigate the extent to which decoding would influence variance in reading comprehension using Time One reading comprehension as the independent variable (see Table 4.8). For the purposes of the regression analysis, the real word decoding measure (WRAT3) and the Pseudoword reading measure were combined into one decoding score and, similarly, the Pseudoword spelling and Diagnostic spelling measures were combined into one spelling score. Scores were simply added together to generate the combined scores.

When Spelling was entered into the analysis before Decoding, spelling explained a significant amount of variance in reading comprehension. However the Beta statistic for decoding was $-.171$ which is not significant, and, in addition, this negative score indicates that decoding explains some of the variance in reading comprehension in common with spelling.

Table 4.8

Regression Analysis to show the Contribution of Decoding and Spelling when Time One Reading Comprehension is the Independent Variable in the Decoding Sub-sample (N=61)

Step	Variable Added	R^2	ΔR^2	β
1	Vocabulary	.632	.639***	.662***
2	Combined Spelling	.681	.054**	.409**
3	Combined Decoding	.689	.008	-.172
4	Morphology	.689	.000	.010

Note. Standardised beta values correspond to the variable in the complete model after all other variables have been entered.

($p < .05^*$, $p < .01^{**}$, $p < .001^{***}$)

A regression analysis for the decoding sub-sample was carried out to show the contribution of prior reading experience as well as word level skills, with Time Two reading comprehension as the independent variable (see Table 4.9). Once Time One reading comprehension and vocabulary were accounted for, spelling and decoding made no additional contribution to Time Two reading comprehension which is similar to the findings for the whole sample.

Table 4.9

Regression Analysis with Time 2 Reading Comprehension as Independent Variable in Decoding Sub-sample (N=61)

Step	Variable Added	R^2	ΔR^2	β
1	Reading Comp. Time One	.693	.693***	.454**
2	Vocabulary	.738	.045**	.389**
3	Combined Spelling	.747	.009	.089
4	Combined Decoding	.748	.001	.056
5	Morphology	.749	.001	.048

Note. Standardised beta values correspond to the variable in the complete model after all other variables have been entered.

($p < .05^*$, $p < .01^{**}$, $p < .001^{***}$)

Results from Time One testing show that word level skills made a significant contribution to the variance in reading comprehension. Vocabulary explained the largest portion of variance, followed by smaller contributions from spelling skills and morphological knowledge. Another finding from the Time One testing was that a poor

score on the pseudoword spelling task might indicate that a student is having difficulties with decoding, so further assessment would be warranted.

Results of Spelling and Vocabulary Intervention

An Analysis of Variance (ANOVA) was conducted to ensure that there were no significant differences between the literacy skills of students in the intervention and control schools at the outset of the intervention. The comparison of means on all measures at Time One is shown in Table 4.10. Levene's test of homogeneity of variances was not significant for most measures except for the Understanding Morphemes Word Parts sub-test and Total scores. This lack of homogeneity of variance is explained by the difficulty of the test, with most students achieving low scores on this task. To compensate for the difference in group size and the lack of homogeneity of variance for the Understanding Morphemes task, the Welch test was used to adjust the results of the ANOVA. The Welch test adjusts the F-ratio and is designed to be accurate when the homogeneity of variance has been violated (Field, 2009). Different numbers of students sat each test so the number of participants is reported for each measure. The only means that were significantly different for any measures in Time One were the Understanding Morphemes Word Parts sub-test and the Total score for this task. The means for the control schools were higher than the intervention schools' means at Time One for the Understanding Morphemes task.

Table 4.10
ANOVA to Show Difference in Means between Intervention and Control Schools at Time One.

Measures	Intervention		Control		F	Sig.
	Mean	SD	Mean	SD		
e-asTTle Reading	N=188 1492.56	93.22	N=101 1489.55	93.09	.068	.794
Pseudoword Spelling	N=187 71.09	19.74	N=98 74.04	19.75	1.420	.235
Diagnostic Spelling	N=176 17.27	9.24	N=95 17.57	9.49	.061	.805
PAT Reading Vocabulary	N=183 21.25	8.56	N=91 22.63	7.55	1.858	.174
Morphology Self-Identified	N=186 9.23	4.70	N=96 9.38	4.71	.064	.801
Morphology Meanings	6.03	4.28	6.93	4.08	3.028	.083
Morphology Word Parts	7.07	6.68	9.24	8.25	5.037	.026*
Morphology Total	13.07	9.76	16.13	11.42	5.080	.025*
Language Terms Self-identified	N=165 3.98	2.53	N=89 3.88	2.74	.079	.779
Language Terms Definitions	1.01	.82	1.12	.98	.841	.361

* $p < .05$

Table 4.11

Means and Standard Deviations of Time One and Time Two Assessments to Show Differences Between Intervention and Control School Gains

Measures	Intervention				Control				Anova to compare gain scores	Sig. <i>d</i>					
	Time One Mean	SD	Time Two Mean	SD	Time One Mean	SD	Time Two Mean	SD							
e-asTTle	N=169				N=100										
Reading	1498.87	92.87	1515.15	83.46	1490.46	93.15	1510.56	91.15	20.10	51.92	.399	.528			
Pseudoword	N=154				N=90										
Spelling	72.61	19.89	75.97	17.59	74.11	20.09	75.97	17.59	-2.37	11.58	16.031	.000***	.51		
Diagnostic	N=136				N=83										
Spelling	17.38	9.31	19.17	9.38	17.94	9.67	19.85	10.42	1.46	21.89	.118	.732			
PAT	N=156				N=76										
Reading	21.67	8.77	22.74	9.37	22.58	7.45	24.62	7.80	2.04	4.33	2.590	.109			
Vocabulary															
Morphology	N=154				N=83										
Self-ID	9.22	4.97	8.01	4.32	-1.01	4.25	9.40	4.32	8.35	4.74	-0.50	4.67	.708	.401	
Morphology															
Meaning	6.28	4.38	6.55	3.89	.41	4.31	6.82	4.29	6.51	4.68	.17	3.89	.228	.643	
Morphology															
Word Parts	7.41	7.01	9.27	6.49	5.86	3.46	9.19	8.46	7.59	6.91	-1.26	6.64	13.077	.000***	.50
Morphology															
Total	13.65	10.14	15.04	9.69	1.74	5.87	15.96	11.83	13.89	10.71	-1.01	8.22	6.720	.010**	.35
Language	N=109				N=65										
Terms Self	4.34	2.49	5.60	3.45	1.34	7.57	4.18	2.80	4.94	3.04	.53	2.57	4.584	.033*	.31
ID															
Language															
Definitions	1.20	.89	1.41	1.10	1.21	2.68	1.16	.90	1.25	1.03	-0.01	1.06	1.768	.185	

* $p < .05$; ** $p < 0.1$; *** $p < .001$

The means of test gains between Time One and Time Two in intervention and control schools were compared to find out if the spelling and vocabulary intervention had made a difference to students' reading comprehension skills (see Table 4.11). An ANOVA was conducted to examine the difference between gains' means in intervention and control schools using the Bonferroni correction to adjust the alpha level to compensate for multiple testing. Gain scores were used to calculate the effect size of mean differences. The larger sample size in the intervention group means that the results must be interpreted with caution as it is more likely that significant results are detected for that group. No significant differences were found in the means for reading comprehension gains, real word spelling gains or reading vocabulary gains between intervention and control schools. Some small but statistically significant differences in the mean gains for the Pseudoword Spelling task, the Understanding Morphemes task and the Language Terminology Quiz were found. In the Pseudoword Spelling task the means in gains for the two groups are significantly different, $F(1,242) = 16.031, p < .001, d = .51$. Another difference in the mean gains occurred in the Word Parts sub-test of the Morphology task, $F(1,235) = 13.077, p < .001, d = .5$. Another small difference in gains in favour of the intervention schools was found. The gains for Language Terms are slightly larger than the gains for the control schools, $F(1,172) = 4.584, p < 0.5, d = .31$. The effect sizes of the gains achieved in this study can be interpreted as better than what would normally be expected for Pseudoword Spelling and Morphology and at the upper end of the expected level for Language Terms.

One focus of the intervention was to investigate the efficacy of differentiated spelling and morphology instruction to improve comprehension for poor readers. Descriptive statistics for the different reading groups' gains are shown in Table 4.12. For the sample as a whole, students in the low reading groups, in both intervention and control schools, made more gains than the students in the middle and high reading groups. A repeated measures ANOVA was run on the e-asTTle reading tests for Times One and Two. Students were grouped according to their reading achievement in the Time One e-asTTle reading test and into intervention and control groups. There was a significant effect of reading group on the e-asTTle reading score in Time Two, $F(2,265)$

= 9.6, $p < .001$. *Post hoc* analysis using Tukey's test showed that there were significant differences between the low and middle groups, as well as between the low and high groups, but not between the middle and high reading groups. No significant effect for status indicated that no significant differences in reading achievement were found between intervention and control schools.

Table 4.12

Means and Standard Deviations of Low, Middle and High Reading groups for asTTle gains for Intervention and Control schools

Reading Group	N	Status	Mean	SD
Low	29	Intervention	52.34	51.26
	14	Control	43.71	58.62
	43	Total	49.53	53.22
Middle	106	Intervention	15.48	43.11
	71	Control	15.69	51.76
	177	Total	15.57	46.63
High	36	Intervention	-6.36	31.53
	15	Control	18.93	42.63
	51	Total	1.08	36.61
Total	171	Intervention	17.1345	45.99
	100	Control	20.1000	51.92
	271	Total	18.2288	48.19

In Time Two, additional sub-tests were added to the Language Terminology Quiz because it was important to see if students in the intervention group had developed some skills in analysing words for sounds, syllables and morphemes (see Table 4.13). Although these skills were not tested in Time One, small differences between intervention and control school students in word level literacy skills at Time One, suggest differences in Time Two would indicate effects of the intervention. There were significant differences in the sub-tests which required students to analyse sounds and syllables in words, to identify blends and digraphs and to identify and explain the meanings of word parts. The largest difference, with an effect size of .86, was in students' orthographic knowledge of blends and digraphs. The total scores of the two groups illustrate these differences, $F(1,238) = 15.174$, $p < .001$, $d = .52$. These results should be interpreted with caution because of the difference in group sizes; however

the Welch test was used to adjust the F statistic to mitigate some of the effects of different group sizes.

Table 4.13
ANOVA for the Language Terminology Quiz at Time Two to Compare Gains Means of Students in Intervention schools and Control schools

Sub-tests and Maximum Score	Intervention N=147	Control N=93	F	Sig.	d
Terms SI -Max 14 (Not in Total)	5.15 (3.41)	4.46 (3.1)	2.537	.113	
Definitions of Terms - Max 6	1.37 (1.1)	1.08 (.95)	4.360	.038*	.28
Phonology Max 16	6.69 (2.69)	5.74 (2.17)	8.232	.004**	.39
Orthography Max 10	4.58 (3.39)	1.99 (2.56)	39.960	.000***	.86
Morphology Max 13	4.19 (2.99)	3.34 (2.87)	4.765	.030*	.29
Total 45	16.83 (7.63)	13.04 (6.88)	15.174	.000***	.52

* $p < .05$, ** $p < .01$, *** $p < .001$

In Time Two an additional measure of reading, the PAT Reading Comprehension test, was used to assess reading comprehension. There was no significant difference between the intervention and control group scores on the e-asTTle measure of reading comprehension at Time One so, although it was not used in Time One, it is probable that there would have been no large difference in the two groups' PAT scores. The correlation between the Time Two e-asTTle reading test and the PAT reading test was high, $r = .82$, $p < .01$. However, unlike the e-asTTle measure, there was a statistically significant difference between the scores of the intervention and control groups on the PAT Reading Comprehension at Time Two. A t -test for independent samples was used to compare the difference in the means of the two groups. On average, students in the control group achieved higher scores than students in the intervention group $t(230) = -1.953$, $p > .05$.

In order to explore this unexpected difference, students were divided into three groups according to the level of professional development that teachers experienced during the intervention phase. One of the two control schools was engaged in a literacy professional development initiative, the Secondary Literacy Project (SLP), at the time of the study, and when this factor was considered, the difference in the means shows that the level of Professional Development was a significant factor in this result. The Analysis of Variance indicated that there was a significant difference between the groups, $F(2, 229) = 4.427, p < .01$. *Post hoc* analysis, using Hochberg's GT2 test because of the difference in group sizes, showed that there was a significant difference between the means of the PAT Reading Comprehension tests for the Intervention and SLP groups at $p < .01$, Intervention ($M = 24.72, 95\%CI[23.11, 26.33]$) and SLP ($M = 29.82, 95\%CI[27.05, 32.58]$). The differences between means for the SLP and the control group, and for the intervention and the control group, were not significant. Descriptive statistics for the three groups mean scores on the PAT Reading test are shown in Table 4.14.

Table 4.14

Descriptive statistics for PAT Reading Comprehension scores for Time Two when Students were Grouped According to Teacher Professional Development Levels

Group	N	Mean	SD	95% Confidence Interval for Mean	
				Lower Bound	Upper Bound
Intervention	142	24.72	9.69	23.11	26.33
SLP Control	38	29.82	8.42	27.05	32.58
Control	52	25.33	9.39	22.71	27.94
••••••••	••••••	25.69	9.57	24.45	26.93

Prompted by the finding that different levels of professional development had resulted in an unexpected difference in reading comprehension outcomes between one control school and the intervention, an ANOVA on the e-asTTle reading gains was run, using school as a group factor. One intervention school, School C, had more professional development and support in relation to the intervention than the other intervention schools because the author was working in the school as an external literacy adviser during the time of the intervention. The ANOVA revealed that school

was a factor in differences in gains scores for the e-asTTle reading comprehension test, $F(5,263) = 11.103, p < .001$. Post hoc analysis revealed that five of the schools' e-asTTle reading gains were significantly different from one intervention school which had negative gains (see Table 4.15). However, the school which had greatest levels of support in the intervention did make the greatest gains in reading. The school with the negative gains could be considered an 'outlier' so a second ANOVA was run to see if excluding School D would clarify the relationships between the remaining schools' gains. In this scenario the ANOVA continued to show a significant variance but the difference was smaller, $F(4,208) = 2.414, p < .05$. Post hoc analysis revealed that the only two schools with significantly different mean gains were School C and School F. The effect size of this difference is $d = .59$. This statistic could be interpreted as greater than expected in the context of adolescent literacy interventions (Hill et al., 2008). School C was the intervention school with enhanced PD and School F was the control school that was not part of the SLP at the time of the intervention, therefore teachers at School F had no literacy professional development at the time of the study. These results appear to indicate that level of professional development was a significant factor in the gains in reading comprehension scores.

Table 4.15
Means and SDs of e-asTTle Reading Gains by School

School	N	Min Score	Max Score	Gain Mean	SD	Skewness	Kurtosis
A	19	-31.	92	33.16	37.51	.063	-1.075
B	63	-46	137	29.30	42.85	.553	-.054
C*	31	-54	114	39.94	41.03	-.063	-.568
D	56	-92	52	-17.18	32.85	-.154	-.340
E*	39	-46	177	32.46	49.20	.642	.458
F	61	-141	141	12.20	52.45	-.174	1.098

Schools A-D = Intervention

Schools E-F = Control

* Schools with enhanced literacy Professional Development

To examine what effect the intervention had on schools which did not receive additional Professional Development gain scores were analysed using an ANOVA. There were no significant differences between the three intervention schools and the

remaining control school on any of the standardised measures. However, on the measures which were developed for the study the intervention schools made significantly greater gains than the control school (See Table 4.16). These results are consistent with the results from the analysis of gains which included all intervention and both control schools.

Table 4.16

ANOVA to compare gains for intervention and control school when 2 schools with extra professional development are excluded

Measures	Intervention		Control		F	Sig
	Mean	SD	Mean	SD		
e-asTTle Reading	N=129 9.40	44.23	N=39 9.87	58.89	.003	.957
Pseudoword Spelling	N=119 3.21	9.30	N=32 -4.47	15.07	12.844	.000**
Diagnostic Spelling	N=113 1.58	3.76	N=29 1.10	5.21	.319	.573
Morphology	N=121 1.87	7.87	N=34 -2.78	9.75	8.293	.005*
PAT Reading Vocabulary	N=120 .71	4.06	N=35 1.49	4.44	.951	.331

* $p < .05$, ** $p < .001$

The level of literacy professional development appeared to have a positive impact on reading comprehension in one intervention and one control school, but in the main the intervention effects on students' literacy skills were limited to improvements in pseudoword spelling, phonological awareness and understanding of morphology.

Teachers' Knowledge of Word Level Literacy Skills

Teachers participating in the study were assessed on their knowledge of terminology, their ability to analyse words into phonemes and syllables, their ability to identify blends and digraphs, and their knowledge of common prefixes, suffixes and root words. The intervention aimed to develop students' awareness of these aspects of language so it was important to find out how much teachers knew about the material that was expected to be covered in the intervention. A one-way Analysis of Variance (ANOVA) was performed to see if there was a difference between the means of the

intervention and control teachers at Time One. There was no significant effect of status on teacher knowledge of word level literacy skills, $F(1,26) = 0.105, p = .748$. Mean scores for sub-tests in the Language Questionnaire for Time One testing are presented in Table 4.15. The range of scores was wide across the sample. For the words identified as known or unknown with a maximum score of 20, the lowest score was 4, whilst several teachers said they knew 18 of the terms. The widest difference was in the morphology sub-test where one teacher could only define two morphemes correctly whilst two other teachers scored the full 18 marks.

At Time Two the teachers were re-tested on a similar test. An ANOVA was undertaken using Bonferroni's correction to adjust significance levels to compensate for comparing gains means on several sub-tests. These data show that teachers in the intervention were confident that they knew the meanings of more terms than control teachers, $F(1,26) = 5.312, p < .05, d = .77$. There was a significant difference in means for the Phonology sub-test in favour of the intervention teachers, $F(1,26) = 6.373, p < .05, d = .97$. Teachers in the intervention group made greater gains in the Orthography sub-test than control teachers, but this difference was not significant. However, the difference in means for the Morphology sub-test in favour of intervention teachers, was significant, $F(1, 26) = 16.380, p > .001, d = 1.55$, with a large effect size. The differences reflected in gains in the Total score for the tests were significant, $F(1,26) = 24.12, p > .001, d = 1.95$. This effect size is large, indicating that being involved in the intervention had a considerable influence on teachers' test scores in Time Two (see Table 4.16). Effect sizes were calculated using the means and standard deviations of gains for the sub-tests and total scores. Caution should be exercised when interpreting the effect sizes for the difference in means because of the small sample size. Nevertheless, it is evident that the intervention did appear to make a difference to teachers' word level literacy knowledge.

Another reason for assessing the teachers' word level knowledge was to find out if there was a link between teacher knowledge and student achievement. A regression analysis was run to see if teachers' knowledge at Time Two could explain

any variability in students' Time Two reading comprehension (see Table 4.17). When Teacher Knowledge was entered first into the analysis without Time One reading scores, the standardised beta value was significant, but after the other Time One variables were entered, the most influential being Time One reading comprehension, Teacher Knowledge no longer explained any of the variance in reading comprehension. Teacher Knowledge, as measured in the Language Terminology Questionnaire, had a weak, but statistically significant, correlation with reading comprehension at Time Two, $r=.19$, $p(\text{two-tailed})<.05$.

Table 4.17
ANOVA to Compare Gains' Means for Sub-tests in Time One and Time Two for Intervention and Control Teachers

Sub-tests	Maximum score	Intervention Teachers N=16				Control Teachers N=12				Anova to Compare Gains	
		Time One	Time Two	Gains	Time One	Time Two	Gains				
		Mean(SD)	Mean(SD)	Mean(SD)	Mean (SD)	Mean (SD)	Mean(SD)	F	Sig.	d	
Self- Id	20	11.37 (3.70)	14.13 (3.24)	2.75(2.98)	12.08 (3.48)	12.75 (3.48)	0.67 (2.55)	5.312	.029*	.75	
Definitions	6	3.13 (1.63)	4.28 (1.61)	1.16 (2.22)	2.83 (1.39)	3.25(1.59)	0.42 (1.49)	0.992	.328		
Phonology	16	6.31 (2.33)	9.81 (3.03)	3.5 (2.770)	7.50 (3.37)	8.46 (3.55)	0.96 (2.44)	6.373	.018*	.97	
Orthography	10	5.63 (3.12)	7.88 (2.33)	2.25 (3.21)	5.00 (3.46)	5.71 (2.62)	0.71 (2.22)	2.025	.167		
Morphology	18	11.22 (4.50)	14.09 (3.74)	2.88 (2.66)	11.71 (4.20)	10.50 (4.10)	-1.21 (2.62)	16.380	.000**	1.55	
Total	50	25.97 (7.31)	36.06 (7.86)	10.09 (5.84)	27.04 (10.21)	27.92 (10.14)	0.88 (3.27)	24.120	.000**	1.95	

* $p < .05$; ** $p < .001$;

Table 4.18

Regression Analysis to show the Influence of Teacher Knowledge on Reading Comprehension with Reading scores at Time Two as the Independent Variable (N=227)

Step	Variable Added	R ²	ΔR ²	β
1	Teacher Knowledge Time 2	.114	.114***	.038
2	e-asTTle Reading Time 1	.746	.632***	.677***
3	Vocabulary	.762	.016***	.196**
4	Pseudoword Spelling	.762	.000	.029
5	Diagnostic Spelling	.763	.000	.031
6	Morphology	.765	.002	.067

Note. Standardised beta values correspond to the variable in the complete model after all other variables have been entered.

($p < .05$ * $p < .01$ ** , $p < .001$ ***)

N=227

••

The intervention had a noticeable impact on intervention teachers' test scores in Time Two but no significant links between teacher knowledge and student achievement were found. Teachers' accounts of the effects of the intervention on their understanding of word level literacy skills are discussed in the next chapter. The implementation of the intervention was evaluated by collating evidence collected during observations and from a self-review survey completed by the intervention teachers.

Intervention Programme Implementation

The intervention was not designed to be rigid or scripted. It was based on principles which teachers were asked to follow, and the intervention was expected to be differentiated according to students' needs. Words for study were expected to be taken from key word lists built up around topics of study. Teachers were asked to test students' spelling and understanding of the topic words at the start and end of each topic. Students were expected to work in problem-solving groups and word study sessions were expected to be run twice a week for a maximum of 15 minutes. These principles had been explained to

teachers in an afternoon professional development session after they had received their students' test results from Time One. Teachers were contacted by email on a weekly basis and offered ideas on how to tackle some of the spelling and vocabulary needs which had been revealed in Time One testing. It was expected that these examples of tasks would be adapted by teachers to fit in with topics of study, and not used as random unrelated tasks. At the end of each term teachers were asked to complete a log of all the spelling and vocabulary topics that had been covered in the word study sessions.

Strict adherence to the principles of the intervention was not monitored tightly. Some teachers in the intervention schools did complete a log of what they had covered in word study sessions, and all intervention teachers were observed delivering a word study session at least once. In addition all intervention teachers completed a self-evaluation survey at the end of the study.

Teacher logs. Seven of the 16 intervention teachers completed logs to describe the topics they had covered each term. For the teachers who had completed logs there seemed to be a balance between spelling and morphology topics covered in the course of the intervention in Term One, but in Term Two there was more focus on morphology. Topics covered included identifying spelling patterns for long and short vowels, spelling of word endings, and work on Latin and Greek morphemes.

Observations. Sixteen teachers were observed conducting word study sessions. Topics that were covered were evaluated with reference to students' word level skills assessed in Time One testing. A judgment was made as to whether the topic was appropriate given findings from Time One. The observations were carried out by the author in Term Three so teachers had been implementing the intervention for a term before they were observed. Teachers had been sent the observation sheet prior to the observation (see Appendix Eleven). On the back of the sheet appropriate topics and the principles of the

desired teaching methods were outlined. The observation sheet reiterated information that had been provided to teachers in the initial professional development sessions.

Most topics covered during the observations were appropriate for the students' skill levels; however in three cases it appeared that the tasks were too easy for the students given the level of skill they had shown in the Time One tests. Two teachers were observed teaching long and short vowels and another two focused on teaching students the difference between blends and digraphs. In one of these classes students had scored highly on the pseudoword spelling test and the lesson was not sufficiently challenging for the students. Two teachers covered the most common ways to divide words into syllables using Elkonin boxes and for most of the students in one of these classes this was a very easy task. In one class students were working out the convention for doubling consonants to preserve short vowel sounds and this was an appropriate topic for the group. Seven teachers were observed teaching common morpheme patterns and for one of these classes there was insufficient challenge but in the others the level of difficulty was appropriate and students were highly engaged. Three teachers linked their focus on morphemes to the Latin and Greek layers of language and these lessons were at the appropriate level of difficulty for the students in these classes. Only one teacher covered a topic in the word study session that was not recommended in the guidelines to the intervention. Students in this class were practising using their topic words in sentences and they really needed more of a focus on spelling patterns. For example, students were asked to write a sentence explaining the meaning of the word *dialogue* without any discussion of why the spelling might be challenging or how the ending *logue* is used in other words like *catalogue* or *monologue*.

The second focus of the observation was to look at the way the word study lessons were structured and how faithfully teachers were implementing the principles of the intervention (see Table 4.18). Findings indicate a lack of

congruence with the principles of instruction that had been intended for use in the intervention, but most of the topics studied were relevant and appropriate. Teachers received written feedback which described what had been seen; however the feedback was not highly prescriptive because a decision was made that negative criticism might offend teachers and it was late in the study to try to change the way teachers were implementing word study sessions. More detail about the observations is discussed in the next chapter which focuses on the qualitative data collected about the intervention.

Table 4.19

Features of Methods Observed in the Teaching of Word Study Skills

Recommended for Intervention	Comment	Times Observed
<ul style="list-style-type: none"> • use small groups • possibly differentiated if there are big differences in achievement in class 	Differentiation only seen in two classes -both teachers had extra support from the researcher	3
<ul style="list-style-type: none"> • use word sorts to help students to distinguish spelling patterns 	In one class task was too simple for the group – other instance was good	2
<ul style="list-style-type: none"> • words from study topics integrated into programme - not stand alone 	Most words used had no links with topics studied	5
<ul style="list-style-type: none"> • keep sessions short and fun if possible (no more than 15 minutes at most) 	All sessions much longer than 15 minutes	0
<ul style="list-style-type: none"> • problem-solving approach – not instruction so much as discovery... 	Mixed with direct instruction in four cases	7
Not recommended for intervention		
<ul style="list-style-type: none"> • whole class activity- no groups 	Some use of pairs in discussion but mostly	14
<ul style="list-style-type: none"> • using worksheets directed by teacher 	whole class	9

Teacher self-review survey. In the teachers' self-review survey teachers were asked to reflect on the way they had implemented the intervention (see Table 4.19). A Likert type scale of 1 to 4 was used. For the questions on the content of the intervention, 1 indicated that they had covered the topic *not at all*, 2 indicated it had been covered *somewhat lightly*, 3 indicated coverage had been *quite well* done, and 4 meant that the topic had been covered *thoroughly*. For the

method of the intervention the numbers had slightly different meanings.

Teachers rated their adherence to the principles of the intervention as 1: *hardly at all*, 2: *sometimes*, 3: *mostly* or 4: *almost all the time*.

Table 4.20

Results of Teacher Self-review Survey on Implementation of the Intervention

Content	Numbers of Respondents for each aspect of the intervention on scale			
	1	2	3	4
Sound-letter correspondences (blends, digraphs, short and long vowels)	3	5	8	
The most common ways to divide words into syllables	2	7	4	3
Common morpheme patterns – prefixes, roots, suffixes and compounds		2	9	5
The productive rules or conventions of the written forms of the language		12	4	
Method	1	2	3	4
Used differentiated small groups when/if there were huge differences in student achievement	4	7	5	
Used word ‘sorts’ to help students distinguish spelling patterns	1	10	3	2
Explained the layers of the language or referred to them when relevant (Anglo-Saxon/ Romance/Greek)	4	3	7	2
Kept sessions short and fun when possible (15mins)		3	8	5
Used a problem-solving approach – not so much instruction – more discovery		4	7	5
Worked on ‘word study’ twice a week	4	6	3	3
Totals	19	62	60	25

The teachers’ self-review indicated that the intervention was implemented in an inconsistent way. Some teachers’ evaluations indicated a faithful adherence to the suggested content and principles of the model but others revealed the delivery of a less faithful version of the expected content and teaching methods that had been recommended. More detail of the impact

of the intervention on teachers' thinking is described in Chapter Five which explores the interviews of the intervention teachers at the end of the project when Time Two testing results were shown to the teachers.

Summary

In this chapter the key results from the three research questions in this study have been reported. The first research question asked about the word level literacy skills of adolescents and the relationships between these skills. This question was addressed through the reporting of data from the e-asTTle reading comprehension test and the five measures of word level literacy skills administered in Time One. One finding was that students in this sample found spelling accurately to be much more challenging than reading proficiently. In addition, a smaller sample of students, with slightly weaker pseudoword spelling skills, was tested individually for decoding skills. Descriptive data from the sub-sample were reported with similar findings to the whole sample. Relationships between variables were examined through an analysis of bivariate correlations; all of the literacy measures used in the study were significantly correlated. Regression analyses were used to further examine relationships between variables. It was found that code-related word level skills made a unique and significant contribution to variance in reading comprehension even after the effects of vocabulary knowledge had been taken into account concurrently.

The second research question related to the efficacy of a word study intervention, and a comparison of the results of the gains between Time One and Time Two testing in intervention and control schools addressed this question. Small gains in favour of the intervention students were found on measures developed for the present study but there were no overall intervention effects on reading comprehension, reading vocabulary or real word spelling. When reading gains were examined with reference to the additional professional development (PD) that one intervention and one control

school had received, it was found that reading comprehension had been positively influenced by extra PD. The difference for the intervention school was only detected when the negative gain score for one intervention school was excluded as an outlier. The overall implementation of the intervention was examined and found to be patchy for several reasons. These reasons will be discussed in Chapter Six.

The third research question asked how levels of teachers' literacy word level knowledge might impact on student achievement. A comparison of Time One and Time Two data from testing teachers was used to address the first question relating to teacher knowledge. Teachers in the intervention schools made large gains in word level literacy knowledge but no specific links were found between teacher knowledge and student gains. Wider questions about the impact of the intervention on teachers and students were addressed through interviews with teachers and students and the findings from these interviews are reported in Chapter Five.

Chapter 5 : The Impact of the Intervention

In this chapter data from interviews are examined to explore how teachers and students experienced the intervention. Information gathered from observations of intervention teachers is analysed. The research questions which could only be answered by using qualitative data are related to participants' experience of the study, the development of word consciousness, and teachers' confidence with implementing the intervention. Interviewees fall into three categories: fifteen intervention teachers, seven control teachers, and 35 students who were successful in at least two of the literacy assessments from both intervention and control schools. Student success was defined by gains of at least one standard deviation above the average gains for each test, in at least two tests. Only students who had experienced some success were interviewed because it was expected that interviews of successful students would yield information that was more useful to the findings of the study.

The method of data analysis is described in the first section of the chapter. The rest of the chapter is broadly organised around five major themes which emerged from an analysis of the data. The first theme involves challenges associated with the implementation of the intervention. The second theme relates to teacher knowledge and beliefs, and their impact on implementation of the intervention. The third theme arises out of the successful students' perceptions of the transition to secondary school and the context of the intervention. The fourth theme is concerned with the development of word consciousness, and the final theme, which stems from an analysis of teacher and student understanding of learning success and failure, is concerned with perceptions of achievement. Unanticipated longer term impacts of the study, identified in the course of the analysis of the data, are briefly discussed in the last section of this chapter.

Protection of Anonymity and Method of Data Analysis

Participants' names have been changed to protect their anonymity. A code identified the participant as a teacher (T) or student (S) with the added label for intervention school (I) or control school (C). For example, a quotation followed by the name Mary, (TI) refers to an intervention teacher, and Cameron (SC) refers to a control student. When a participant mentioned details that would make it easy to identify them deleted words are replaced by an (X). When pronoun referents needed clarification this was achieved by inserting an italicised word in brackets. For example: ". . . it (*the intervention*) was worthwhile pressure." The italics indicate that the word was implied.

Data analysis was thematic, based on Glaser's (1965) constant comparative method. The first stage involved careful coding of each interview transcript into thematic categories. Each transcript was examined and compared with the previous analyses of transcripts to discover similarities and differences in respondents' perceptions of their experiences. The analysis did not seek solely to find congruent evidence to flesh out the properties of each theme; exceptions and differences were analysed to serve as a contrast to the experiences that had been grouped together because of similarities. Cresswell and Plano-Clark (2011) argue that the inclusion of contrasting points of view confirms the validity of the data. Reporting contradictory evidence should strengthen the feeling that the data analysis is accurate, because in real life things are rarely clear cut or simple.

The second phase of analysis consisted of a process of integrating themes when data overlapped or separating themes when several contrasting views warranted a separate code. Glaser's process involves the development of theory from the analysis of qualitative data. The interviews provided a rich description of teacher and student experiences whilst revealing some insights into how teachers and students think about teaching and learning. The constant comparative method of data analysis was chosen because it seeks to

explore many dimensions of a situation. The analysis includes the consideration of a range of possible explanations for why events have evolved the way that they have in each particular setting (Glaser, 1965, p. 438). This method seemed appropriate for exploring the context and experience of teachers and students involved in an educational intervention.

The interviews gave teachers and students an opportunity to explain and describe their experiences. Nagy Hesse-Biber (2010) discusses the interpretive approaches to mixed methods research in which the researcher "aims to understand how individuals make meaning of their social world" (p. 105). In the analysis of teacher and student interviews I have endeavoured to acknowledge the multiple perspectives revealed in these conversations and attempted to understand the different perceptions of the impact of the study on participants' experiences. This methodology privileges the experiences of the participants with the purpose of understanding their interpretation of events whilst acknowledging myself, the researcher, as a participant with my own interpretation of the impact of the study. In searching for themes it was important that the participants' voices were distorted as little as possible. The first theme to emerge from the analysis of intervention teacher interviews and from observations of word study lessons was that there were many challenges to implementing an intervention delivered by classroom teachers.

The Challenges of Implementing an Intervention

Some of the challenges relating to the implementation of the intervention were external to the study and others were internal. Internal challenges were either features of the intervention itself or resulted from way teachers reacted to or interpreted the intervention. Some of the challenges could have been anticipated and others were completely unexpected.

I should have anticipated several of the external challenges, but their impact on the intervention had not been considered as something that would

need to be managed. The first example of a challenge over which teachers had no control was that the year of the study coincided with changes being made to the National Certificate of Educational Achievement or NCEA¹. The standards used to judge student achievement were being aligned to the revised NZ Curriculum (Ministry of Education, 2007a), which meant teachers of senior students had to re-write their Level One NCEA courses and this task necessarily took priority over other work because of the high-stakes nature of NCEA assessment. Several intervention teachers commented that the way the newly aligned standards were introduced was haphazard and confusing which created additional stress for teachers involved in this adjustment.

“Yeah. NCEA. Oh it was ridiculous . . . because we didn’t get the exemplars and they changed the goal post.” Mary, (TI)

“. . . hectic, I’ve been a teacher in charge of implementing the new Level One curriculum for English. And I’ve had three NCEA classes. So it’s been a heavy workload . . . Which is actually going to lead in to some of my comments that I will say to you about how I implemented this (intervention).” Annie, (TI)

Annie immediately acknowledged that the work she had done for the implementation of the changes to NCEA Level One had had a significant impact on her ability to manage the intervention. She was to return to this point later on in the interview and one of her comments suggested that she felt some regret about her failure to manage the intervention as well as she would have liked:

¹National Certificate of Educational Achievement (NCEA) is the New Zealand qualification for students. Level One is the first level usually completed in year 11 when students are aged between 15 and 16 years.

“You need to wait until I tell you the details of how I could have done better before you absolve me of all blame in this area.”

Annie, (TI)

One of the aspects of the intervention that I had not considered until I was interviewing teachers was how their own evaluation of their implementation of the intervention might affect their emotions and their sense of self-efficacy. Reio (2005) investigated the way that educational changes and reforms impact on teachers’ emotional lives and suggests that emotions are critical components of teachers lives and identities and that the role of emotions should not be ignored when interventions and reforms are planned. Annie’s comment indicates that she blamed herself to some extent for not achieving as high a standard of implementation as she would have expected from herself even though the timing of the implementation of NCEA was something over which she had no control.

Another external challenge to the implementation of the intervention was that New Zealand hosted the Rugby World Cup in September 2011 and school terms were altered to accommodate this international competition. Consequently some terms were unusually long whilst others were short, disturbing the usual cycle of the school year. The change to the routine of the school year had an impact on the intervention primarily because Term Three was especially long, tiring students and teachers. Term Four was unusually short and this was the term in which the final round of testing took place, making it difficult for schools to spread the timing of the testing out to reduce the chance of students experiencing test fatigue. One teacher said that:

“Incredibly busy and not well structured by the Ministry because of the World Cup rugby, and it’s exhausted the children and it’s exhausted the teachers to an extent that I think it’s been detrimental to their learning.”

Irena, (TI)

Other external factors that presented as challenges to the intervention came in the forms of unexpected illness and promotion. All the participants in the study had volunteered but two teachers in particular had additional demands on their time which they would not have predicted at the time of volunteering. One experienced teacher's elderly mother became ill which necessitated her taking leave. She indicated that during her absence much of the work she had set had not been taught and no word study sessions had taken place:

"Oh well, it's been a very up and down year, and that's because of my mother's illness so I wasn't here for probably five weeks over Term Three. Yeah, so there was a reliever in the classroom and I don't think some of the work that I left wasn't done or most wasn't done really to tell you the truth. And certainly not this (*intervention*) work." Dawn, (TI)

A teacher, who was new to her school, was offered the post of senior dean and this extra responsibility put additional pressure on her planning time. The position of senior dean carries considerable status in most secondary schools so it is quite natural that this teacher accepted the promotion even though she acknowledged that it made her teaching job more difficult:

"Yeah, extremely busy. I was promoted to head of the senior school at the end of Term One and . . . I've only been at (X) since the beginning of the year . . . And then the senior dean left and they asked me to apply for the job . . . but yeah from Term Two, it's just been a blur to be honest. And I really felt that sometimes I didn't give enough time to my planning." Joy, (TI)

Although these two examples of unexpected challenge were atypical, most teachers described the year as extremely busy. However, this feeling of having too much to do would probably not be different in any other year.

Words like 'full on,' 'tiring', 'incredibly busy', 'diabolical' and 'tough' were used to describe the year in many interviews.

Three of the intervention teachers were new to teaching. Although this was not strictly an external challenge it is one over which these teachers had no control. Their lack of experience would have made it more difficult for them to evaluate how much extra work implementing the intervention would entail. Even though they had volunteered, two new teachers might have found it difficult to refuse to participate. At the time of the intervention I was working in their school as a literacy adviser and the Senior Management Team strongly approved of the intervention. I was able to give these two new teachers more support than other intervention teachers in the form of help with planning. However, this extra support did not materially help them to deal with the demands of being beginning teachers. One of the newly qualified teachers found her situation particularly stressful:

"Incredibly difficult, because of a lack of resources and difficulties with lack of communication . . . Because it made things really difficult to plan and gather resources and those sorts of things." Erica, (TI)

Erica found what she perceived as a lack of communication about forward planning and expectations from her head of department challenging, but the other newly qualified teacher had a more positive response to her situation:

"It has been a very hectic year for me because I am obviously not trained in the (X) position that I am currently working in. But it's been exciting in that I have learnt lots. And had lots and lots of challenges . . . At times it has been difficult to understand some of the literacy tasks. . . then in some ways it's probably been really good because I have had to learn them before I teach them . . . I may have delivered some things really well – you know you get that feeling when you have." Carol, (TI)

Carol responded to the challenges of her situation by using the intervention as an opportunity to learn more about literacy teaching, and gained feelings of self-efficacy and satisfaction from the way she delivered her literacy lessons. It appears that Carol had some inner resilience which helped her to respond positively to the challenges of the intervention. Erica had a different experience and because she perceived that the communication between her and her head of department was not clear and she was having difficulty planning her teaching programme, she found it difficult to manage the extra planning needed to implement the intervention.

Factors inherent in the intervention itself made implementation difficult for many teachers. One of the key principles of the design of the intervention was that word study sessions should be integrated into teachers' current teaching programme and not be an 'add-on' separate activity. It was important for student engagement that they should see the relevance of the work on vocabulary and spelling. One way of ensuring the relevance of the word study sessions to their existing programme was to use words that were important vocabulary in the topics they were learning about. This integration proved to be extremely difficult for many teachers, with seven out of 15 teachers mentioning difficulties with integration.

One of the factors influencing teachers' implementation of initiatives designed to improve the quality of teaching is how teachers perceive the cost of the implementation. The cost of the intervention consists of the availability of resources and the time needed to implement and plan for the intervention (Abrami, Poulsen, & Chambers, 2004). In the present study it became evident that the cost in terms of time to adapt the suggested resources, so that they would be integrated into the current teaching programme, was too high for many teachers:

"The difficulty was fitting it in and trying to make it contextual and authentic which made me sort of lose heart a bit and I ended

up not doing a lot of the things because I couldn't adapt them. I struggled to adapt, was it solidification? No, some of the things it took me ages to try and work out with words that we were using . . . and just the time involved in trying to make it authentic. And I sort of lost heart over that and because of that I didn't do a lot of the activities, didn't do a lot of the activities particularly well or consistently." Annie, (TI)

For Annie the struggle to adapt the suggested activities to the words that she was focusing on in her teaching programme was just too difficult. The difficulties she had integrating and adapting the word study sessions caused her to 'lose heart' and she felt that she was not making a success of implementing the intervention. The cost in terms of time and lack of success were de-motivating factors. Another teacher, Mary, felt that she needed access to the resources right from the beginning so that she could have planned their use to fit in with what she was doing:

"I found it a bit difficult . . . In that it just didn't, I already sort of had a system of warm -ups that I do with them so I had to throw those ones out. And use these ones and they didn't always fit in with what we were doing, they were kind of time limited . . . I would have to have it at the beginning of the year so that I could fit it in." Mary, (TI)

Adapting the resources to fit in with her teaching programme was difficult for Joy who had her time curtailed with extra responsibilities and could not find time to think about how to use the activities in an integrated way:

"Probably time. . . Time is a biggie. And then, and I was trying really hard not to use those spelling activities in isolation. And that's it . . . that's where I think I fell down and I sort of missed the boat a bit because I was so tied up with deaning planning wasn't

necessarily a priority . . . And just actually trying to think creatively like how can I fit this activity in with what I am doing?"

Joy, (TI)

One of the newly qualified teachers blamed herself for not planning the implementation properly which possibly added to her feelings of inadequacy. The difficulty of making time for extra planning had an effect on this teacher's morale and feelings of responsibility and accountability:

"Probably my lack of organisation, you know streamlining and having it, making sure that there were regular slots or just implementing it all the time. If I had, yeah . . . effective planning probably." Erica, (TI).

My response to this teacher during the intervention was to assist her with planning and to help her to group her students in order to understand their word level strengths and weaknesses in more depth. This additional support was not enough to sustain her in my absence and in hindsight it was unreasonable to expect an inexperienced teacher to manage the implementation of an intervention which placed such a high reliance on teacher knowledge and confidence.

An experienced teacher seemed to take responsibility for the lack of planning time which meant he did not present the activities to the class in what might have been a more engaging way:

"The only barrier was my own preparation - I would have liked time to plan more fun alternative ways of presenting things, laminated cards – groups, more carefully structured groups. It was a workload issue. I used the data projector when I think students would have responded to more tactile experiences. The class enjoyed the vibe, but it was challenging and there were ups and downs." James, (TI)

One more challenge to the implementation was that some teachers felt that the content of the intervention was not suited to their students. Although it

had been intended that teachers adapt resources to meet their students' needs it became apparent that this adaptation had proved far more difficult to achieve than anticipated:

"Yeah, just the type of kids that we had, if it . . . maybe was a different class." Irena, (TI)

Conversely, other teachers found that the students in their class made implementation easy:

"I can see that with other groups it wouldn't be so easy. . . I felt reasonably grateful that I'd got a group who were receptive."
Michael, (TI)

Michael was confident with the content of the intervention and scored highly on the initial teacher test so another interpretation of the comment that the students were 'receptive' could be that Michael knew enough to be able to integrate the content into his teaching programme. The link between confident implementation and teacher knowledge will be analysed in more detail in the next section of this chapter.

Student response to the intervention was in some cases, an enabling factor, but at other times it was problematic. Teachers were asked to devote two fifteen-minute time slots a week to word study sessions and for some students this became less interesting as time passed:

"Sometimes really well, very sparky and full of suggestions and discoveries and exclamations and sometimes, 'not another one'. . . that kind of thing." Sandra, (TI)

One of the most onerous demands of the study on teachers and students was the administration of additional literacy tests. Most students would be expecting to complete reading comprehension tests and possibly a writing assessment at the start and end of a year (Craig, 2011). In addition they had

two spelling tests, two vocabulary tests and a language terminology quiz. Tests were administered over a couple of weeks in Term One and Term Four. There was evidence that students in both control and intervention schools experienced what one teacher described as 'test fatigue' which presented a challenge to the implementation of the intervention:

"I tell you one thing that shocked me a bit was when they came to do their final PATs, the reading and the comprehension ones . . . halfway through the paper that someone asked me a question and I said, yes this is for Jessica Craig but it's also for your end of year assessment for (X) and they said oh I didn't know that, and panicked. And I said haven't you been trying properly? And they said no. . . So they were, in a way, totally over it. . . By the end they thought, oh this is just another one of those, not important, no big deal." Sandra, (TI)

Testing of teachers was a stressful element of the study for some of the teachers but it helped them to feel some empathy with their students:

"Oh, that was terrible. I actually felt for my students. They must feel awful when we test them all the time." Anila, (TC)

"I felt quite anxious and I did not expect it and was worried about how I would do. I thought the testing helped us see how it is for our students when we test them." Erica, (TI)

Not all students responded negatively to the tests. Some students enjoyed the pseudoword tests. One girl wrote on her test paper at the end of the year: "We love pseudowords" decorated with kisses and a big heart.

Teachers reported student enjoyment of the strange words:

"Actually they loved the pseudowords. You could see the smiles on their faces as they did them, yeah." Sandra, (TI)

“They do, (love pseudowords) and they love the way I would pronounce them.” Dawn, (TI)

“What happened was with a lot of it is that they feel more confident in their abilities so they’re quite happy to have a bit of fun with pseudowords.” Annie, (TI)

It became clear that differentiation of resources was another challenging aspect of the intervention. None of the teachers mentioned difficulty with differentiation. However, the expectation that students would be grouped according to their achievement in the literacy tests had either not been understood, thought to be unimportant, or found to be too difficult to do. An assumption was made that teachers would be keen to group students to provide more targeted word study teaching to raise achievement. Yet this focus was not evident when teachers were observed in Term Three, more than half way through the intervention. Differentiation was not evident except in the classes of the newly qualified teachers who had had my help to group students and to plan the sessions. The planning for differentiation took considerable time and I should have realised that this was an unrealistic demand to make on busy teachers. My initial response, when I had seen no examples of differentiated teaching, apart from the two teachers I had helped, was one of dismay. Initially I blamed the teachers for not following my instructions which I had thought were clear. On reflection I realised that the intervention was more complex than I had thought it to be. I had thought that teachers would naturally group students into about three or four groups according to their word level skills but this did not happen.

Another issue became apparent through the observations, which was that most teachers were teaching the whole class and students were not working in small groups. I had emphasised the importance of students working in small groups to ‘discover’ spelling principles by sorting words and working out meanings of prefixes, suffixes and root words, rather than whole

class teaching strongly directed by the teacher. The small group discovery method had been clearly described by Nunes and Bryant (2006) and I wanted to replicate this aspect of their work. Despite my concern I made a decision not to give any negative feedback. Teachers were doing extra work because of the intervention and might be antagonised by criticism of the conduct of word study sessions. Criticism might have negated the positive things I had observed and might damage my relationship with teachers. Teacher good-will to administer tests at the end of the year was needed and there was not much time left for any changes in practice that I might have been able to generate, to make much difference. Nevertheless, I had observed many positive interactions in the observations relating to student and teacher enthusiasm for finding out about how words work. These positive aspects are described in more detail later on in this chapter.

Teachers' self-assessment of their implementation of the intervention indicated that there was patchy adherence to the principles underpinning the intervention and analysis of the interviews confirmed that there were a number of issues which influenced teachers' ability to deliver regular word study sessions that were integrated into planned teaching programmes. The issues ranged from external pressures over which teachers had no control, to elements within the intervention itself which made implementation difficult. Another interpretation of some of the challenges associated with the implementation of the intervention is that some of the difficulties relate to levels of teacher knowledge. It is possible that some teachers had difficulty managing to integrate the intervention in to their teaching programmes because they did not feel that they knew enough about phonology, orthography and morphology to successfully adapt the resources that were provided for them. The influence of teacher knowledge and beliefs is the next theme that emerged strongly from the data.

The Influence of Teacher Knowledge and Beliefs

It became evident, when examining the data, that teacher knowledge was bound up with feelings of efficacy in this study. The theme of the influence of teacher knowledge and beliefs had many aspects and dimensions. Teachers who had higher levels of knowledge of phonology, orthography and morphology were confident about their ability to implement the intervention successfully. However, knowledge was not the only factor that influenced the teachers' commitment to the implementation of the intervention. Teachers' attitude to learning themselves was an additional factor. Teachers' estimation of their own levels of knowledge was not always accurate and could be grouped into three main categories.

The first group consisted of those teachers who believed they knew a lot and had this conviction confirmed when they were given their initial test results and began to see the content of the intervention. Another group consisted of teachers who were aware that they knew little about phonology, orthography and morphology and had this knowledge confirmed when they saw their test results. The last group was made up of teachers who believed they were knowledgeable but found out that they knew less than they had thought they knew. They were surprised by their test results and by the content of the intervention activities for word study sessions. Teachers responded differently to the intervention depending on their levels of knowledge and their approach to learning new information about the structure of English. Research indicates that when teachers perceive that they will be successful implementing an intervention they do so more assiduously (Abrami et al., 2004), and this finding is supported by the data.

There were five intervention teachers with relatively high levels of knowledge about the structure of English and these teachers had less difficulty implementing the intervention than some other teachers. Some of the high knowledge teachers had gained their knowledge through studying another

language at school or university; others had taken post-graduate papers in literacy acquisition or had related professional development earlier on in their teaching careers. Dawn credited her levels of knowledge about English to her knowledge of other languages:

“I do see you know, and I’ll just add this bit in, and that’s the fact that I did Latin at school and German, and French.” Dawn, (TI)

Michael was another teacher with high levels of knowledge. He used this knowledge quite naturally in his daily teaching which made the implementation of the intervention easy for him. When I observed a word study session, the root word *vac* was written on the board in the centre of a spider diagram with words like *vacuum*, *vacant* and *evacuate* round the edges. He explained to the class that he had been talking about *vac* with his year 11 English class and then asked the students what they thought *vac* might mean. A good discussion ensued and this was his unplanned introduction to the word study session. Michael had complete confidence that he could implement the intervention because he was secure in his own knowledge which was demonstrated in his teaching practice:

“I think I felt very confident because my background has given me an understanding of the way words are constructed, I mean . . . I, my own schooling focused very much upon that. And was quite academic I suppose in its approach, so I felt that I had the grounding in the grammar but also in the knowledge of the way words were put together. . . I did Latin at school and I did Anglo-Saxon at University and . . . I never realised quite how valuable it might turn out, well the Anglo-Saxon probably less so.” Michael (TI)

Bronwyn was confident because of post-graduate study. She admitted she was slightly 'rusty' but she had a basic level of understanding which made it easy for her to pick up the main ideas about the word study sessions:

"I felt quite confident because I had begun that paper on Diploma Literacy at Massey and we had done a lot of that. . . morphemes . . . and so yes, I did feel OK about it. I mean there were some things I didn't know." Bronwyn, (TI)

Two teachers had experience of related professional development prior to the intervention and this gave them confidence that they would understand the content of the intervention and that the approach would be consistent with what they knew because I had provided a resource written by Joy Allcock who had delivered their professional development:

"I've always done a Joy Allcock spelling program and so it was very similar, yeah." Joanna, (TI)

"I actually didn't doubt my ability to implement projects cause I don't as a rule. And this one . . . I particularly like Joy Allcock. And I've used her program at preschool, not preschool, at primary school before." Maria, (TI)

Another group of teachers had little word level literacy knowledge at the start of the study but were keen to use the intervention as an opportunity to learn more about language. Eva explained to me how she had found Elkonin boxes useful to support students to analyse sounds in words, once she understood how to use them. She indicated that she had little confidence because she knew she did not know much about the content of the intervention:

"Not at all (*confident*). . . Because I'm not primary trained I didn't feel when you talked about morphemes and things like that I was like ah hah, so I hadn't a clue. . . Never encountered them before in my life . . . My own lack of knowledge in it, like the Elkonin boxes,

I was like going . . . what? And second guessing myself . . . I was lucky because I went and asked Maria.” Eva, (TI)

Joy was an English teacher who had expected to know more and had been surprised by her first test result. However she was not daunted by this lack of knowledge:

“I was okay about it. There were some things that even as a teacher of English . . . like I was not familiar with and so I felt that once I’d sort of refreshed myself and taught myself some of the things that I didn’t know I was happy to deliver it.” Joy, (TI)

For others, who had started off with confidence, the realisation that they did not know as much as they thought they knew was rather a shock. James was quite critical of his initial response and used strong language to describe what he perceived as unjustified confidence in his ability to deliver the intervention:

“I felt I was somewhat ignorant and naïve – reasonably confident. If I had known then what I know now I would not have been confident - I had a certain arrogance – once I saw that there were a whole range of other approaches and methods of remembering, sorting games - I felt less certain.” James, (TI).

Sandra used her surprise at her relatively poor score in the initial testing to spur herself on to learning more about the phonological and orthographic elements of English. She responded with resilience to what could have been a discouraging finding. She acknowledged that she thought that because she is an English teacher she would know the content of the intervention:

“I was not too nervous about being tested the first time because I am an English teacher so I assumed all would be well. It was not. I got a terrible result and realised how much I did not know about linguistics. I felt ignorant. Did my swot and by the end achieved a respectable result

. . . It's a fascinating subject. I quite enjoyed the challenge of improving my score. I thought the idea of the test was good. It certainly threw us into all the new terminology at a rush. Stimulating." Sandra, (TI)

Another interesting dimension to the concept of teacher knowledge was that the high knowledge teachers saw benefits in this project for their colleagues' learning because they saw the project as a way to lift their colleagues' knowledge of language. This was not intended to be a criticism of the teachers but a comment on their lack of opportunity to learn these things at school or university:

"Well, I think in terms of the awareness that, or the raising of awareness perhaps of staff towards some of these things, because I think, you know not having gone through the kind of training or, not training but the education we have in these kind of areas I think their knowledge of some of those things is. . . patchy at best. . . But you know you've got to say well, where would they have got it (*knowledge*) from?" Michael, (TI)

Hansen (2005) interviewed English teachers in the course of research into teacher self-efficacy and several teachers commented that they were not trained to teach reading and spelling acquisition. Similar concerns were expressed by Rosa, who commented on the difficulties teachers have with lack of knowledge about how to teach reading and writing:

". . . it's been nagging at me for a wee while about the lack of training that secondary school teachers have in regards to basic principles of reading and writing and how to teach them . . . and being an English teacher, so core business being literacy, I was very aware of what I didn't know and then I think given that I'm in those two positions how desperate must that be for say a science teacher." Rosa, (TC).

(The 'two positions' Rosa refers to in the quote are her roles as an English teacher and as the school's Literacy Leader.)

For another teacher who had a leadership role, the project was an opportunity to embed a spelling programme which is something she had wanted to do but had found teachers a little resistant:

"But yeah I'm really pleased that, that we have done it because it has initiated you know, other teachers in the team, planning for spelling. And teaching spelling. Yeah, I think probably they were, they were reluctant to but they really needed to." Joanna. (TI)

It seems that teachers who had a strong conviction that teaching spelling is important, or that the project was a good idea before it even started, implemented the intervention really assiduously and found lots of positive benefits to students. The literature suggests that interventions are more likely to be implemented well by classroom teachers if they expect that they will be successful, and if the content of the intervention is congruent with their teaching philosophy (Abrami et al., 2004). Another condition that supports successful interventions is that teachers need to see the benefit of the proposed programme for either themselves or for students (Abrami et al., 2004; Datnow & Castellano, 2000).

Three teachers in particular were highly committed to implementing the word study sessions regularly and this commitment seems to stem from teacher beliefs about the intervention. Maria had a firm belief that the project was useful right from the outset:

"Oh enormous positives, one, it's getting back to the basic skills which I firmly believe we need to do. Two, it's encouraged the students to think more about the language they use in writing. I firmly believe that a limited vocab limits writing . . . I firmly believe that spelling's an absolutely vital part of learning to write

so for me it was, it was, you know it was worth the time and worth the energy.” Maria, (TI)

When we were discussing students in Sandra’s class who had made really good progress, she praised the students but added that she used all the resources I had sent her. In addition, she revealed that she had a belief in the value of teaching spelling and morphology:

“Cool, well they are a good class but also they, also I’ve done everything you sent. I’ve done, I don’t think I missed anything that you sent or suggested to do in the end yeah . . . Well I learnt a lot . . . And I believed in it too, I believed that that kind of programme will help them.” Sandra, (TI)

For Bronwyn there was congruence with the content of the intervention and what she perceived as the needs of her students. The short sessions slotted in to the way she structured her teaching. Bronwyn’s class was the only group of year 10 students in the study and she had asked to be included in the project because she believed it would benefit her students:

“Well my year 10s really enjoyed it because it was competitive and they, yeah they liked the little testy things that we did and they liked to improve, see their improvement and they also like learning things in small blocks. So it was just easy and because of the kids that they are, we have, like we work in blocks of three anyway or blocks of four so we do reading, we do a language activity and then we do our project, whatever we’re working on. So it just fitted in really well.” Bronwyn, (TI)

The influence of teacher knowledge and beliefs was critical to the implementation of the intervention. Levels of knowledge as well as teacher attitudes to their own levels of knowledge shaped how teachers approached the task of regularly planning short word study sessions. Few teachers felt happy

about the way they had implemented the intervention and several teachers said that they felt they could have done better if they had known more at the start:

“If I knew then what I know now . . . I would have done it differently.”

Sandra, (T1)

When I asked Sandra what she meant she said she would have implemented the intervention in a much more integrated way but she had not had the confidence and the knowledge to do that at the start of the project. The statement seems to be tinged with regret. Feelings of regret about the way they had implemented the intervention were suggested by Annie and James who used phrases such as “could have done it better” and “If I had known then what I know now . . .

This theme of the influence of teacher knowledge and beliefs has been developed in response to the analysis of the teachers’ voices. The next theme arose out of an examination of student responses to questions about their experience of the study which took place at a time of transition to secondary school for most participants.

Successful Students’ Experience of the Study

The student sample was selected on the basis of success in the literacy testing so the comments they make cannot be inferred to be typical of all participants. Nevertheless, they represented a wide range of literacy achievement. Ten of the 35 students who were interviewed fell into the ‘struggling reader’ category with reading comprehension scores below the 30th percentile in Time One. Almost a third of those interviewed, 11 students had average achievement in Time One and 14 students had scores in the high range, above the 70th percentile. The majority of the 35 students interviewed said they had had a good start to secondary school. Only two students reported having a difficult or unhappy year and four students indicated the year had been one of mixed fortunes.

For many students academic achievement underpinned positive feelings about school. This may be because students had experienced some success. In addition, they had indicated, when they signed consents, that they were willing to be interviewed. This willingness may indicate openness to new experiences when compared with students who allowed test results to be used but would not be interviewed. Some comments that students made about their academic achievement do not relate specifically to literacy achievement but to the year in general:

“It went great, I really liked the start of this last year in general, just learning the school, adapting like going from primary to college, it was a big leap but after a couple of weeks it was just normal, I absolutely loved it last year. Drama I started, with doing Shakespeare and stuff as an extra and I just absolutely loved it.” Rory, (SI)

A few students mentioned literacy skills as their area of improvement:

“It was good. Because our teacher taught us lots of reading skills and that.” David, (SI)

“I loved it. The teachers’ support and the community around me. Miss (X). I enjoyed the reading programme.” Laura, (SI)

For many other students positive academic experiences were linked to making new friends. In addition students mentioned teachers and said they had contributed to their good experiences.

“Good. Because I learnt heaps of new stuff and I got on well with everybody in there.” Aroha, (SI)

“It was a good year . . . I made friends really easily because they were all into stuff that I am in to . . . The teacher gave interesting things.” Bridget, (SC)

Some of the students who had less positive experiences found it difficult to be specific about what the year had been like, using words like “OK” or “alright” But others were more able to pinpoint what had been the ‘ups and downs’ for them:

“Some of it was easy and some of it was hard. I got subjects I liked and the ones I enjoyed I did well in. Some of the subject I didn’t really want to do I did actually quite well in them.” Lisa, (SI)

For the students who said they had not had a good year it was either down to their experiences with other students or because work had been difficult:

“A crap year . . . Just people, like just normal people, just like talking about me.” Carla (SI)

“Well in some subjects I did pretty bad and, well where I got tested for the spelling thing, that class I struggled in a bit, but it was pretty good, and last year I did pretty bad and this year I’m going really well . . . I didn’t concentrate.” Catherine, (SI)

Much research into transition from primary to secondary schools suggests that this is generally a stressful time for students. Some of the stresses relate to fears of bullying, fears about workload and fears about relationships with peers (Zeedyk et al., 2003). Other research suggests a general loss of academic attainment and declining attitudes to school as well as a loss of motivation associated with transition (Hawk & Hill, 2004). One reason cited for the lack of motivation is the perception that work is not as challenging as expected and that it has been done already (Hawk & Hill, 2004). There was evidence that some students in both control and intervention schools felt that the work was easy or had already been done at primary school:

“Not really because at primary I was doing most of the stuff that we were doing last year so some of it was just a recap.” Dan (SI)

“It was kind of ups and downs; yeah it was just pretty basic there was just heaps of stuff from Intermediate.” Leon, (SC)

Many of the students in this sample did not seem to find the transition troubling. Or at least, they did not report their difficulties when interviewed. Many students had positive things to say about the transition.

“I found it great actually . . . Because Intermediate was really cool but I liked it here just because it was different and I felt like I fit in pretty well.” Alex, (SC)

“It wasn’t like – when we were in year 8 . . . all the teachers were like. . . we’re going to get you ready for college. . . it’s way harder. . . you think this is hard? I find that we have got a lot more freedom at college. We have got more stuff that we are allowed to do. I thought it was gonna be bad, but it was actually really good.” Karl, (SI)

The general impression gained from student interviews about their first years of secondary school was that it was a mostly positive experience. There was little evidence of the loss of motivation and decline in attitude reported in the transition literature (Cox & Kennedy, 2008; Kirkpatrick, 1997). Students’ impressions contrasted with feelings of stress and pressure described by many of the teachers in the study. In the next section of the chapter the theme of word consciousness is explored from teacher and student perspectives.

Word Consciousness

Although developing ‘word consciousness’ as described by Scott and colleagues (Scott et al., 2012; Scott & Nagy, 2004) was never explicitly stated as an aim of the project to teachers, I had hoped that students would enjoy discovering patterns and making links between words with similar prefixes or roots and that ‘word consciousness’ would develop in word study sessions. Because of the relationships I had developed with the participants it is probable

that teachers emphasised positive effects, and omitted some negative effects, of frequent word study sessions; this factor should be considered when evaluating findings relating to the intervention. Students were asked to comment on things teachers had done to help them with spelling or learning new vocabulary, and student responses are included amongst teachers' comments as a way of triangulating the data. Few student responses specifically relating to word study sessions were identified which suggests they were far less conscious of the intervention than teachers.

Many teachers reported that students began to take an interest in working out what words might mean and that they had fun with words. Students talked about the value of learning more about how language works and increasing their knowledge of vocabulary. Annie saw that learning about morphology and focusing on spelling patterns helped students with close reading. Close reading involves examining an unseen text for more than just meaning. Students are required to notice and analyse the structure and form of the text, for example they might have to comment on the use of a metaphor or a sound device such as alliteration. This skill is assessed in NCEA English external examinations:

“Yeah I mean suffixes, prefixes or suffixes in particular and root words and some of the spelling rules were really beneficial, the suffixes and the root words, and just making connections between words and looking at patterns. Anything that gets the students to close read.” Annie, (TI)

Students who were interviewed saw that learning new words was empowering, and that spelling is sometimes quite challenging. The following quotes from students indicated that they saw the word study sessions as useful and engaging. There was an acceptance of the proposition that an increase in vocabulary is a useful and positive thing. Learning new words and how to

deconstruct them was seen as a way of enhancing esteem and impressing others:

“I think learning new words is like a good thing so it might increase your vocabulary. Learning how to like spell a word can be quite difficult because you need to like practise it . . . Yeah we did quite a few activities based on like long vowel sounds.”
Anthea, (SI)

“I find that my speech becomes more, I don’t know how you put it, I extend my vocabulary.” Nadia, (SI)

“I enjoy learning new words because you feel brainy. The stuff . . . you know the prefixes . . . Yeah we did a lot of stuff like that and that always helped.” Dan, (SI)

Students expressed interest in learning about the ‘layers of language’ which was a simplified explanation of some of the origins of English words from Anglo-Saxon, Romance (Latin and French), and Greek.

“Cos we were learning interesting topics that we wouldn’t usually study . . . the teacher would explain what it’s about to us, where it originates from and stuff like that.” Madeline, (SI)

“And I think from my point of view it’s about empowering them and telling them that they’re on the right track all the time . . . They liked doing the breaking down and the Anglo-Saxon and the Greek.” Eva, (TI)

A couple of teachers were pleased that some students became more confident about reading long, unfamiliar words. Moreover, students in two classes became more willing to acknowledge words they did not know. One teacher described how students had skipped reading unfamiliar words in the past but now made the effort to decode them. The second teacher gave a

detailed account of some of the changes she had noticed in students reading habits:

“If I look in their reading, like our shared reading, they are far more able to . . . when they see a word and they don’t, never come across it before, they don’t know it like biodiversity . . . Instead of going I don’t, can’t say it they’ll go bio - di, so they’re self –correcting . . . in a huge reading if somebody’s decoding a word they’re all sitting there mouthing it and breaking the sounds down. So that’s brilliant, so then they can say it and then they will . . . And then I might say to them at the end of it, any words that you don’t know? At the beginning of the year they didn’t want to put their hand up and tell me . . . And that’s empowered them. So now they’re keener to attack something new. I’m really proud of them all actually.” Eva, (TI)

Many teachers saw that students enjoyed working things out and became engaged because they were problem solving and making connections between words with similar roots or prefixes. Word consciousness encourages teachers to teach vocabulary in such a way that “leads to flexible application of word knowledge” (Anderson & Nagy, 1991, p.721), and Mary describes one such moment when students have transferred the knowledge they gained in one context, their English class, to another context, a Science lesson:

“Yeah, I mean there’s lovely moments like when the kids were in our science class and the teacher came and said, I asked them what biology means and they said it’s the study of life . . . so they got it – just like that . . . so I’m sure . . . You know that there are a lot of positives. They liked it when they could learn what a word means by taking it apart. A lot of them enjoyed it.” Mary, (TI)

Scott, Miller and Flinspach (2012) suggest that word consciousness develops vocabulary knowledge in three ways: firstly, it increases knowledge of

words and word meanings; secondly, it increases metalinguistic knowledge because students learn more about the structure of words; and thirdly, it activates affective aspects of word learning so that feelings of interest and appreciation of words are aroused. All three aspects of vocabulary development are evident in teachers' descriptions of student engagement in word study sessions:

"and they learnt a lot, I know they learnt a lot . . . Well I could tell by the way they were chatting and responding, especially for language roots." Sandra, (TI)

"As soon as students start sort of working with words and understanding them they start to try and experiment . . . It's been a lot of fun, the actual program has been fun to teach because it's little short bites for the most part . . . but they've been fun to do." Maria, (TI)

"Actually they quite enjoyed it I thought. I think you came in once. And they really liked doing these exercise . . . They actually do, it's like a puzzle . . . and patterns and puzzles are things that I think they like now that they do gaming and all sorts of things like that. So they seem to enjoy it I have to say." Dawn, (TI)

In James's class some students who were not usually engaged in English got quite involved in solving puzzles and working out patterns. I noticed intense animation when I observed his class in Term Three. Students were working out the rule about doubling letters to conserve short vowel sounds and at one stage James wrongly identified a vowel as long when it was short and the students knew that he had got confused and, respectfully, put him right. However, James's perception of the students' response indicates that the levels of engagement I had seen were not sustained:

“I think that (*the level of engagement*) varied – more able students could see the patterns- some, who do not engage with school – and have negative attitudes to English – were able to get it . . . More able students confirmed their ideas about spelling and parts of words, knew when to double consonants and the difference between ice/ise . . . ” James, (TI)

Carol reported high levels of enjoyment in learning about words from the students and said that she, in a similar way, became engaged with learning about words:

They’ve really, really enjoyed it. In the sense that – especially studying the root words . . . doing those activities – we spent a good hour some days. It was taking up other learning time but they were all focused and engaged and quite competitive and they wanted to find out so that was really exciting . . . but as I say it was really cool seeing the kids . . . they really got focused in on it. And they could see that I was learning as well.” Carol, (TI)

Carol’s last sentence leads into another aspect of the intervention which resonated with a number of intervention teachers; this was the idea of reciprocal learning. In word study sessions at times the teachers learned from the students as well as the students learning from the teacher and from each other. Several teachers mentioned this quality of the word study sessions; they saw it as a positive element of the project that they were learning alongside the students. This links into the theme of the influence of teacher knowledge and beliefs but additionally these quotes illustrate growing teacher word consciousness:

“ and it was sort of me and the students making our way through and learning together.” Joy, (TI)

“and so I, even they corrected me on my syllables sometimes cause I didn’t realise a *y* could be a syllable you see, so there were gaps in my knowledge . . . Yeah, yeah, so being a bright class they pull me up occasionally and that was, you know I learnt a lot myself and they learnt a lot, I know they learnt a lot.” Sandra, (TI)

Many of the teachers commented on how they felt as they learned more about the structure of words.

“Yeah . . . I have learned a lot about the English language, personally, but as I say it was really cool seeing the kids . . . they really got focused in on it. And they could see that I was learning as well. So . . . and I think that makes it really important. So it’s less daunting for them. They can see I am trying to get my head around it . . . ” Carol, (TI)

“Positives, the positive was that I’ve got a much better idea now of how to teach that kind of thing and I would do it and I would find better ways to integrate it. Yeah, knowing what I’m about. Other positives? I enjoyed doing it myself.” Sandra, (TI)

One of the features of qualitative research which sits uncomfortably with the quantitative dimension of the mixed methods paradigm is that interventions in authentic situations can have messy and confusing aspects which dilute the clarity of findings. Nagy Hesse-Biber (2010) puts it neatly when she says that mixed methods researchers may need to find ourselves “developing a tolerance for some chaos and ambiguity” (p. 174). In interviews with control teachers and students there was clear evidence of the development of word consciousness in students, even though they had not been through the intervention. In terms of quantity, more intervention students talked about the fun of learning new vocabulary but the responses from control students suggest

that many teachers naturally foster an interest and enjoyment of learning about words:

“I find it pretty cool because like it expands your vocabulary so later on in life you can use more technical words which would be quite cool.”
Karl, (SC)

“I enjoy learning new words like it is you know . . . it makes you feel smart.” Bridget, (SC)

To further confound results one of the control teachers, who had a high level of word level knowledge herself, used the data from the initial testing in precisely the way that I had intended intervention teachers to use it:

“Well the morphology was something I actually worked on quite a bit with them . . . Once we’d done the test, like we sort of looked at words in more depth. Because that’s something I’m interested in anyway . . . But because they responded to that I was able to . . . (*do a bit more*) than I would have normally, yes. So because morphology is something that I, you know I push a little bit, so that they . . . you know, could recognise words that they hadn’t come across or . . . and they also fed off each other because we’d have a class discussion and somebody would put a suggestion in and we’d build on that.” Sally, TC

In this control teacher’s class it is clear from her comments that word consciousness was fostered. She used the data from the Time One testing to delve more deeply into students’ knowledge of morphemes and carried this on through her vocabulary teaching because of the students’ interest and response, and because of her own interest in the structure of words. It would not have been possible or ethical to advise control teachers that they should not teach morphology or foster an interest in words, and by reporting this confounding evidence it is possible that the validity of evidence from the intervention teachers and students is enhanced.

Teachers' and Students' Perceptions of Achievement

To understand some of the factors which might have influenced student achievement in the word level literacy assessments, teachers and students were asked about causes of academic success and failure. There were contrasts and differences in the way teachers and students explained academic success or failure. The topic was approached in different ways with teachers and students and this difference in approach may be one explanation for the contrasting responses. Teachers were asked to comment on individuals they had taught who had either made progress or not; students were asked two general questions linked to attribution theory (Anderman & Midgley, 1998; Weiner, 1985). Briefly, attribution theory is concerned with people's perceptions of causes of success or failure and whether the causes are thought to be within the person's locus of control or to do with conditions over which a person has no control, such as luck. If a person attributes failure to something over which they have control, such as how much effort they put into a task, then they are more likely to be motivated to persevere with the activity than if they believe the cause is something over which they have no control (Anderman & Midgley, 1998). Another aspect to this theory is the way a person conceives of intelligence. For example, if a person believes that intelligence is fixed then they are unlikely to believe that they can make a difference to how much they achieve by applying themselves to thinking hard or effort (Dweck, 1986). In response to questions about why students had made progress many teachers described successful students as hard-working, self-motivated or bright:

"Most of the students already had very good work habits and many are also high achievers. This meant they already had built up strategies to help them improve their knowledge and deal with new concepts."
Chris, (TC)

"But she worked really hard and enjoyed . . . school." Mary, (TI)

“Yeah she’s a smart girl and I think that being in a smart class even if . . . she liked to hang out with naughty kids really but . . . there weren’t so many to hang out with so she just picked up and worked harder perhaps.” and “ I think he’s a smart boy”. Mary, (TI)

One interpretation of these explanations for students’ success is that teachers attribute success to students having intelligence, not to anything they themselves have done. Although application and effort are seen as causes of success, being ‘bright’ seems to be conceived as something innate in students, not something that the teachers can develop. Another interpretation of these explanations could be that teachers were not thinking of what they had done to foster application and effort when they were thinking about the students’ results. Rather, they were thinking of students’ engagement over the year. Another explanation may be that they were too modest to claim any direct influence on success.

Two teachers attributed students’ spelling achievements to the intervention. One particular student increased her raw spelling score by 10 marks which was an impressive shift:

“She’s a real little worker that one. She would have put every effort in to those tasks . . . Great, which is good, because it proves that there may have been something in your programme.” Sandra, (TI)

Another student who also made very good gains prompted this response from her teacher:

“Well it’s, well I knew at the time it was well worth my energy. The shifts, there’s been some sort of . . . look at Holly’s shift.” Maria, TI

Students were asked about their theories of intelligence to see if they had the idea that intelligence is fixed or incremental. It was expected they would fall almost evenly into two groups, but the results were clearly in favour of the incremental view. The question was in the form of a simple multiple choice test. Students were asked to pick between two scenarios to explain what they thought about intelligence. One scenario described fixed intelligence and the other depicted an incremental view of intelligence. Only four students opted for fixed intelligence whilst 25 said they thought you could increase brain capacity. Six students said they did not think either option was the correct explanation because they felt that some people had a better aptitude for learning than others and the capacity to learn new things limited your ability to grow your intelligence:

“Your intelligence can grow but you’re born with a capability of . . . like some people find it easier and some people don’t. It’s not like you’re born with knowledge, just some people find it easier to learn.” Cheryl, (SI)

“I guess I’m . . . I think it’s weird because I think people are just so different, my little brother he really struggles with school and so we always do homework together and I’ll always have to give him heaps of help, and we were born so different and I think that everyone gets born with like a certain amount of intelligence but they still, it’s still really up to you . . . it’s really how much you take it on.” Tania, (SC)

Teachers usually attributed failure to something over which students had control. The following comments from teachers related to particular students whose marks had gone down over the year:

“Interesting because, that really interests me, because I wonder if she tried terribly hard.” Dawn, (TI)

“He’s got an attitude problem.” Sandra, (TI)

“She, she’s one of the least committed members of the class so she may have thrown this final test.” Michael, (TI)

Students were asked to consider a hypothetical situation in which they received some poor test results. Most students took responsibility for test failure which indicates they would probably support the teachers’ idea that something within students’ control is linked to failure. Many of their responses suggested that this was a resilient group of students who would be disappointed by failure but it would not put them off making more effort next time.

“Disappointed. Use it as motivation to get better for the next test and use that to study so you know what you’re good at and what you need to improve on.” Tracey, (SI)

“I’m just real bummed with myself, just disappointed really. I wouldn’t give up, I kind of think, what did I do wrong?” Leon, (SC)

Another dimension to the theme emerges from these responses which were typical of the majority of students. It seems they do not consider poor teaching might be responsible for their lack of success. Rather, that failure is a result of them not paying sufficient attention. Students were asked why they thought they had achieved well in the literacy tests and many of them said it was because they had been well taught:

“she was always really inspiring and made you want to learn. I found it really good. English was my favourite subject last year.” Tania, (SC)

“The teacher. Miss (X), I really enjoy her as a teacher and she gave me like challenges and work to my level which helped me.” Amelia, (SC)

“Because my teacher taught us really well and made us do our work at a high standard.” David, (SI)

Several students felt they had learned most from reading extensively, currently and in the past.

“Just because I’ve read a lot growing up, home schooling you have a lot of spare time so do a lot of reading.” Josh, (SC)

“I guess because I have read a lot . . . well I read more complex books.” Alex, (SC)

The main difference between teachers’ and students’ concepts of success was that teachers attributed success to innate intelligence and/or application whilst students thought effort and paying attention made them successful.

Longer Term Impact of the Intervention

Long term impacts were not considered in the design of the study. However, when the interview data were examined, it seemed that several teachers felt that they would like to continue working with some elements of the study. In addition, there has been personal communication with five teachers after the end of the project which suggests that the intervention has had some small long term impacts on teachers’ thinking and practice.

In one of the intervention schools, two teachers felt the intervention should continue in the form of a spelling and vocabulary development programme based on the spelling resource (Allcock, 2009) that had been provided to support teachers’ planning. One teacher felt the intervention had not been implemented consistently and should be viewed as a two year programme, and the other teacher felt committed to teaching spelling because she saw this as an important student need:

“It’s this, there’s a lot of pressure this year. This is, it (*intervention*) was worthwhile pressure and it’s meant that Maria and I have organised a spelling programme for next year. Based on *Spelling under Scrutiny* and we’ve already worked out, I’m doing the presentation at staff meeting

early next year that will explain how it will be done and what people will be doing. " Annie, (TI)

One teacher asked me in the interview if she could use the tests on her students in the following year:

"Now look, I'll tell you what I've done, if this is alright with you, I've kept a copy of your tests. And may I use them in . . . you know? Just for finding out more . . . I won't be assessing them as well as you but it will give me an idea." Dawn, (TI)

"All in all good, still using it." Joanna, (TI)

In one of the control schools the literacy leader, who had been a participant in the study, told me that they had used the pseudoword test and some resources written for the intervention:

"In terms of your research we've done a couple of things: Last year the bottom band year 11 class mostly tested at levels 2 and 3 of the curriculum so we then gave them a spelling test and your pseudoword test to try to understand the nature of their literacy issues. This year we have implemented a spelling programme with the year 9 classes where we have used the PAT vocab and Joy Allcock's gaps test to identify specific word level literacy issues and are using many of your intervention lessons to teach these skills." Rosa, (TC) (personal communication, May 27th 2013)

One pleasing comment came from an intervention teacher when I happened to come across her in a social setting:

"Doing your project has changed the way I think about words. Now, when I am teaching and we come to a word with a prefix and a root word I stop and talk about it with kids. It has made me think differently about teaching words." Erica, (TI) (personal communication, February, 2012)

Summary

In this chapter a balanced analysis that was fair to the 'spirit' or intended emphasis of each response was attempted. The risk of researcher bias suggests that the interpretation of positive impacts of the intervention should be tempered with some scepticism. Nevertheless, there appears to be sufficient evidence to claim some beneficial impacts of the intervention.

It was important to understand the context of the intervention, and teachers described how busy they had been and what factors had affected their lives in the year of the study. Five teachers, one third, indicated that they did not feel satisfied with the way they had implemented the intervention, either because of their focus on other more pressing demands or because they did not feel confident that they knew what to do. Seven teachers were confident that they had faithfully completed the tasks provided but had not necessarily integrated the tasks into the topics students were working on. Seven teachers said that they had found it challenging to integrate the word study into existing programmes of work and had had to treat the intervention as an 'add-on' activity. Three teachers indicated that they believed that they had worked out how to do the intervention by the end of the year and if they had a chance to do it again they would do it better. The context of the intervention was perceived differently by students and teachers. In contrast to teachers' feelings of too much work and stress, most students interviewed had enjoyed the start to secondary school for a variety of reasons. The students did not reflect any awareness of the pressures described by their teachers.

A strong theme emerged around teacher knowledge and beliefs. This theme helped to explain how teachers approached the challenges of implementing an intervention. Differing levels of knowledge and belief in the value of the intervention help to explain the variations in the way that teachers responded to the challenges involved in adding word study sessions to their teaching programmes. About one third of the teachers had confidence in their

ability to implement the intervention because of prior knowledge. Another group had strong beliefs in the value of the intervention because it focused on teaching aspects of language which they feel have been neglected, but which they saw as important. Both of these groups implemented the intervention with more consistency than some of the other intervention teachers.

Positive aspects of the intervention described by teachers were gains in students' knowledge of spelling patterns and morphemes as well as increased confidence to tackle new words. Other beneficial outcomes were student engagement and interest in learning new words. Students described enjoyment at learning new words and some teachers felt that they had been learning about words alongside their students, and that students had seen this and felt encouraged by it. Many teachers said that they had felt good about learning more about the structure of words.

Negative aspects of the intervention included the difficulty of integrating word study into topics being studied, the time it took to plan the sessions, and in some cases, student indifference or boredom associated with the word study sessions. A number of students found the number of tests they had to complete excessive.

Interviews explored teachers and students understanding of successful learning and failure. Teachers generally seemed to think that student success was because students were intelligent or because they had worked hard, not because of anything the teachers had done to help them, and students believed success happened when they worked hard and listened to their teachers.

Longer term effects of the intervention were that in a few cases teachers have incorporated aspects of the intervention into their teaching practice, and in one school, a different version of the intervention was implemented in the year following the end of the study. In one control school word level assessments were administered to a year 11 class of students with poor literacy skills in an

attempt to gain a deeper understanding of their difficulties in the year after the intervention was undertaken.

In the following chapter, which is the final one, results reported in this chapter and Chapter Four are discussed. The chapter includes an evaluation of how well the research questions have been answered, as well as a description of the limitations of the study. Contributions made by the study are identified and appraised. Lastly, recommendations for future research and practical implications of the findings are considered.

Chapter 6 : Discussion and Conclusion

The main purpose of this mixed methods explanatory study was to find out how adolescent word level literacy skills were associated with reading comprehension. The first research question was about adolescent word level skills and how these skills relate to reading comprehension. The hypothesis was that a group of students would have poor decoding and spelling skills in conjunction with their poor comprehension skills. Quantitative evidence supported this hypothesis. The second question asked whether a word study intervention would improve students' reading comprehension skills as well as developing word consciousness in the participants, both students and teachers. It was expected that spelling and morphological knowledge would affect reading comprehension but the results were inconclusive. Small effects on pseudoword spelling and morphological knowledge were found as a result of the intervention but the intervention had no unequivocal effect on reading comprehension in all intervention schools, perhaps because positive effects were not sufficiently large to have an impact on reading comprehension. Students with poor reading skills made greater gains on the reading comprehension tests than students with average and good reading skills in both intervention and control schools. In one intervention school in which teachers had received additional professional development e-asTTle reading comprehension gains were greater than gains in a control school, and in one control school which had been involved in the Secondary Literacy Project, significant gains, on a different reading comprehension test, were made when compared to the intervention schools. Qualitative evidence suggests that the intervention did encourage the development of greater word consciousness in intervention participants compared to control students and teachers.

The third question asked what teachers' word level literacy knowledge is and how this might impact on students' achievement. Very strong effects of the intervention on teachers' word level knowledge seemed apparent in Time

Two testing. No links to teacher knowledge and student achievement were found using quantitative analysis of student achievement data but qualitative evidence showed that teacher knowledge influenced the implementation of the intervention. A further question linked to the intervention, sought to examine the participants' experience of the intervention and the study in general. Qualitative analyses of interview data and observations suggested that there were many challenges to the implementation and to the conduct of the study. It emerged that students' and teachers' experiences of the study were different, with teachers describing more pressure and stress than the students who were transitioning from primary to secondary school.

In this final chapter the major findings of the study, and their significance, are discussed in the order of the questions that underpinned the project. Findings from each aspect of the study are related to similar studies to establish links and points of difference between this study and other research into adolescent literacy. Alternative explanations for findings are considered so that other possible interpretations of the results are identified. Limitations to the design and implementation of the study are acknowledged and the contribution that the study has made to the field of adolescent literacy is described. In light of the findings, and the limitations of the study, suggestions for further research are made. The last section of the chapter includes several recommendations for educational practice and policy.

Findings from Assessment of Word Level Literacy Skills

The overall aim of the study was to examine the word level literacy skills of a group of adolescents in New Zealand and the role these skills played in the development of reading comprehension. A focus on word level skills was selected because this aspect of adolescent literacy has been under-researched and it was hypothesised that some students with poor reading

comprehension might have poor word level skills. In addition, the relationships between skills were examined.

Findings related to reading comprehension. The group's reading comprehension mean score at Time One was close to the national mean of the e-asTTle test used to measure reading comprehension. Lower decile schools had been invited to participate in the study because of the association of poor literacy with lower socio-economic status and it is likely that it would have been more difficult to find students with poor reading skills in high decile schools. The sample included 87 students with poor reading comprehension. Such adolescents with poor reading skills are quite frequently described in the literature as 'struggling' readers (Hock et al., 2009; Lesaux & Kieffer, 2010; Scammacca et al., 2007; Wanzek, Wexler, Vaughn, & Ciullo, 2010). A cut-off point of the 30th percentile in the current sample's e-asTTle score was used to identify the struggling readers so that the profile of their word level skills could be examined more closely. Most students in the struggling group were not just weak in reading comprehension, but had weaknesses in either spelling or vocabulary or both. Few students in this group had average spelling and vocabulary scores with weakness isolated to reading comprehension. This finding challenges the belief that word level skills are not an important component of adolescent reading (Lewkowicz, 1987; Schoenberg et al., 1999). Recent research suggests that vocabulary knowledge, which has long been recognised as a significant component contributing to reading comprehension skill, also contributes to word recognition skills (Tunmer & Chapman, 2012b).

The present study had findings similar to several other studies of adolescent literacy skills. Hock and colleagues (2009) included students who scored below the 40th percentile on a state literacy assessment in their group of struggling readers and found 202 strugglers in a sample of 345 students. They concluded that there were greater numbers of struggling adolescent readers in urban secondary schools in the United States than had been identified in the

literature. Another important aspect of Hock and colleagues' research was the finding that few of the students who had been identified as poor readers had problems that were isolated to reading comprehension, most had issues with fluency, and as many as 61% of those struggling readers had low scores on all the word level measures assessed in the study. Two other studies demonstrate that struggling readers do not form a homogenous group. In a study which further examined data from the Hock and colleagues (2009) study, Brasseur-Hock and colleagues (2011) found that the struggling adolescent readers fell into five distinct groups with varying levels of word level and fluency skills. A similar finding, that most of the adolescents with poor comprehension had decoding or fluency weaknesses, was described by Cirino and colleagues (2013).

Findings related to spelling, decoding and vocabulary. In the present study, the results of the pseudoword spelling test demonstrated that most participants had a strong understanding of the alphabetic principle but that a significant number of students had difficulty selecting appropriate patterns to represent the phonemes they were required to write. One implication of this finding is that some students may not have noticed, or had not been taught, to pay attention to the patterns and combinations of letters used to represent some sounds, particularly vowel sounds, in English.

There were more very poor spellers than there were proficient spellers in this sample. Another finding was that no proficient spellers had poor reading comprehension but some proficient readers had extremely poor spelling skills. This finding suggests that spelling may not have been taught effectively in primary schools. Another interpretation of this result could be that it demonstrates that English has a challenging, opaque orthography (Seymour et al., 2003). The complex nature of the orthography, which does have high levels of regularity alongside the 'exceptions' to the common patterns, means that teachers of reading and writing need to have an excellent

understanding of the structure of English so that they can instruct those students who fail to notice the detail of how words are written. Poor spelling skills in adolescents were identified as a cause for concern in two related studies conducted by Shankweiler and colleagues (Shankweiler et al., 1996).

A smaller sample of students were assessed for decoding skills to see if poor decoding skills were evident in this group of adolescents. Decoding skills in adolescents have not been researched frequently, especially in New Zealand samples. In the sample of 61 students, which included many students with low pseudoword spelling scores, about one third of the sample were found to have weak decoding skills. There was a relatively high correlation between spelling and decoding skills, which suggests that spelling measures can be used effectively to screen students with poor reading comprehension for decoding skills. Pseudoword spelling, which assesses understanding of the code of English in relation to novel words, could be especially useful for the purpose of identifying poor decoders. No students in the small sample had high pseudoword spelling scores and poor decoding. Generally, the results indicated that spelling and decoding measures were assessing the same skills.

The results of the reading vocabulary assessment showed that the students in the sample had, on average, reading vocabulary levels that were similar to the norms for year 9 students in New Zealand. The scaled score mean of 65.28 ($SD = 13.14$) is within the range of scores identified as expected for year 9 students in the PAT test manual (Darr et al., 2008). The task used to assess morphological knowledge was much more difficult for students than the reading vocabulary assessment. In this task students had to define the meanings of words and word parts which they found challenging. These results show that the students in the sample had little knowledge of root words, suffixes and prefixes, and had difficulty defining words and word parts.

Relationships between literacy skills. Vocabulary knowledge made the greatest contribution to the variance in reading comprehension at Time

One, which is to be expected. However, in addition to vocabulary, spelling made a unique contribution to reading comprehension. All of the variables measured had significant correlations with each other; vocabulary and reading comprehension had the strongest correlations but correlations between spelling and the other measures were similarly strong. These findings are consistent with research findings from studies with younger children. The role of vocabulary knowledge, which has been associated with the language comprehension component of the SVR (Gough & Tunmer, 1986), has also been found to contribute to the development of word recognition (Tunmer & Chapman, 2012b).

These results suggest that word level skills should be included in assessments of students with poor reading skills because they are a significant component of reading skill. However, the hypothesis that all the word level skills assessed in the battery of tests at Time One were measuring proximal skills was not supported. Once reading comprehension scores for Time One were entered into a regression analysis for Time Two reading skill, spelling and decoding were no longer significant factors explaining the variance in Time Two reading comprehension scores.

Findings from the Word Study Intervention

In this section the findings relating to the intervention are discussed. These findings indicated that the intervention did not improve students' reading comprehension skills in Time Two, except in one school, and no effects from the intervention were found on the standardised spelling or vocabulary measures. However, some effects on word level skills assessed by the measures developed for the study were found in favour of the intervention. Qualitative data suggested that elements of 'word consciousness', as described by Scott and colleagues, were fostered by the intervention (Scott et al., 2012; Scott & Nagy, 2004). Qualitative and quantitative data relating to the implementation of the intervention indicate that the word study sessions were difficult to manage in

the manner that had been envisaged in the design of the intervention and this patchy implementation of the intervention may need to be considered when interpreting the findings. Each of the findings will be discussed in more detail.

Intervention effects of reading comprehension. Initial analysis suggested that there were no intervention effects evident in the reading scores. In both intervention and control schools, students who had poor results in Time One made most progress by Time Two; they made significantly more progress than the middle group or the high achieving group (see Table 4.11). It is probable that in all schools efforts were made to improve the reading skills of poorly performing students but it has not been possible to find a clear explanation of this result. It is possible that regression to the mean was implicated, particularly because students were allocated to groups on the basis of achievement in the first e-asTTle comprehension test (Coladarci et al., 2004). The high achieving groups made no gains greater than the margin of error for the e-asTTle test, which suggests that regression to the mean may have had an influence on these scores. Another reason for the lack of progress of the top group could be that less attention was paid to extending good readers than was paid to students experiencing difficulties with reading comprehension. There were no easily identified causes for the progress made by the lower group or the lack of progress made by the top group.

In Time Two, an additional reading comprehension assessment was added to the test battery and in this test, students in one of the control schools scored significantly higher than students in the other control school and the four intervention schools. One confounding factor is that this control school was involved in the Secondary Literacy Project (SLP) at the same time as the study was conducted. The SLP was a literacy intervention which aimed to increase the literacy knowledge of teachers through the support of a literacy adviser working with the school's literacy leader. The author was the literacy adviser working in this control school. The school chose to teach vocabulary as

part of their literacy intervention but did not use any of the resources developed for this study or focus on morphology instruction. The school had increased the amount of reading that students were required to do in class because of their involvement in the SLP. For example, in several Social Studies classes year 9 students were involved in sustained silent reading sessions several times a week which would be likely to develop students' fluency. Increased exposure to extended text may have been a factor in these students' superior performance on the PAT Reading Comprehension test. One other factor, which might have been implicated in this unexpected difference, was that this school was the only Decile 6 school in the study, so it had a higher SES than the other schools. Relatively higher socio-economic status might indicate that factors associated with lower academic achievement in lower decile schools were not as strong in this school. However, because there were no statistically significant differences in the reading comprehension means between intervention and control schools at Time One, it is probable that the higher PAT Reading Comprehension mean is associated with the SLP intervention.

This unexpected difference in reading achievement in a control school exposed to additional PD support from the author triggered a closer analysis of e-asTTle reading gains. An analysis of gains in each school was undertaken because one of the intervention schools had received more literacy support from the author than other intervention schools and it seemed important to investigate whether this additional PD had had any effects on reading comprehension outcomes. Further analysis of gains revealed that three intervention schools and both control schools had significantly higher gains than one intervention school with a negative gain score. Once this school was removed from the analysis only one significant difference in reading gains remained, between the intervention school with additional PD and the control school with no additional PD. This significant difference in reading gains for the one intervention school cannot be attributed to the intervention with absolute certainty, as other factors may have contributed to this school's

relatively superior gains over the control school. One reason for this difference might be that there was a whole school focus on literacy improvement over and above the intervention. Teachers were encouraged to include reading and writing in their daily programmes and they received PD around the use of interactive reading activities and the teaching of reading comprehension and writing strategies. Another reason might be that this school had a high proportion of struggling readers and over the whole study students with lower scores made better gains than students with relatively higher scores. However, in this school the intervention was delivered with closer adherence to many of the principles underpinning the intervention than had been evident in other intervention schools. Teachers were supported to use the data from Time One to sort students into groups according to spelling and/ or vocabulary needs, and differentiated tasks were planned using words from topics being studied. In addition, words from word study sessions were encountered in reading extended text and used in writing around the topics under study. These aspects of implementation indicate that the intervention may have had some influence on reading comprehension achievement in this college.

At the onset of the project the role of the author as an external literacy adviser to one intervention and one control school had not been expected to influence the results of the intervention. This expectation was possibly mistaken because students in both the schools with additional professional development from the author made greater progress with reading comprehension than schools without this extra support. Some of the possible reasons for the greater gains made in these schools have been discussed in the preceding paragraphs. However, it cannot be ruled out that additional literacy professional development had an influence on students' reading achievement. The main quantitative intervention effect for students was that their pseudoword spelling and morphological awareness increased when compared to control students, this finding remained even when schools with enhanced professional development were removed from the analysis (see Table 4.16).

Qualitative evidence from intervention teachers indicated that the word study intervention had a positive impact on some students' reading behaviours. Two teachers described changes in students' attitude to reading polysyllabic words. Students, who at the start of the year had avoided reading polysyllabic words or would not acknowledge longer words as a challenge, became more courageous at tackling words by breaking them into morphemes or syllables. Bhattacharya and Ehri's (2004) finding, that teaching students to chunk multisyllabic words into syllables improved spelling and decoding, was not replicated in the present study. However they did not expect this improvement in decoding multisyllabic words to transfer into improvement in reading comprehension. One reason cited was that Ehri and colleagues (Ehri, Nunes, Stahl, & Willows, 2001) found that teaching decoding to older students only had a small effect on reading comprehension. In addition, results from several successful word level interventions have demonstrated that teaching skills directly had much more effect when combined with reading or writing strategy instruction than when instruction is delivered in isolation (Lovett et al., 2012; Swanson & Hoskyn, 1998).

Intervention effects of spelling, vocabulary and word consciousness.

The intervention did not have any effect on scores in the Diagnostic Spelling test and the PAT Reading Vocabulary test, which are standardised tests. However, there were some significant effects on the assessments which had been developed for the study. These assessments included the Pseudoword Spelling test, the Understanding Morphology task and the extended Students' Language Terminology Quiz used in Time Two. One interpretation of this difference in means is that, because the gains achieved by the intervention students had no observable influence on their real word spelling or reading vocabulary assessed in the published tests, the gains have little educational significance. Another interpretation of these results could be that, although students in the intervention improved their ability to choose orthographically acceptable spelling patterns when writing pseudowords, this was not enough to

improve their decoding skills sufficiently to impact on reading comprehension. The intervention was not explicitly linked to reading or writing practice, so students may not have transferred their improved orthographic knowledge to decoding or spelling real words. It is possible that there may have been some long term influences of students' improved code knowledge and knowledge of morphemes on reading comprehension because some intervention effects increase over time (Tunmer et al., 2003). However, no testing of long term effects was undertaken in this study.

Although there were no significant gains in the mean scores for spelling, a number of individual students made especially large gains. During interviews with teachers, individual students who had made significant gains on the real word spelling assessment in Time Two were identified and teachers were asked why they thought those students had made such significant progress. Some teachers suggested that the focus on words paid off for some students in terms of spelling gains. In reflecting on some individual students' spelling gains Maria and Sandra credit the effort put into implementing the intervention for the improvements in students' results. Another teacher in a control school, with several students who had made significant spelling gains of more than one standard deviation, said she had always taught vocabulary in the context of teaching novels and had used the students' assessment data from the study to focus more explicitly on teaching morphology. Students' interest and response to morphology instruction, and her own interest in the structure of words, had encouraged her to continue with this approach. She explained the successful students' spelling progress as a product of her morphology instruction. In other morphology interventions an improvement in spelling has been reported (Arnbak & Elbro, 2000; Nunes & Bryant, 2006). In the present study, no overall effects of the intervention on spelling are evident in spite of the fact that there were considerable gains made by some individual students.

The improvement in the intervention students' ability to identify and define morphemes in words had no impact on increasing students' reading vocabulary scores or on reading comprehension. One possible reason for the lack of transfer to the vocabulary test is that morphological knowledge might not have been useful to work out the meanings of enough words in the test to make an impact on students' achievement. To explore this possibility an analysis was made of the words that appeared in the PAT Reading Vocabulary Test 6. Target words, as well as the words used as synonyms for target words, were examined to see if knowledge of prefixes, root words and suffixes would assist with finding correct answers on the test. It seems that morphological knowledge would not have had much influence on test performance. In 40 target words and 200 possible synonyms, only two prefixes (*dis* and *re*), three root words (*dict*, *rupt* and *bene*), and six suffixes (*ful*, *tion*, *able*, *ly*, *less* and *ive*) were used. In this vocabulary test, a wider knowledge of morphemes would not have given a candidate much advantage over someone with less knowledge of morphemes, so it is not surprising that improved morphological knowledge did not influence the PAT Reading Vocabulary test results.

Morphology interventions have been found to generally improve students' ability to define untaught words which contain taught morphemes, but there are seldom observable effects on reading comprehension (Baumann et al., 2003; Baumann et al., 2002; Beaumont & Erlam, 2010). Baumann and colleagues (2002) discuss a range of reasons why improved ability to infer meanings of polymorphemic words did not increase vocabulary knowledge enough to impact on reading comprehension performance and some of these reasons pertain to the present study. Firstly, they suggested that there needs to be a careful alignment between the vocabulary intervention and the comprehension measures to ensure that the comprehension questions rely on understanding polymorphemic vocabulary. Baumann and colleagues (2002; 2003) had attempted this alignment by developing reading comprehension tests specifically for their studies. However, no such alignment was contemplated in

the present study in which standardised tests were used to assess reading comprehension. A second, possibly related difficulty could be that the comprehension tests used in the current study relied on understanding text structure and identifying main ideas, both of which were not practised in the intervention. Thirdly, the duration and the scope of the intervention might have been too slight to reasonably expect an impact on comprehension.

Another purpose of the intervention was to foster word consciousness. It appears that this aspect of the intervention was successful for many participants, both teachers and students. A number of intervention teachers and students indicated that students became interested in finding out more about words. In addition, it was clear that many intervention teachers felt they had learned a lot about language and that they had enjoyed the learning. Teachers described students' engagement in various ways. The word 'enjoyed' was used frequently, as was the word 'fun' to describe both the activities and the teaching of the activities. Another dimension to the word study sessions was that the activities involved solving puzzles; teachers used terms like 'nutting out', 'experiment', finding 'patterns and puzzles', 'taking words apart' and 'competitive' which suggest that in some classes the word study sessions created interest and lively engagement. This engagement was clear in many of the classes observed in Term Three.

An intervention teacher, who had limited knowledge about words at the start of the intervention, captured the focus on the interest in learning about words that had been intended in the design of the intervention by describing students as "engaged", "competitive" and "excited". For some teachers and students the activities that focused on working out word origins were reported to be particularly interesting. Students expressed enjoyment at learning words. They said that learning new words made them feel 'brainy'. They could see the value in learning about morphemes and how to improve spelling.

A significant difference between the intervention and control students' achievement was in the extended Time Two Language Terminology Quiz. The greatest differences were in the sound analysis task that required students to identify phonemes, in the orthography task which involved identifying digraphs and consonant blends, and in the morphology task which involved explaining the meanings of some prefixes, suffixes and root words. These were all skills which were specifically developed by the intervention. These results indicate that the intervention did improve some discrete literacy skills related to spelling and vocabulary development but the improvement did not extend to an overall improvement in reading comprehension or standardised spelling and vocabulary tests.

Whilst there was no quantitative evidence that improved morphological awareness had any impact on spelling, vocabulary knowledge or reading comprehension, intervention teachers and one control teacher attributed individual student gains in the standardised spelling test to the intervention or to a focus on teaching morphology. Intervention teachers reported improved decoding strategies in some students. Students in control schools expressed similar reasons for enjoyment at learning new words as intervention students but it seemed that there was more evidence obtained from intervention teacher and student interviews of a developing sense of word consciousness. Observations of intervention teachers provided additional evidence that word consciousness was being fostered in the word study sessions.

Fidelity of the implementation of the intervention. Even though the intervention was exploratory, with no clearly defined programme for teachers to follow, it was based on several principles which were developed from the literature concerning successful adolescent word level interventions (Henry, 1988, 1993; Nunes & Bryant, 2006). It was evident from the observations and from teachers' own evaluations that adherence to the principles of the intervention was uneven. The teachers' self-review survey (see Table 4.19)

indicated that the intervention was implemented inconsistently. Some teachers' evaluations indicated a faithful adherence to the suggested content and principles of the model but others revealed the delivery of a less faithful version of the expected content and teaching methods. The two most faithfully implemented aspects of the intervention were, keeping the sessions short (13 out of 16 teachers), and the use of a 'problem-solving approach' (12 out of 16 teachers). Only three teachers said they completed the word study sessions twice a week *almost all of the time* and another three said they *mostly* completed the sessions twice a week. Four teachers indicated that they had never had two sessions in a week. The most common topics involved morphology. Instruction in letter-sound correspondences, which probably would have been most useful to poor decoders was *not covered at all* or covered *somewhat lightly* by half of the intervention teachers. Eleven teachers reported minimal levels of differentiated instruction, and no teachers indicated that they felt they had done this well or frequently.

The challenges of implementation of the word study sessions emerged as a strong theme in the qualitative data. Some of these challenges were associated with external factors over which teachers had no control, such as the change in routine demanded by New Zealand's hosting of the Rugby World Cup, NCEA changes to Level One assessments and unexpected family illness. Other challenges were internal to the intervention, such as the difficulty of integrating word study sessions into existing teaching programmes. The time taken to plan for integration was another challenge and few teachers had attempted to differentiate the word study sessions to meet targeted needs of all students. Further challenges related to teacher knowledge and confidence which had an impact on intervention implementation. Implementation was influenced by several factors, including how closely the focus on word level skills aligned with teacher beliefs, and how valuable teachers thought the intervention would be for the development of students' literacy skills.

The uneven implementation of the intervention makes it difficult to say categorically that the intervention, if implemented as it had been planned, could not be effective. What can be said is that it proved difficult for teachers to sustain a commitment to using differentiated instruction and working on word study twice a week. Another key principle of the intervention was difficult for teachers to implement; this principle was that the word study should be associated with words that students were learning as part of their programme of work, as an integrated element of the unit under study. It seems that the plan was not realistic. In the original design it had been intended that the intensity of the intervention be increased by having three participating teachers for each class of students; the English, Social Studies and Science teachers. This did not eventuate because there were not enough volunteers attached to the same group of students to create the intensity that had been envisaged initially. In two classes which had two participating teachers, one of the teachers did not implement the intervention with any consistency and in the other class one of the participants withdrew because of pressure of work.

A minor finding was that students and teachers use different language to describe reasons for success and achievement. Teachers in this study did not attribute student success to their teaching; they attributed student achievement to the students' intelligence and diligence. Students on the other hand, thought they did well because they had been well taught.

Teachers' Word Level Knowledge

The third major question addressed by the study concerned the word level literacy knowledge of secondary teachers. Little research into secondary teachers' literacy acquisition knowledge exists, so this study contributes to filling a gap in the literature. It could be argued that secondary teachers do not need to know about literacy acquisition and spelling because there may be a belief that most students generally know how to read and spell by the time they

reach secondary school. However, congruent with other studies, this study found that a significant group of secondary students did have poor word level literacy skills and poor reading comprehension skills, so it could be seen as important for secondary teachers to know how to support the literacy development of the students they teach.

A wide range of scores was evident in the results from the teachers' Language and Meta-language Terminology Questionnaire in Time One. The minimum score was 9 (maximum of 50) and the highest score was 44. No significant differences between intervention and control teachers' scores were found on any of the sub-tests (see Table 4.17). Although the definitions of terms task proved quite difficult for the teachers, the sub-test that was the most challenging involved counting the phonemes in a word. This is a similar finding to other New Zealand studies (Carroll et al., 2013; Nicholson, 2007). A more surprising finding was the wide variance on the morphology analysis sub-test which involved teachers explaining the meanings of prefixes, suffixes and common root words, with scores ranging from 2 to 18 (maximum of 18).

At Time Two the effects of the intervention on teacher knowledge were notable. The gains in word level knowledge made by the intervention teachers were significantly greater than control teachers with a large effect size, $d = 1.94$. Although this effect size should be treated with caution because of the small sample size, it is evident that being in the intervention had positive effects on the teachers' word level literacy knowledge. Significant gains were made in a number of the sub-tests including phoneme counting and morphology analysis, but the gain in the identification of spelling patterns task was not significantly different to the control teachers' gains. Teachers' positive responses to their growing word level literacy knowledge were also evident in the interviews. Many teachers expressed pleasure in the process of learning more about the structure and conventions of English language. Comments made about the positive impacts of the study on the teachers' own learning included references

to 'enjoyment', being 'mutually beneficial', and 'good professional development'.

It was hypothesised that teachers' levels of word level literacy knowledge would have an influence on student achievement outcomes. No links between student achievement and teacher knowledge were found. Although it seems obvious that a teacher would need to know something in order to teach it; it was not possible to find any evidence that student progress could be explained by the extent of teacher knowledge, apart from a weak positive correlation between teacher knowledge at Time Two and e-asTTle Reading Comprehension at Time Two, $r=.19$, p (two-tailed) $<.05$. It may be that there are too many variables contributing to student achievement, such as motivation, amount of personal reading, engagement, and student relationships with teachers and attendance, which were not measured in this study, to clearly understand what factors made a difference to student achievement.

In the analysis of intervention teachers' interviews, the theme of teacher knowledge and beliefs emerged as a complex web of influence on the way that the intervention was carried out. This characteristic of the theme, its multidimensional aspect, lead me to the understanding that this theme can be conceived as a theory. The theory, developed from analysing the influence of teacher knowledge and beliefs, explains how teachers respond to the challenge of implementing an intervention. The theory, which relates to teachers' knowledge and beliefs about literacy, helps to explain the variations in the way that teachers responded to the challenges involved in adding word study sessions to their teaching programmes. About one third of the teachers had confidence in their ability to implement the intervention because of prior knowledge through their own education or professional development. Another group had strong beliefs in the value of the intervention because it focused on teaching aspects of language which have been neglected but which they saw as important. These teachers articulated their convictions about the value of

teaching word level skills, particularly spelling and morphology. Both of these groups implemented the intervention with more consistency than some of the other intervention teachers. In the two schools with improved reading comprehension scores in comparison with other schools, additional literacy PD seems to have been a contributing factor. The purpose of the literacy PD in both schools was to increase teachers' literacy knowledge; however, there was more emphasis on word level knowledge in the intervention school than in the control school.

Limitations of the Study

Over the course of the research a number of limitations became clear. The limitations are considered in three sections: limitations relating to the investigation into participants' word level skills, limitations relating to the content and conduct of the intervention, and limitations of methods and design.

One of the limitations of the investigation of word level literacy skills is that a great deal of research which examines adolescent word level literacy skills includes measures of fluency (Brasseur-Hock et al., 2011; Cirino et al., 2013; Hock et al., 2009). This study would have benefited from the inclusion of fluency measures as well as testing the decoding skills of all participants. However, due to time constraints, it was not practical to include more measures requiring individual assessment of participants. An additional limitation was that only one measure of reading comprehension was used in Time One because it was considered that too much testing would be onerous for teachers and students. The single measure of reading comprehension may not have shown the full range of students' comprehension abilities. A second measure was added at Time Two that appeared to be more sensitive to differences in reading comprehension abilities. The use of this measure in Time One may have led to slightly different patterns of results.

The level of professional development for intervention teachers was

inadequate. Assumptions were made at the outset that teachers would be able to analyse the Time One data to develop a differentiated model of word study; that they would be able to adapt suggested exemplars of lessons to words being taught in subject areas with minimal training; and that it would be practical to use problem solving, hands on, sorting activities so that students could 'discover' principles of spelling and what different word parts and root words mean. All of these assumptions were proved to be incorrect to some degree. Thus one serious limitation is that the intervention teachers needed more support than they were given. In defence of the original plan it is likely that too much support could have been seen as interference and may have alienated teachers, but a balance was needed and it was not achieved. The implementation of the intervention would have been greatly improved if teachers had received regular professional development related to teaching orthographic and morphological awareness at least twice a term. Further improvement could have been achieved if a structure had been developed to support intervention teachers in the same school to collaborate and to share resources and experiences. Developing a community of learners has been shown to improve the uptake of educational interventions along with regular professional development (Cantrell, Burns, & Callaway, 2009).

Inadequate monitoring of the intervention in the early stages meant that implementation problems were not identified until the intervention was almost completed. To protect against this occurrence observations should have taken place earlier than Term Three. More observations could have strengthened the design. Another sign of inconsistent implementation was that less than half of the intervention teachers completed and submitted logs of their activities at the end of each term of the intervention. This could have initiated more vigorous demands for compliance but a decision was made not to make too many requests after a second email reminder had not elicited more responses. It may be that many of these issues would have been identified if a smaller scale pilot with one or two teachers had been conducted first.

Another limitation might be that the intervention was too broad in scope. The combination of spelling and morphology teaching tasks may have diffused the efficacy of the intervention which was intended to be delivered in two short sessions each week for 21 weeks. The original plan was to focus on spelling and decoding but in an effort to keep the intervention classroom based, the morphology aspect was included so that all students could benefit from the word level study sessions. Not all students in a class would need to develop decoding and spelling skills, but it was expected that all students would need more practice to develop morphological awareness. It was important that the intervention was not viewed as a 'remedial' programme but one that had relevance for all students. Evidence in the literature (Larson et al., 1993), and anecdotally, implies that adolescents do not like being removed from class or made to feel different because they need additional support with learning.

It is possible that the intervention would have been more effective if the word study skills had been practised in reading and writing extended text in a systematic way. Reading and writing the words selected for study in an extended context was never explicitly suggested as a way to link the study of words to the topics being studied in class. It is likely that practising the spelling and decoding of topic words would have assisted students to transfer spelling and morphological knowledge from word study sessions to their reading and writing experiences. In successful adolescent interventions, word study skills have been taught in conjunction with extensive reading and writing practice (Lovett et al., 2012; Scammacca et al., 2007).

In view of the fact that there were proximal results in favour of the intervention which had no general effect on reading comprehension in all intervention schools, another limitation might be that there was no data collection that examined distal effects. It would have been useful to see if some of the gains in pseudoword spelling and morphology knowledge could have made a difference to reading comprehension, spelling or vocabulary

knowledge, after some time had elapsed. Intervention effects, in some cases, may become more pronounced over time. In a study to compare the effects of beginning reading instruction modified to develop phonological skills with a standard whole language method of reading instruction, Tunmer, Chapman and Prochnow (2003) found that the effects in favour of the modified instruction at the end of one year of schooling, had increased when students were assessed at the end of their second year at school. It must be pointed that this effect was present in an intervention with younger participants than those in this study.

The research design that was chosen had the potential to be more responsive to teachers' needs in the interest of improving the intervention but, because of inadequate monitoring, this opportunity was missed. If more feedback to intervention teachers had been given earlier than Term Three, it might have been possible to influence teachers into using the data to group students more effectively to meet identified needs. More active collaboration with teachers, to solve problems when integrating word study sessions into existing programmes, could have improved the relevance of the intervention for students.

Notwithstanding the noted limitations the study did make a contribution to the understanding of issues related to adolescent literacy. Gaps in the literature relating to secondary teachers word level literacy knowledge have been partially filled and a number of results replicate and confirm the relevance of findings from previous international research.

Contributions Made to Adolescent Literacy Research

One contribution that the study has made to an understanding of adolescent literacy is that word level skills play a significant role in skilled reading. The role of vocabulary knowledge has not been contested but the importance of orthographic knowledge for accurate and rapid word recognition

has not been explored in much depth in adolescent literacy research. With regard to the Simple View of Reading (Gough & Tunmer, 1986) this current study has helped to confirm its value as a theory to frame thinking about adolescent literacy beyond the limits of reading acquisition for beginning readers. More recent research which has investigated the role of vocabulary in the SVR model has found that vocabulary knowledge influences reading comprehension in two ways (Tunmer & Chapman, 2012b). Vocabulary knowledge not only has a direct effect on reading comprehension on the language comprehension side of the SVR equation but it also influences decoding and orthographic knowledge. The influence of vocabulary on decoding occurs because beginning readers' partial attempts to decode irregular or exception words are likely to lead to successful identification of the irregular word if that word is part of the reader's lexicon (Tunmer & Chapman 2012a). Successful decoding will enable the reader to build up a mental image of the orthographic patterns present in a word which will lead to the development of rapid recognition of that word in future encounters. This dual process remains important for adolescent readers who are presented with increasingly complex subject-specific texts as they enter secondary school. Vocabulary has a reciprocal relationship with decoding and orthographic knowledge; through improved decoding a reader is able to access more complex texts which in turn builds up vocabulary knowledge. Extremely poor spelling is often linked to poor decoding. Poor spelling ability has implications for educational achievement. Another contribution made by the study is the finding that poor spelling ability is a problem for many adolescents, even for some with proficient reading skills.

Poor reading is associated with poor spelling and decoding skills for a significant number of 'struggling' adolescent readers. The present study supports this. Poor literacy skills are likely to have a negative impact on an individual's conceptual and vocabulary development (McGuinness, 2005; Stanovich, 1986). This limitation to cognitive development may have

potentially harmful limiting effects on peoples' lives which is why it is important to increase our knowledge of the factors that influence literacy growth.

The relationships between the word level variables and reading comprehension were examined and the study found that after the influence of vocabulary knowledge on variance in reading comprehension had been accounted for, spelling skills made an additional contribution to reading comprehension. In the analysis of the relationships between word level skills of the decoding sub-group it became evident that spelling and decoding assessments were measuring the same skill. This finding strengthens the case for using spelling assessments, which can be group administered, to screen poor readers for decoding difficulties. The study also identified a need to develop assessment tools to make it more manageable to investigate word level skills at secondary level (Hock et al., 2009); the group-administered polysyllabic pseudoword spelling test used in this study might be a useful addition to secondary teachers' bank of assessment tools.

Despite the limited positive effects of the intervention there were some findings of significance. The broad scope of the word study sessions, which were designed to be relevant to all students in a class, was intended to remove any notion that word study sessions were 'remedial' or only for weak readers. Most students had poor morphological knowledge and many needed to increase their orthographic knowledge, so the interest and engagement shown by many participants at times, suggests that learning about words does not need to be a boring skill and drill exercise with many worksheets. Students in the intervention did improve their ability to analyse sounds in words and their morphological awareness increased, as did their word consciousness. The possibility that improvement of these proximal skills might have a beneficial influence on students' literacy growth should not be ruled out on the evidence of this study.

Another contribution made by the study was the evidence that many secondary teachers appear to have little understanding of literacy acquisition theories and the role of word level skills in literacy acquisition. One finding associated with the intervention was that it was relatively easy to increase teacher knowledge and that they valued learning more about the structure of the English language and how to teach it effectively. The influence of teacher knowledge and beliefs emerged as a theory which partially helped to explain the variations in implementation of the intervention.

Suggestions for Future Research

The first recommendation is that different versions of the intervention should be developed and trialled. Ways to improve the current intervention could be to increase the level of support for teachers during the intervention, to collaborate more with teachers to problem solve and adjust the intervention during implementation, and to link and integrate word level sessions explicitly with reading and writing extended text. Other kinds of interventions, with more prescriptive requirements to cover specific content, might tighten the focus to meet targeted student needs identified in assessments. Examples of this type of intervention may include a series of focused professional development sessions on teaching literacy alongside English, Social Studies and Science. However, teachers in New Zealand are used to a significant level of autonomy, and it is likely that interventions which are too tightly controlled would be unacceptable to secondary teachers. Additional research into the word level skills of adolescents should include measures of fluency to add to the understanding of the nature of adolescents' literacy knowledge.

Significant gaps in research into teachers' knowledge about language and literacy acquisition remain. More work needs to be undertaken into what teachers need to know in order to be effective teachers of literacy in secondary schools. In addition, research from a larger scale inquiry into secondary

teachers' existing literacy knowledge would be useful to identify the level at which the findings from this study might apply to the wider population. It is likely that poor adolescent literacy will continue to be a cause of concern for secondary teachers, so more research into what teachers know and what they need to know seems to be of considerable importance.

Implications of the Findings for Educational Practice and Policy

The study has indicated that word level skills play a role in reading comprehension. What is less clear is how to develop decoding and spelling skills in poor readers to improve reading and writing skills. Adolescents in this sample had disproportionately poor spelling skills in comparison with reading comprehension skills. It appears that spelling is generally not well taught in some primary schools and some secondary schools in New Zealand. The ability to spell well confers many advantages on a person and there are several things that could be done to improve adolescents' spelling skills.

Teachers need to be more knowledgeable about how to support students, often those from lower socio-economic backgrounds, who have difficulty mastering reading and writing. This improved teacher knowledge might have a flow on effect. Developing better readers and writers at the primary level could mean that fewer secondary students have such a poor understanding of how English is structured and more of them might spell better. It might be helpful if teachers changed the language used to describe students with poor literacy skills so that the students' knowledge gaps are not seen to be their fault. Literacy weakness needs to be seen as a symptom of inadequate teaching, for whatever reason, rather than poor learning on the part of the student. One key to improving adolescent literacy might be to improve teacher knowledge of effective literacy teaching.

Many secondary teachers would probably benefit from learning more about language and literacy acquisition because this knowledge might help

them to support struggling adolescent students more effectively. It would be useful if modules relating to language and literacy learning became part of pre-service training and in-service training for secondary teachers. Such modules, which expand the notion of literacy learning to include word level learning, would need to be developed because there is little emphasis on word level literacy skills in secondary teacher training or in-service training at present.

In addition, it would be helpful if a spelling syllabus could be developed to guide teachers through topics related to sound-letter correspondences, vowel patterns, syllabification and morphology as children progress through their schooling. Older students need a basic understanding of the layers of language, including an understanding of how English has developed, in order to help them understand and enjoy some of the richness of the language rather than being mystified by it.

Students would benefit from teachers' encouragement to learn more about language and words and the fostering of 'word consciousness'. If students do not read and learn more about words, there are alarming consequences for their intellectual development. Another reason to foster word consciousness is that students and teachers usually enjoy learning more about words, and student engagement in this learning is enhanced through the use of a range of interactive, small group, word learning activities.

Literacy assessments which routinely included measures of vocabulary and spelling to identify students' word level literacy strengths and weaknesses would probably increase teachers' understanding of their students' literacy weaknesses and strengths. If students with poor reading comprehension were also found to have poor spelling skills they could be screened with a polysyllabic pseudoword spelling test. This group administered assessment would assist teachers to diagnose the nature of students' gaps in knowledge of the code of English and the conventions of spelling. Another factor which might be considered when contemplating the use of pseudowords spelling tests

for diagnostic purposes is that they are generally non-threatening. Students and teachers appear to enjoy playing with strange sounding words and the knowledge that there are many acceptable ways to spell pseudowords takes some of the anxiety out of a test situation. Students reported that they enjoyed pseudoword spellings, one even writing “We love (indicated with the symbol of a heart) pseudowords” on her second test paper. Likewise, teachers reported ‘having fun’ with pseudowords.

Conclusions

The relatively large group of students with poor spelling ability in this sample of adolescent students suggests that the development of children’s word level literacy skills has been neglected in New Zealand to some extent. The incidence of poor selection of spelling patterns in writing pseudowords supports this conclusion. This study has not demonstrated that a specific focus on teaching word level skills can improve reading comprehension. However, the patchy implementation of the intervention and flaws in the intervention design suggest that this approach to supporting students with poor reading skills should not be completely dismissed until further research is undertaken. Interventions designed to develop word level skills hold promise for improving the literacy skills of a specific group of poor adolescent readers with weak decoding and spelling skills because of the nature of the relationships between word level skills that have been identified in the literature and supported in this study.

A final conclusion is that many students benefit from small group interactive word study sessions because they enjoy learning more about language and solving problems. A related conclusion is that teachers are interested in learning more about language and literacy acquisition. It appears that if teachers are confident that they are learning about useful literacy skills, or that they believe in the value of learning about the ‘basics’ of spelling and

morphology, they may be prepared to change their practice to include word study as an element of their teaching programmes.

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Appendices

Appendix One: Pseudoword Spelling Tests and Mark Sheets

Polysyllabic Pseudoword Spelling Test Form A

Explain to students that this test is to see how they write down the sounds of English. The words are made-up nonsense words. They must try to write down all the sounds they hear in each word. Explain that *pseudo* means false in Greek. They only write the word once under the “Pseudoword” column. The other columns are there for the markers. Also there will be more than one way to spell some of the words, if you (the teacher administering the test) can read the word the way it was pronounced then it is correct. **The words in brackets are NOT to be read out aloud – just there to help with pronunciation...**

1. fradding (said like cladding)
2. nushplock (like mush and clock as one word)
3. choamscraited (like home and waited as one word)
4. splodgement (like lodge and mint)
5. squainful (like painful)
6. streeplessness (like sleeplessness)
7. reconpluted (like ree con fluted as one word)
8. vorjopely (like more hope ly)
9. gowmicious (gow like cow – icious like vicious)
10. stroidation (like void and end of station)
11. disthurbloy (dis as in dismay -soft th like thin)
12. scrowdartic (grow dart ic)
13. brawpision (braw like claw pision like division)
14. yelutive (ending like ‘give’ not ‘dive’)
15. zarrying (like marrying)
16. darchlious (like parch and lee us)
17. slearvodible (slear like clear - long o like Vodafone)
18. joopsycue (like sloop and see and kew)
19. blithiment (hard ‘th’ like this)
20. mordliest (mordly + ist)

Pseudoword Spelling Test Form A Marking Guide

For the sounds just check that all phonemes are represented with at least one letter. As long as there is a letter that is remotely connected to the sound then the student has phonemic awareness.

Pseudoword	Sounds	Patterns	Conventions
fradding		short 'a'	double dd
nushplock		short a and o sh digraph	-ck ending
choamscraited		ch 'oa' o+e	-ed ending
splodgement		short 'o' dge pattern	ment ending
squainful		ai	ful ending
streepleanness		ee / ea/	lessness suffix
reconpluted		u+e/oo	re con prefixes ed ending
vorjopely		or o+e /oa	ly ending
gowmicious		ow	cious ending
stroidation		oi / oy	oi in mid syll tion ending
disthurbloy		ur/ oy	dis prefix oy ending
scrowdartic		ow / ou ...ar	ic ending
brawpision		aw	sion ending
yelutive		schwa e/u/a	ive ending
zarrying		y ing	double r for short a
darchlious		ar ch	ious/eous/ius
sleavodible		ear/eer/o	ible/able
joopsycue		oo and cue not q	
blithiment		th short i	ment ending
mordliest		or aw or/aw/au	y+ est ending changes to i

Polysyllabic Pseudoword Spelling Test –Form B

Explain to students that this test is to see how they write down the sounds of English. The words are made-up nonsense words. They must try to write down all the sounds they hear in each word. Explain that pseudo means false in Greek. They only write the word once under the “Pseudoword” column. The other columns are there for the markers. Also there will be more than one way to spell some of the words, if you (the teacher administering the test) can read the word the way it was pronounced then it is correct. **The words in brackets are NOT to be read out aloud – just there to help with pronunciation...**

- | | |
|-------------------|---|
| 1. slodding | (sounds like ‘prodding’) |
| 2. mishpleck | (sounds like ‘dish’ and ‘fleck’) |
| 3. frainsloatly | (sounds like ‘drain’ and ‘bloat’ + ‘lee’) |
| 4. spludgement | (sounds like ‘fudge’ and ‘mint’) |
| 5. stronelessness | (sounds like ‘phone’ and ‘less’ and ‘ness’) |
| 6. grineful | (sounds like ‘grime’ and ‘full’) |
| 7. rejoooped | (sounds like ‘re’ and ‘looped’) |
| 8. prechottify | (sounds like ‘pre’ and ‘rot’ and end of ‘ratify’) |
| 9. strowticious | (sounds like ‘str’ and ‘cow’ and ‘tish’ and ‘us’) |
| 10. croidation | (sounds like ‘void’ and the end of st’ation’) |
| 11. exturgloy | (sounds like ‘ex’ + ‘her’ + ‘gl’ and ‘oy’ in boy) |
| 12. brawslartic | (sounds like ‘draw’ + ‘bar’ and ‘tick’) |
| 13. zowmision | (sounds like ‘know’ + ‘vision’) |
| 14. yegartive | (sounds like ‘yu’ in ‘yum’+ ‘dart’ +‘ive’ as in give) |
| 15. squinnying | (sounds like ‘chin’ + ‘ee’ + ‘ing’) |
| 16. thorchlious | (sounds like ‘scorch’ + ‘lee’ + ‘us’) |
| 17. flearnodible | (sound like ‘fear’ + ‘no’+ ‘d’ + ‘ible’) |
| 18. dismewbism | (sounds like ‘dis’ + ‘new’ + b +ism) |
| 19. jorthilogue | (sounds like ‘jaw’ + ‘thee’ + ‘log’) |
| 20. nuddliest | (sounds like ‘mud’ + lee + ist) |

Pseudoword Spelling Test – Form B

Marking Guide

For the sounds just check that all phonemes are represented with at least one letter. As long as there is a letter that is remotely connected to the sound then the student has understanding of alphabetic principle.

Pseudoword	Sounds	Patterns	Conventions
slodding		short 'o' ing pattern	double dd
mishpleck		short i and e sh digraph	-ck ending
frainsloatly		fr long 'ai' or 'a+e sl long oa/o+e others OK	-ly ending
spludgement		short 'u' dge pattern	ment ending
stronelessness		long o	lessness suffix
grineful		long i+e	ful ending
rejooped		u+e/oo	re prefix ed ending
prechottify		short o ch digraph	double tt ify ending
strowticious		ow/ou	cious ending
croidation		oi / oy	oi in mid syll tion ending
exturgloy		ur/ oy	ex prefix oy ending
brawslartic		aw / au ...ar	ic ending
zowmision		ow/	sion ending
yegartive		schwa e/u/a ar	ive ending
squinnying		y ing	double n for

			short i
borchlious		or ch	ious/eous/ius
flearnodible		ear/eer/o	ible/able
dismewbism		ew/	dis prefix ism -ending
jorthilogue		or/aw th short i	ogue ending
nuddliest		short u	y+ est ending changes to i double dd

Revised Pseudoword Marking Guide

The purpose of using a polysyllabic pseudoword spelling in this study was to measure adolescent students' knowledge of the code of English. The spelling of pseudowords reveals knowledge of sound-letter correspondences, orthographic knowledge and, in some cases, morphemic knowledge. Orthographic knowledge is information that is stored in memory which tells us how to write down spoken language. Orthographic knowledge encompasses both a knowledge of the patterns that are found in the language and the mental representation of specific words or word parts (Apel, 2011). Morphemic knowledge is an awareness of the way that bound and unbound morphemes are written.

Pseudowords can often be written in more than one way, but it must be phonologically plausible. For example the pseudoword 'squainful' could be spelt 'skwainful' or 'skwaynefull' to be phonologically plausible. However the combination of letters 'skw' is not present as a pattern in English orthography so it is orthographically illegal (Kemp et al., 2009). The spelling of the suffix 'ful' rather than the choice of 'full' at the end of the word is an indication of morphemic awareness. The use of polysyllabic pseudowords in this study was an attempt to find out about students phonological, orthographic and morphemic knowledge.

The revised marking system rewards more sophisticated use of orthographic knowledge and morphemic knowledge above phonological plausibility.

Each syllable of each pseudoword will be scored.

If the syllable is phonologically plausible but orthographically illegal it will be worth one mark. For example: skrate for scrate/scrait = 1

If the syllable is orthographically correct, and it is possible to write the syllable in a phonologically plausible way, it will gain two marks. scrait/scrate = 2

If there is no possibility of writing a phonologically plausible alternative then the orthographically correct syllable will score 1 mark. For example: choam/chome=1

A correctly spelt suffix will gain two marks. 'ful' = 2... but 'full' = 1

Here are some examples.

fradding – fradd ing 2 + 1 = 3

frad ing 1 + 1 = 2

fard ing 0 + 1 = 1

gowmicious gow mi cious = 1+1+2 = 4

gow/gou mish us/iss/ 1+1+1 = 3

go mi cious 0 + 1 + 2 = 3

choamscraited choam scrait ed 1 + 1 + 2 = 4

chom skrat id 0 + 0 + 1

Appendix Two: Task to Assess Understanding of Morphemes

Explanation of task

Teacher to read and explain this part to students. Model answering questions on board.

Morphemes are the smallest bits of meaning in words. Some words consist of just one morpheme.

One morpheme - dog

Two morphemes – dogs = 'dog' + 's' (the s tells you there is more than one dog here)
or

doglike = dog + like ('dog' means *a four legged furry animal that barks*, 'like' means that the thing you are describing *has some of the qualities of a dog*, it also shows the word is an adjective

Three morphemes – unkindness = un + kind + ness ('un' means *not*, 'kind' means *nice and friendly*, and 'ness' shows the word is a noun.

Your task is to break up each of the words into their morphemes, or word parts, and explain what each part means. The words are used in year 9 Social Studies, English and Science texts. You find morphemes in all languages but we are just looking at words used in the English language.

Practice items:

Practice question 1.

unforgettable

What are the parts of this word?

Explain the meaning of each part.

_____ means _____ _____ means _____
_____ means _____

Answer to practice question 1:

unforgettable

What are the parts of this word? un + forget + able

(Note: the extra 't' in unforgettable is to keep the vowel sound "e" short)

Explain the meaning of each part.

un means not forget means not remember able
means can be or capable of being

So 'unforgettable' means something is hard to forget, you remember it.

Practice question 2:

biography

what are the parts of this word?

Explain the meaning of each part.

_____ means _____ _____ means _____
_____ means _____

Answer to practice question 2:

biography

what are the parts of this word? bio + graphy

Explain the meaning of each part.

bio means life graphy means to
write _____ means _____

So 'biography' means writing about a life.

Warning: Although there are **three** spaces for your explanations in the assessment task some words – like biography – will only have **two** parts. You don't have to fill in all the boxes.

Understanding Morphemes Assessment Task- A

Name: _____ Class: _____

Date: _____

Here is a list of words.

<p>Please “traffic light” them. Put a coloured circle next to each word.</p> <p>Green – You could explain the word to a ten year old.</p> <p>Amber – You have a clue but could not really explain it.</p> <p>Red – No idea at all.</p>	<p>If you don’t have coloured pencils you can use these symbols:</p> <p>✓ - You could explain the word to a ten year old.</p> <p>? - You have a clue but could not really explain it.</p> <p>X - You have no idea at all.</p>
---	---

<ol style="list-style-type: none"> 1. recycle 2. autobiography 3. multicultural 4. transfer 5. prediction 6. incredible 7. export 	<ol style="list-style-type: none"> 8. disapprove 9. telephone 10. biodiversity 11. interrupt 12. renewable 13. geology 14. destruction 	<ol style="list-style-type: none"> 15. unsustainable 16. thermometer 17. microscopic 18. co-operation 19. contradiction 20. malfunction
--	---	---

Now explain the words you have marked with a green circle or a tick. You can try the other words but please do your green, or ticked, ones first. **Warning:** Although there are **three** spaces for your explanations, some words – like biography – will only have **two** parts. If you need another space just add it in the margin.

Break the word into parts and explain each part. Then explain the meaning of the word. The first word is done for you.

Whole word	Word part	Word part	Word part
Example: biography	bio = life	graphy = writing	
biography means: A piece of writing or a book about someone’s life			
1. recycle			
recycle means:			
2. autobiography			

Whole word	Word part	Word part	Word part
autobiography means:			
3. multicultural			
multicultural means:			
4. transfer			
transfer means:			
5. prediction			
prediction means:			
6. incredible			
incredible means:			
7. export			
export means:			
8. disapprove			
disapprove means:			
9. telephone			
telephone means:			
10. biodiversity			
biodiveristy means:			
11. interrupt			
interrupt means:			
12. renewable			
renewable means:			
13. geology			
geology means:			

Whole word	Word part	Word part	Word part
14. destruction			
destruction means:			
15. unsustainable			
unsustainable means:			
16. thermometer			
thermometer means:			
17. microscopic			
microscopic means:			
18. co-operation			
co-operation means:			
19. contradiction			
contradiction means:			
20. malfunction			
malfunction means:			

Marking Sheet

Number of words self-identified	Meanings correct	Morphemes correct
Green		
Yellow		
Red		

End of Year Understanding Morphemes Assessment Task -B

First Name: _____ Last Name: _____

Class: _____

School: _____ Date: _____

Here is a list of words.

<p>Please “traffic light” them. Put a coloured circle next to each word.</p> <p>Green – You could explain the word to a ten year old.</p> <p>Amber – You have a clue but could not really explain it.</p> <p>Red – No idea at all.</p>		<p>If you don’t have coloured pencils you can use these symbols:</p> <p>✓ - You could explain the word to a ten year old.</p> <p>? - You have a clue but could not really explain it.</p> <p>X - You have no idea at all.</p>
<p>1. preview</p> <p>2. biology</p> <p>3. import</p> <p>4. extract</p> <p>5. reconstruction</p> <p>6. multiracial</p> <p>7. credible</p>	<p>8. premature</p> <p>9. television</p> <p>10. transport</p> <p>11. reject</p> <p>12. uniform</p> <p>13. dictator</p> <p>14. intercept</p>	<p>15. coincidence</p> <p>16. malnutrition</p> <p>17. inaudible</p> <p>18. illiterate</p> <p>19. hemisphere</p> <p>20. dysfunctional</p>

Now explain the words you have marked with a green circle or a tick. You can try the other words but please do your green, or ticked, ones first. **Warning:** Although there are **three** spaces for your explanations, some words – like biography – will only have **two** parts. If you need another space just add it in the margin. Break the word into parts and explain each part. Then explain the meaning of the word. The first word is done for you.

Whole word	Word part	Word part	Word part
Example: biography	bio = life	graphy = writing	
biography means: A piece of writing or a book about someone’s life			
1. preview			
preview means:			

Whole word	Word part	Word part	Word part
	<i>Word part</i>	<i>Word part</i>	<i>Word part</i>
2. biology			
biology means:			
3. import			
import means:			
4. extract			
extract means:			
5. reconstruction			
reconstruction means:			
6. multiracial			
multiracial means:			
7. credible			
credible means:			
8. premature			
premature means:			
9. television			
television means:			
10. transport			
transport means:			
11. reject			

Whole word	Word part	Word part	Word part
reject means:			
12. uniform			
uniform means:			
13. dictator			
dictator means:			
14. intercept			
intercept means:			
15. coincidence			
coincidence means:			
16. malnutrition			
malnutrition means:			
17. inaudible			
inaudible means:			
18. illiterate			
illiterate means:			
19. hemisphere			
hemisphere means:			
20. dysfunctional			

Whole word	Word part	Word part	Word part
dysfunctional means:			

Marking Sheet

Number of words self-identified	Meanings correct	Morphemes correct
Green		
Yellow		
Red		

Appendix Three: Language Terminology Quizzes for Students

Language Terminology Quiz for Students – Time One

Name: _____ School: _____ Date: _____

Language spoken at home: _____

Here are some words used to talk about English language, reading and spelling. Please use the traffic light code to show which ones you know well, which ones you are not sure of, and which ones you don't know at all.

Traffic light these terms by putting a coloured circle after the word:

<p>Green – You could explain the word to a ten year old.</p> <p>Amber – You have a clue but could not really explain it.</p> <p>Red – No idea at all.</p>	<p>If you don't have coloured pencils you can use these symbols:</p> <p>✓ - You could explain the word to a ten year old.</p> <p>? - You have a clue but could not really explain it.</p> <p>X - You have no idea at all.</p>
--	---

<p>word</p> <p>syllable</p> <p>short vowel</p> <p>long vowel</p> <p>digraph</p> <p>consonant</p> <p>blend</p>	<p>phonemes</p> <p>morphemes</p> <p>compound word</p> <p>prefix</p> <p>root</p> <p>suffix</p> <p>plural</p>
---	---

If you have marked any of these words with a green circle please explain what they mean.

Definitions:

word _____

syllable _____

short vowel _____

long vowel _____

blend _____

digraph _____

Language Terminology Quiz for Students – Time Two

Name: _____ School: _____ Date: _____

Language spoken at home: _____

Here are some words used to talk about English language, reading and spelling. Please use the traffic light code to show which ones you know well, which ones you are not sure of, and which ones you don't know at all.

Traffic light these terms by putting a coloured circle after the word:

<p>Green – You could explain the word to a ten year old.</p> <p>Amber – You have a clue but could not really explain it.</p> <p>Red – No idea at all.</p>	<p>If you don't have coloured pencils you can use these symbols:</p> <p>✓ - You could explain the word to a ten year old.</p> <p>? - You have a clue but could not really explain it.</p> <p>X - You have no idea at all.</p>
--	---

<p>word</p> <p>syllable</p> <p>short vowel</p> <p>long vowel</p> <p>digraph</p> <p>consonant</p> <p>blend</p>	<p>phonemes</p> <p>morphemes</p> <p>compound word</p> <p>prefix</p> <p>root</p> <p>suffix</p> <p>plural</p>
---	---

If you have marked any of these words with a green circle please explain what they mean.

Definitions:

word _____

syllable _____

short
vowel _____

long
vowel _____

blend _____

digraph _____

Sounds

How many **sounds** are there in each of these words?

trip _____ shadow _____ large _____ finger _____ children

 strain _____ church _____ condition _____ writing _____ access _____

/10

Syllables

How many **syllables** are there in each of these words?

gradually _____ difficulty _____ necessary _____
 radio _____ ruinous _____ unequalled _____

/6

Spelling

Circle the **digraphs** in each of these words.

torch ship peach think warn

Circle the **blends** in these words.

from square stock throw skipped

/10

Morphology/word parts

Explain the meanings of these **prefixes**.

pre _____ re _____ inter _____ trans _____

What do these **suffixes** tell us about words?

-tion _____ -able _____ -ian _____ logy _____

What are the meanings of these **root** words?

struct _____ port _____ dict _____
 rupt _____ audi _____

/13

Total /45

Appendix Four: Language Terminology Tasks for Teachers

Language and Meta-language Terminology Questionnaire for Teachers – Time One

School _____ Year 9 Class(es)taught _____

Name: _____ Subject _____ Date: _____

The following list of words consists of some terms used to talk about decoding, spelling and breaking words into meaningful parts of words. Please go through the list and mark the words according to the 'traffic light' code that is explained below. Then define any of the words below the box that you have marked green.

Traffic light these terms:

Green – You could explain the word to a ten year old.

Amber – You have a clue but could not really explain it.

Red – No idea at all.

word	syllable
vowel	orthography
short vowel	morphology
long vowel	morpheme
digraph	semantic
consonant	schwa
blend	prefix
grapheme	root
phoneme	suffix
phonemic awareness	plural

Definitions: If you have highlighted any of the following words green in the box above, please write a short definition to explain their meaning. To make things clearer you may like to add an example.

word _____

syllable _____

short
vowel _____

long
vowel _____

blend _____

digraph _____ /6

Phonology

How many **sounds** are there in each of these words?

trip_____ shadow_____ large_____ finger_____ children

 strain_____ church_____ condition_____ writing_____ access_____

/10

Syllables

How many **syllables** are there in each of these words?

gradually_____ inconsequential_____ necessary_____
 radio_____ ruinous_____ unequalled_____

/6

Orthography

Circle the **digraphs** in each of these words.

torch ship peach think warn

Circle the **blends** in these words.

from square stock throw skipped

/10

Morphology

Explain the meanings of these **prefixes**.

pre_____ co_____ inter_____
 trans_____ pro_____ contra_____

What do these **suffixes** tell us about words?

-tion_____ -able_____ -ly_____
 -ian_____ -ness_____ -logy_____

What are the meanings of these **root** words?

struct_____ port_____ dict_____
 cred_____ rupt_____ audi_____

/18

Total Marks /50

This questionnaire was developed with reference to a Teacher Questionnaire published by Joy Allcock (2004) on the Spelling Under Scrutiny website <http://www.spelling.co.nz>

End of Year Language and Meta-language Terminology Questionnaire for Teachers

School _____ Year 9 Class(es)taught

Name: _____ Subject _____

Date: _____

The following list of words consists of some terms used to talk about decoding, spelling and breaking words into meaningful parts of words. Please go through the list and mark the words according to the 'traffic light' code that is explained below. Then define any of the words below the box that you have marked green.

Traffic light these terms:

Green – You could explain the word to a ten year old.

Amber – You have a clue but could not really explain it.

Red – No idea at all.

word	syllable
vowel	orthography
short vowel	morphology
long vowel	morpheme
digraph	semantic
consonant	schwa
blend	prefix
grapheme	root
phoneme	suffix
phonemic awareness	plural

Definitions: If you have highlighted any of the following words green in the box above, please write a short definition to explain their meaning. To make things clearer you may like to add an example.

word _____

syllable _____

short
vowel _____

long
vowel _____

blend _____

digraph _____ /6

Phonology

How many **sounds** are there in each of these words?

split _____ shipment _____ barge _____ singer _____ chicken _____
 trainer _____ search _____ urge _____ written _____
 accident _____

/10

Syllables

How many **syllables** are there in each of these words?

finally _____ intercontinental _____ unnecessary _____
 video _____ innocuous _____ recalled _____

/6

Orthography

Circle the **digraphs** in each of these words.

lurch fish cheap third corn

Circle the **blends** in these words.

fret squash stick threw slipped

/10

Morphology

Explain the meanings of these **prefixes**.

pre _____ co _____ inter _____
 trans _____ pro _____ contra _____

What do these **suffixes** tell us about words?

-tion _____ -able _____ -ly _____
 -ian _____ -ness _____ -logy _____

What are the meanings of these **root** words?

struct _____ port _____ dict _____
 cred _____ rupt _____ audi _____

/18

Total Marks /50

This questionnaire was developed with reference to a Teacher Questionnaire published by Joy Allcock (2004) on the Spelling Under Scrutiny website <http://www.spelling.co.nz>

Appendix Five: Explanations for Student Assessment Headings

Explanations for data headings			
Pseudo S	Pseudo P	Pseudo C	Pseudo T
<p>Sounds Out of 20.</p> <p>This mark indicates If a student has a good idea of the alphabetic principle and knows to write a letter or a group of letters for every sound/phoneme in the word even if it is not a good pattern. e.g. frading for fradding is OK</p>	<p>Patterns Out of 20</p> <p>This shows whether they know good English patterns to use. frading for frading is fine for patterns but chomscratted is not Ok for choamscratted</p>	<p>Conventions Out of 20</p> <p>This score shows whether they know some conventions such as double d in fradding to keep short a sound or not ending disthurbloy as disthurbloi</p>	<p>Total Out of 60</p> <p>Just adds up previous 3 scores. if they only get about 30 or below that is a concern</p>
Voc1Scaled	VocabSt	Morphs SI	MorphsM
<p>PAT Vocabulary Scaled score Scaled score This is a score based on year level and numbers correct - a year 8 doing TEST 6 and getting 20 out of 40 would get more than a Year 9 getting the same number right. For test 6, scaled score of 66 is round stanine 5.</p>	<p>Stanines 1-9 Based on Bell curve so most students in whole of NZ in stanines 4-6 fewer in Stanine 9 excellent and 1 disastrous</p>	<p>Self Identified Out of 20 – how many they said they knew</p>	<p>Meaning out of 20 How many words they could define accurately – very generous marking except for incredible – had to have unbelievable</p>
Morphs WP	Quest SI	QuestD	
<p>Word Parts out of 43 Morphemes identified and defined correctly eg, pre – before dict- say ion- shows it is a noun</p>	<p>Questionnaire on terminology Self Identified out of 14 How many words they said they knew.</p>	<p>Definitions Out of 6 How many words they could define accurately for" word" needed two of: a sound or group of sounds/ group of letters/ with a meaning</p>	

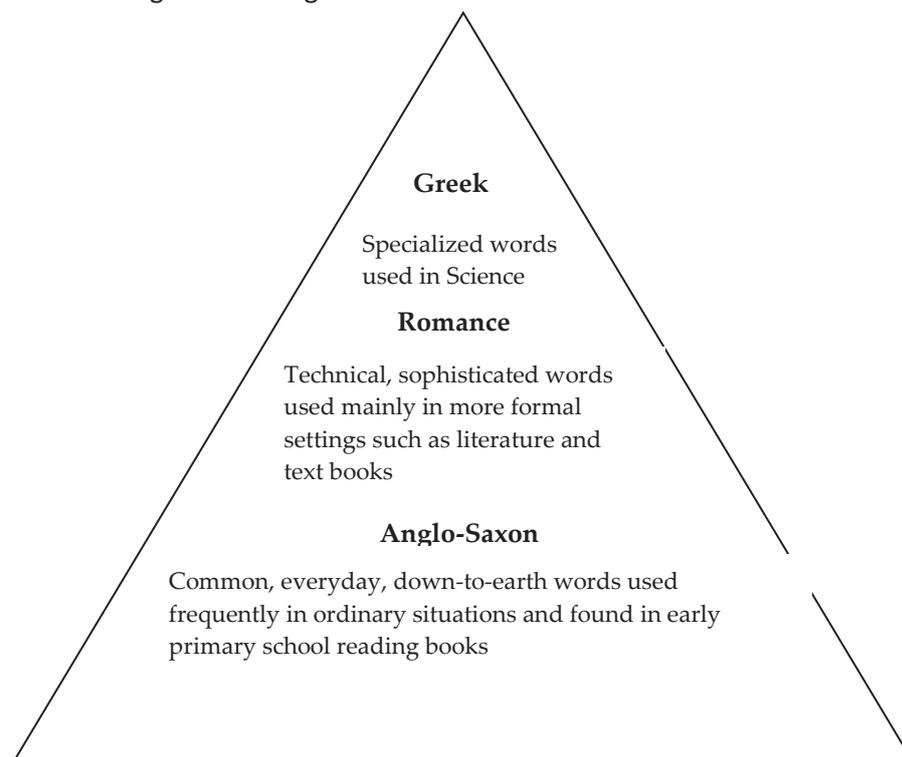
Appendix Six: Notes for Intervention Teachers

Decoding and Spelling – Word Origin and Structure

Based on (Henry, 1988) and (Nunes & Bryant, 2006)

What poor adolescent decoders and poor spellers need to know:

1. A number of sound-letter correspondences organized within categories such as consonants, short and long vowels, blends and consonant digraphs.
2. The most common ways to divide words into syllables.
3. Common morpheme patterns – prefixes, roots, suffixes and compounds.
4. The productive rules or conventions of the written forms of the language
5. An understanding of the history of the English language in order to understand the apparent complexities of the written language by contrasting (a) the regularity of words of Greek and Latin origin and Anglo-Saxon words that generally have less regular sound-letter correspondences, and (b) syllabic and morpheme patterns that differ according to word origin.



The layers of the English Language(Henry, 1998)

The Layers of Language in English Spelling

Anglo-Saxon Layer

Words of Anglo-Saxon origin are the common words that are in frequent, everyday use. Henry (1988) gives an example from Nist (1966) to illustrate this.

No matter whether a man is American, British, Canadian, Australian, New Zealander or South African, he still *loves his mother, father, brother, sister, wife, son and daughter; lifts his hand to his head, his cup to his mouth, his eye to his heaven and his heart to God' hates his foes, likes his friends, kisses his kin and buries his dead; draws his breath, eats his bread, drinks his water, stands his watch, wipes his sweat, feels his sorrow, weeps his tears and shed his blood; and all these things he thinks about and calls both good and bad.*
(p.9)

Another feature of Anglo-Saxon is that new words are created by forming compound words such as *hardware, software, and lipstick*. Words of Anglo-Saxon origin are affixed by adding prepositions as prefixes and short suffixes to base words, for example *forgotten, forbidden* and *beholden*.

Romance Layer

This layer of the language is made up mostly of words of Latin and French origin. These are the technical, more formal words mostly used in text books and in literature. Common in these words are the suffixes: *tion, tious, tial, cian, and cious*. Words in Latin are affixed e.g. *interrupted, transmitting* and *prevention*. Here is another example from Nist (1966):

So great, in fact was the *penetration* of Latin *affixing* during the *Renaissance* that it quite *undid* the Anglo-Saxon habit of *compounding* as the leading means of word *formation* in English. (p.11)

Some common Latin root words are: *rupt, struct, port, form and tend*. They are all easy to spell with one to one sound to letter correspondence.

Greek Layer

Greek words came into English during the renaissance to meet the needs of scholars and scientists. Words with Greek origins use the sounds of ph/ch/y found in *chlorophyll*. In this layer compound forms in words appear in largely scientific texts, such as *microscope, hemisphere, physiology*.

This information is condensed into a table with some examples to exemplify the differences in the layers of language. The table is copied from Henry, (1988) page 260.

How should word study/morphology be taught?

Henry (1988) based her programme on some principles that were taken from the Stanford Project READ (Calfee and Henry, 1985). This project sees the elements of reading as separable components, takes a structured and reflective approach to reading instruction and used small group discussion as the primary mode of instruction. This fits in with the approach advocated by Nunes and Bryant (2006). Nunes and Bryant conducted a series of experiments to show that morpheme awareness was associated with reading and spelling skills, better morpheme awareness predicted better reading and spelling in a longitudinal study. They also showed that improving students understanding of morphemes helped them to understand new vocabulary. Another interesting feature of their final piece of research described in this series of studies was that when teachers were taught more about teaching morphemes their students spelling and vocabulary knowledge grew. Nunes and Bryant were keen not to bore the children they worked with so developed interesting tasks which involved problem solving and discussion. They wanted students to learn to spell better by applying principles not learning rules.

Table 1

Word Origin by Word Structure Categories: Framework for a Decoding and Spelling Curriculum

Layer	Sound-letter Correspondences	Syllable Patterns	Morpheme Patterns
Anglo-Saxon	cap stand that set brisk ship pin/pine car beat tall crown snow	tennis sister napkin hobo cabin hundred	railroad pigtails like bid unlike forbid unlikely forbidden
Romance	direction spatial excellent	inter- intro- -ity	prediction disruptive admission
Greek	physics chemist	auto- micro-	microscope chronometer physiology

Sample lesson (from Henry, 1988)

Begin by writing *rupt* on the board. Ask students to generate a number of word with *rupt* as the root. See if students can get the meaning of *rupt* (to break, to burst) from the words they suggest. (This would have been preceded by some work on the meanings of common prefixes and suffixes.

rupt

rupture
corrupt
bankrupt
irrupt

erupt
disrupt
interrupt
abrupt

eruption
interruption
disruptive
irruption

After students have discovered the meaning of *rupt* and practised reading the words they have generated they could see if they could work out which forms of the words are nouns, verbs or adjectives.

Maybe they could complete some sentences or develop sentences to show these distinctions?
How could word study segment of a lesson be integrated into a topic in English/Social Studies?

Appendix Seven: Example of email to Intervention Teachers

19th June 2011

A Summary of Expectations by the End of Term One

I know how busy you are and hope you know how much I value your participation in this project. I thought it might be a good idea just to summarise what I need you to do for me by the end of this term. A sort of check list:

- show students the triangle 'layers of language' so they are aware that the different layers have different letters for some sounds (/ph/ for/f/ and /ch /for /k/ in the Greek layer for example)and that there are different syllable patterns and morphology in each layer. (Explained in the handout with the triangle...)
- have set at least one Pre- and Post-topic test for key vocabulary for which you derive three marks:
 - Spelling out of 20
 - Self-Identified as knowing (green light) out of 20
 - Correct meanings
- fill in a weekly log briefly describing what you have done with spelling and vocabulary in each week since you started
- Send me the log by the end of term

If you need examples of any of these things please let me know and I shall send you the information straight away.

Teaching topics

Some priorities from the tests I marked:

Weak spellers would benefit from learning about short and long vowels as a starter. Use Elkonin boxes for very weak spellers.

Good spellers still need to work on patterns they got wrong in the real word spelling test

(most of them got audible wrong so need to work on the morpheme audi – lots of schools have a sign up saying “auditorium” and what is an audience etc.,...)

All of them need to work on morphemes

I found a fun Science morpheme activity which I shall send you along with this email – good for Friday last period.

Thank you

Jessica

Appendix Eight: Examples of Spelling Tasks

Spelling task to find rule for doubling consonants in words with short vowels

Put students into pairs or groups of three.

Hand out cards made from words below.

Ask students to sort the words into groups to see if they can work out what is different about the words.

What have they discovered?

(You are wanting them to discover that if a vowel is a short sound like: a in cat, e in egg, i in ink, o in dog and u in hut – then you need to double the consonant if you add an ending or it is a multisyllabic word. Words with long vowels keep a single consonant when you add endings.)

Note – words on next page!

write	writing	written	spelling
hiding	hidden	kitten	kite
shut	shutting	shoot	shooting
wed	wedding	weeding	widen
slip	slide	slipping	sliding
tip	tipping	tide	tiding
fit	fitting	sit	sitting
site	sited	fitted	spell
tell	telling	fill	filling

Simple Doubling consonants to keep short vowels

Ask students to cut up these words and sort them. Do not instruct them on how to sort them.

What you are hoping they discover is that words with short vowel sounds have a double consonant when you add endings.

killing	culling	tiling	milling
filling	filing	tilling	cropping
reaping	shaping	piling	biting
bitten	butter	fatten	slitting
ripen	ripping	cutting	hitting
hiding	fading	taping	kitten
liking	shading	biking	sipping
dipping	tapping	drilling	hiking

OY or OI Word Sort

(For students who got this wrong in the pseudoword test)

You want them to work out where to use the oy or oi pattern.

Note – always **oy** at the end of the word (except hoi polloi!)

oi pattern in a syllable that has **consonants at the beginning and end** of the syllable e.g. void or boil

(CVC) = consonant vowel consonant

oy in middle of word if it is **the end of a syllable** (oyster)

(CV)

Or, if it is easier to understand - use oy when words that ends in oy have a suffix – like enjoyment

Please ask students to cut up the words – much easier than writing lists.

Tell them to think about **what is at the end of each syllable** – consonant or vowel, explain oy and oi are vowel digraphs

Get them to do the monosyllabic words first if they are very poor spellers. Better spellers might start with monosyllables or skip this part – explain **mono** means one, and **poly** means many

Monosyllabic Words

boil	boy	toy	void
soy	joy	coil	soil
toil	hoist	groin	coy
ploy	broil	foil	choice

Polysyllabic Words

When do you use **oy** and when do you use the **oi** pattern?

enjoy	avoid	disappoint
celluloid	employment	flamboyant
humanoid	charbroil	convoy
poisonous	embroider	typhoid
voyage	decoy	boisterous
enjoyment	voyage	toilet
rejoice	destroy	exploitation
adroit	loiter	deploy

Ask students to explain when to use the **oy** pattern and when to use the **oi** pattern. Something like – When the **oy sound** is the last sound in a syllable you use the **OY** pattern, but when the **oy sound** is followed by a consonant in the syllable you use the **OI** pattern.

It's all Greek.....

These word study activities all focus on Greek layer of language - spelling sound/letter correspondences and Morphology. You could do one pattern at a time for a struggling class and the whole lot at once for better spellers

1. Pronunciation

If you know that in words of Greek origin:

- 'ch' is used to write the 'k' sound,
- 'ps' is used to write the 's' sound, and
- 'ph' is used to write the 'f' sound

how would you **pronounce** these words?

choir orchestra chorus choral
 Christian

psychology psychiatrist psyche psychotic
 psychopath

philosophy Phillip physiotherapy physical
 philharmonic

Do you know what any of the words mean? Challenge: Find out!

2. Morphology and Meanings

If psyche means 'mind' or 'soul' and logy means 'study of' what does 'psychology' mean?

Can you work out the meanings of the other 'psych' words? ('patho' means disease)

If philo means 'love of' and sophos means 'wise' or 'wisdom' what does 'philosophy' mean?

Do you know any other 'phil' words? philanthropist for example...

'tract' words...**This could be a whole class activity**

Put the word 'tract' on the board.

Then write : tractor

What does a tractor do? It pulls stuff behind it – so tract means pull

Ask class to think of all the words they know with *tract* in them

If they have small offerings here are some to add:

attract attractive attraction extract detract contract (stressed first syllable)	contract (stressed second syllable) contraction (words shortened, shortening of muscles) tractable intractable distract/distraction
--	--

Then get students to work out meanings in small groups – DIVIDE UP THE WORDS, illustrate the word then put it on a word wall - Please model this to help with end of year morphology test:

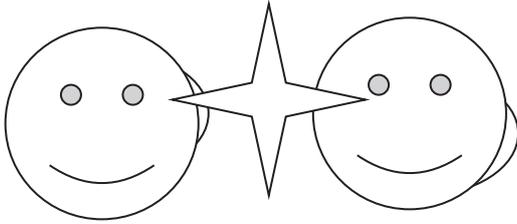
FORGIVE LAME ILLUSTRATION!

contract

con = with tract = pull

contract means:

- 1) 'pull together, agree to something together'
- 2) muscle fibres pulling together to make muscle shorter



1 + 1 = AGREE

Words to do with the root words 'port' and the prefix 'trans'

Look at these two words: (Write on board)

export and import

What do they mean?

What do you think 'ex' means?

What might 'im' mean?

How many other 'port' words do you know? Brainstorm

(porter portable important transport deport report)

What does port mean?

What does the suffix 'er' often tell you about a word?

What does the suffix 'able' tell you about a word?

What does 'trans' mean?

Think of other words which start with 'trans'

Brainstorm:

(Some possibilities-not sure of the capitals!)

TransTasman, transatlantic, transalpine, transform, translate, ...

Word sorting task - focused on – g endings

catalogue	vague	epilogue
peg	rug	vague
league	monologue	prologue
fog	plague	synagogue
dialogue	intrigue	fugue
rogue	tag	fatigue

Task

Sort the words into groups. You could colour code them. Focus on the endings ...

What do you notice? What would happen to the sound of the 'g' if the 'u' was removed after the 'g'?

(what you are trying to get them to notice is that polysyllabic words ending in 'og' get a 'ue' and so do monosyllabic words with long vowels...Sorted on the next page)

Then ask students to choose a word they don't know and find out what it means...

catalogue	vague	epilogue
peg	rug	log
league	monologue	prologue
fog	plague	synagogue
dialogue	intrigue	fugue
rogue	tag	fatigue

Appendix Nine: Interview Questions

Interview Questions for Word Study Intervention Teachers

Name: _____

Date: _____

The purpose of the interview is to find out how the intervention has been from the teachers' point of view.

Question 1. Context

In general, nothing to do with my research project, how has your year been?

Question 2. Value of word level data – Time 1 test results

What difference, if any, did it make to get more detailed information about your students' phonemic awareness (pseudoword test), spelling skills and vocabulary skills?

Question 3.

How confident were you, at the start of the project, that you would be able to implement the word study intervention?

Question 4.

How did the students react/respond to the spelling and vocabulary lessons?

Question 5.

What were some of the barriers or difficulties to implementation?

Question 6.

Were there any positive aspects to the project? For you? Or for your students?

Question 7.

Any comments about the Time 2 data? Any disappointments/surprises?

Thank you very much. Your participation has been really valued.

Interview Questions for Teachers in Control Schools

Name: _____

Date: _____

The purpose of the interview is to find out:

- what happened for some students who did really well in the tests and
- if it made any difference having the data at the beginning and
- how you felt about being 'tested' and
- anything else you might like to add

Question 1. Context

In general, nothing to do with my research project, how has your year been?

Question 2. Value of word level data – Time 1 test results

What difference, if any, did it make to get more detailed information about your students' phonemic awareness (pseudoword test), spelling skills and vocabulary skills at the start of the year?

Question 3.

How much reading do you do in your year 9 class last year? Was this influenced by the Secondary Literacy Project?

Question 4.

How did you teach vocabulary? (last year in year 9 classes)

Question 5.

Did you ever focus specifically on spelling?

Question 6.

Why do you think the student/s you taught in your year 9 class improved so much in asTTle or the other tests they had to do for my project? (See list in email)

Question 7.

Any comments about the Time 2 data? Any disappointments/surprises?

Question 8

How did you feel about being tested yourself?

Any other comments about literacy/spelling or vocabulary or the process that might be helpful?

Thank you very much. Your participation has been really valued.

Interview Questions for Students

College: _____

Class: _____

Name: _____

Date: _____

Purpose of interview:

First of all thank you for agreeing to be interviewed. You signed the consent form last year –are you still OK about this? If anything is too hard to answer or you don't want to answer a question just say "pass"... I have asked to interview you because you did well in some tests you had last year and I am interested in finding out how teenagers build their literacy skills.

General

1. What was your year like last year? What were some good things in general? At home? At school? What went well?
2. Was there anything difficult about school last year? Moving from year 8 to year 9?

Reading

As I said I am interested in how students build their literacy skills so I want to ask you some questions about reading, vocabulary and writing.

3. How do you feel about reading at school?
4. What about reading in English? How much do you have to do?
5. How do you feel about reading in Science? – how much reading do you have to do?
6. How do you feel about reading in Social Studies? – how much reading do you have to do?
7. How do you feel about word problems in Maths? How much reading do you have to do?
8. Do you ever take books out of the library here at school?
9. What sort of books and for what purpose?
10. How do you feel about reading at home? Do you read at home? What and when?
11. Say that you won a prize and it was a book. How would you feel?
12. What sort of book would you choose if you could choose the book prize?

Decoding

13. When you are reading and you come across a long word you have never seen before and you don't know what do you do?

Vocabulary

14. Say you have worked out how to say a new word that you have not seen before but you still don't know what it means. What would you do?
15. How do you feel about learning new words?
16. How do your teachers help you to learn new words?
 - a. In English?
 - b. In Science?
 - c. In Social Studies?
 - d. In Maths?
17. In which subject/s are the words most challenging?
18. Can you think of anything your teachers have done to help you learn new words that worked particularly well?

Spelling

19. How do you feel about spelling?
20. What do you do if you are writing and you are not sure how to spell a word that you need to use?
21. Do you ever learn how to spell words in class?
 - a. In English
 - b. In Science?
 - c. In Social Studies?
 - d. In Maths?

Thoughts about learning

22. Say you had a multi-choice question about intelligence which of these statements do you think is true for you?
 - A. When you are born you are given a certain amount of intelligence – it may be a small amount or a large amount – and you use this intelligence for the rest of your life.

OR

 - B. If you keep trying and making an effort to learn something then your brain capacity will grow even if you get things wrong some of the time.

Next choice:

23. If you had to choose one of these statements about successful test results which one do you think is true for you?

A. If you do well in a test then it is because you put in a lot of effort to understand the topic.

OR

B. If you do well in a test then it was because of good luck that you knew the answers to the questions.

24. Say you get a test back and you have done badly. What do you say to yourself about the test result?

Wrap up – looking ahead

Last questions –

25. How do you feel about school this year? Is there something you are looking forward to?

26. What do you want to do when you leave school? What are your dreams?

Appendix Ten: Simplified Marking of Pseudoword Tests

In the initial simplified scoring system each pseudoword was marked for three qualities: for phonemes (Sounds), for appropriate spelling patterns (Patterns) and for spelling conventions (Conventions) so each student had three scores for pseudowords (see Appendix Ten). Each student had a total score out of 60 and three sub-test scores out of 20. The first mark was for Sounds which indicated an understanding of the alphabetic principle; if each phoneme in the pseudoword was represented by a letter or group of letters (which may or may not be orthographically correct), it scored a mark. The second mark, for Patterns, was awarded for orthographically correct choices of spelling patterns to represent phonemes, and the last score, Conventions, indicated that the student was aware of spelling conventions including the correct spelling of prefixes and suffixes. This method of scoring made it easier for teachers to identify students' spelling difficulties.

Pseudowords *fradding* and *gowmicious*

Examples of Student's incorrect responses:

Pseudoword	Sounds	Patterns	Conventions
frading	1	1	x
gomishis	1	x	x

Results of Simplified Marking of Pseudoword Test at Time One

Aspect	Max	Mean SD	Skewness	Kurtosis
Pseudoword Sounds	20	18.21 3.51	-2.88	8.47
Pseudoword Patterns	20	11.99 4.32	-.63	-.04
Pseudoword Conventions	20	12.21 3.59	-.54	.36
Total	60	42.24 10.24	-1.43	2.27

Appendix Eleven: Observation Sheet

Observation sheet for Word Study session

Teacher's Name: _____

Class: _____

Date: _____

Description of activity/activities	Students' engagement/responses:
Purpose of activity:	Students' understanding of purpose:

(See Principles of the Intervention overleaf)

Principles of the Word Study intervention:

What poor adolescent decoders and poor spellers need to know:

6. A number of letter-sound correspondences organized within categories such as consonants, short and long vowels, blends and consonant digraphs.
7. The most common ways to divide words into syllables.
8. Common morpheme patterns – prefixes, roots, suffixes and compounds.
9. The productive rules or conventions of the written forms of the language
10. An understanding of the history of the English language in order to understand the apparent complexities of the written language by contrasting (a) the regularity of words of Greek and Latin origin and Anglo-Saxon words that generally have less regular letter-sound correspondences, and (b) syllabic and morpheme patterns that differ according to word origin.

How best can we teach the poor spellers and decoders and the students who spell well but need to grow their vocabularies?

- use small groups – possibly differentiated if there are huge differences in achievement in class
- use word sorts to help students to distinguish spelling patterns
- explain the layers of the language (Anglo-Saxon, Latin/Romance/Greek) and assist students to notice differences in patterns of these different layers
- keep sessions short and fun if possible (no more than 15 minutes at most)
- problem solving approach – not instruction so much as discovery...