Evaluation of the influence of the Phono-Graphix™ programme on children's reading achievement.
Direct instruction of phonological processing skills with a small group of predominantly Māori students.

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Abstract

A weakness in phonological-processing skills and alphabetic understanding is theorized to be responsible for the lack of reading development with some children. This study investigated the influence of a programme designed to use a direct instruction approach to teach these skills and knowledge on reading development. Fourteen children and the teacher from one classroom in a small urban primary school participated in this study. The students ranged in age from 7 years 7 months to 9 years 9 months, and ranged in reading ability from achieving below to achieving above their comparable chronological age in reading. At the time of the study, the school roll consisted of 81% Māori, 2% Cook Island, and 17% New Zealand European. Of the 14 students involved in the study, 12 were Māori, one was a Cook Island Māori and one was New Zealand European.

The study took place over nine months, and consisted of 20-minute direct instruction sessions on phonological-processing skills and alphabetic knowledge and understanding, supported by other daily practice sessions as suggested by the programme's curriculum. Children were administered a range of tests on phonological-processing skills, word attack and identification, and reading comprehension and attitude at the beginning, middle and end of the study period. Comparisons and analysis of the data revealed that there were differences with all groups; i.e., those achieving in reading at, above, or below their expected level, with all aspects tested. Because of other interventions put into place by the classroom teacher, it is not possible to fully attribute the development of skills and understanding, and acquisition of knowledge, to the implementation of the programme. Nevertheless, these results suggest that children responded favourably to the specific, explicit teaching. Although this study was small, the positive response of the Māori and Cook Island Māori participants is worthy of further or closer investigation.

Introduction

As principal of a primary school in a small urban town, I was concerned about the reading achievement of many of the students. Fifty one percent of the students at the school were achieving six months or more below where we expected them to achieve. Every child had been given a reading test that enabled a reading age to be decided. The reading age was decided as a result of children achieving 96+% with decoding and 80+% with comprehension. This test is described in more detail further in this report.

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Eighty three point three percent of these underachievers were Māori (with a comparative 81% of Māori students on the roll). Analysis of the data we had gathered that gave us the above information indicated that the main gap in the students' learning was the ability to decode. At that stage, although I was an experienced teacher (and had been a principal for two years), and, I believed, had been a reasonably effective teacher of reading, my understanding about the knowledge and strategies needed to decode was limited. I didn't realise this at that time though.

Discussions I had with colleagues alerted me to the fact that some schools in the area had implemented a programme designed to improve students' ability to decode. One principal of a small rural primary school of predominantly New Zealand European students told me that the year the programme had been implemented in her school was the "most exciting year of her teaching career". A school in a small urban town with a predominantly Māori population had had a write-up in the local newspaper the previous year. The newspaper article discussed the rise in reading achievement at the school as a result of implementing the programme, and an increase in self-esteem, which was attributed to this rise.

I investigated the programme through talking with other principals who had implemented the programme, and with the tutor of the programme. After consideration of the information available, the school decided to implement the programme. This programme was called Phono-Graphix™.

McGuinness and McGuinness (1998) designed Phono-Graphix™. It is a programme that aligns with a 'bottom-up' theoretical perspective. It used a structured, explicit and specific approach to help struggling readers acquire phonological-processing skills and alphabetic code knowledge.

Although designed as a remedial programme, it can be delivered to students from the time they are ready for reading instruction. The programme was developed over a period of years of working with students who struggled to succeed with their reading. The authors worked with these students in clinics. While the programme itself is not norm referenced, the tutor suggested using Woodcock Johnston (1987) tests for data gathering on word attack and word identification, for evidence of the success or otherwise of tuition. These Woodcock Johnston tests are norm referenced, although in the United States of America

approximately 20 years ago. There is a more detailed description of the programme on page 23 -25 of this text.

Because so many of our students needed development with their phonological-processing skills, or decoding as I knew it then, we made the decision to implement the programme school wide. Consequently the teaching staff and two teachers' aides underwent training prior to the school year starting.

At this time I was in the process of completing my master's degree and needed to complete a research project. The school was investing a large sum of money into professional development for staff, and the implementation of Phono-Graphix™ into the school. I made a decision to investigate the influence of the programme on the development of phonological-processing skills for my research project. The results of the study would help determine whether the school would continue with the implementation of the programme in future years.

The reading process
The author acknowledges that the reading process has many aspects, and believes that the principle purpose of reading is to gain understanding in order to gather information, ideas, and enjoyment. For the purpose of this study, however, the author will focus on one of the main aspects of the reading process, that of decoding.

It has been suggested that children who have difficulty learning to read may decode less effectively than do their more successful peers (e.g. Adams, 1990; Catts & Kamhi, 1999; Gough, 1986; Spear-Swerling & Sternberg, 1996, as cited in Laing, 2002; Howell & Nolet, 2000).

For many years there have been debates about how children learn to read, and how to teach reading. These debates have generally centred on teaching reading using 'whole language,' or 'phonics,' or using a dual approach. It is generally agreed that 'whole language' is an approach to learning to read, in which the child relies on natural language ability to discover how the writing system works, whereas using the 'phonics' approach relies on direct instruction of some reading skills specifically related to letters and sounds.

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More recently the focus for teaching reading has been on the dual approach, with a call for balanced instruction, which is defined as "a lot of skills instruction in the context of massive holistic teaching" (Pressley, Roehrig, Bogner, Raphael & Dolezal, 2002, p. 1).

Some researchers believe that the reading process has a number of specific stages. All of these stages are important if a reader is to succeed with the main purpose of reading, which is to gain meaning from text. Nicholson (1997) uses the following bottom-up theoretical perspective model to depict the process.
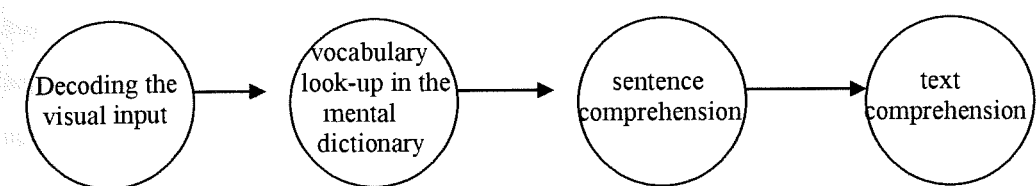

Figure 1a – A visual representation of Nicholson's model of the reading process

This linear model of the reading process demonstrates that a reader must be able to decode to proceed effectively to the next stage. The diagram suggests that the reading process is linear. However, for effective comprehension, or when a reader encounters difficulty, the process is not linear as a reader may need to go back a stage or two to check on a previous decision or understanding whether it is for decoding or comprehension purposes.
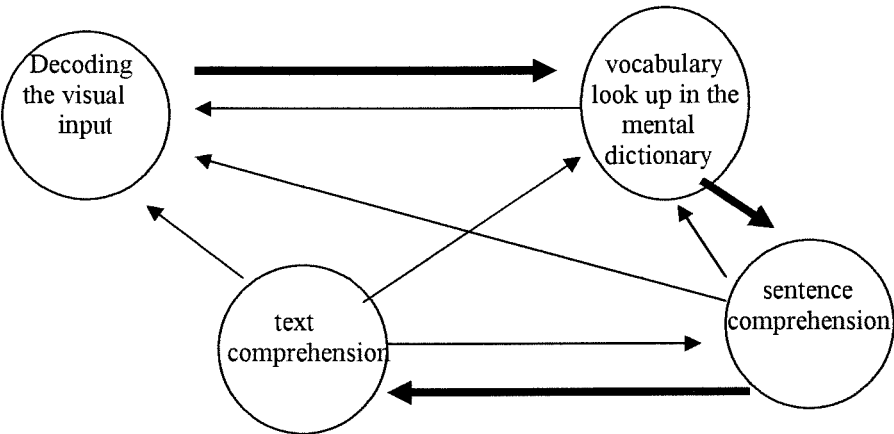

Figure 1b – The interactivity, interrelationship and interdependency of the stages in the reading process - an interpretation of Nicholson's model

This modified model demonstrates that for the reading process to be successful for depth of comprehension or when a reader encounters difficulty, the process must be non-linear. Text comprehension is dependent on sentence comprehension, which in turn is dependent upon vocabulary understanding, which is dependent on correct decoding. This means a reader may need to check the accuracy of his/her decoding or comprehension at any stage of the process.

One of the main causes of contention with the whole language/phonics debate is whether a reader needs planned explicit and specific instruction at the first stage of the reading process, decoding, or whether he/she needs incidental instruction geared to meet specific needs as they arise during whole language reading instruction. There has been an increasing call for the need for specific instruction as a result of research into this area. (e.g. McGuinness, 1997; Moats, 2000; Nicholson, 1997, 2000).

Pressley et al. (2002) discuss misconceptions about balanced literacy instruction, suggesting that proponents of either whole language or skills instruction generally include aspects of the other approach as more of an add-on, rather than as a fully integrated approach. They stress the importance of a balanced literacy approach for all students, but especially for students who have initial difficulties in learning to read and write.

Gough (1995, cited in Nicholson, 2000) refers to two levels of literacy, Literacy 1 and Literacy 2. Literacy 1 is the ability to read and write. Gough suggests that years of tuition are necessary to give a child the ability to decode or encode any word, which then provides the opportunity to achieve Literacy 2, which is being educated and having the ability to think critically. If readers are unable to achieve Literacy 1, then they are unable to access and process ideas and information that is available through written text.

Gough and Juel (1991, cited in Harvey, n.d.) see reading as two interacting and interdependent aspects, word recognition and comprehension. Thompson, (2003) using Luke and Freebody's (1999) model, states that reading (and writing) has three aspects; learning the code, making meaning, and thinking critically. Davis (2005) discussed that reading is about comprehension, and that decoding is one aspect of comprehension.

A reader who has difficulty with decoding, turning letters into sounds, or sounds into words, will have major problems with reading. Because these readers decode slowly, sentences are not processed efficiently. As readers decode, they hold each processed sound in short-term memory. If the period of time between sounds or words is too much for this short-term memory, sentence comprehension is affected because information is lost before it can be processed. Because slow decoders read so little, they are less likely to learn new words in context. The full or varied meanings of many words are only obvious through the supporting text of a sentence or passage. If a slow-decoder stretches decoding past the two-

second limit for short-term memory, then new words cannot be automatically decoded. This means that these new words are less likely to be recalled next time they are sighted.

Comprehension is also affected because slow-decoders are usually inaccurate. These readers may get the general idea of a passage, but will have difficulty gaining precise meanings and inferences (Nicholson, 1997). Speed and accuracy in the retrieval of internal representations of words in sound form, or phonological segments is therefore essential (Chard, Vaughn & Tyler, 2002; Downs & Morin, 1990; Dymock & Nicholson, 1999; Howell & Lorson-Howell, 1990; Howell & Nolet, 2000; Rasinski, 2000).

Munro (1998); Sensenbaugh (1996); Tunmer (1999:12; cited in Harvey, n.d.) and Yopp (1995), suggest that the ability to learn to read, in particular to learn to decode, can be predicted by the acquisition of phonological or phonemic awareness. Hurford, Schauf, Bunce, Blaich, and Moore (1994, cited in Hempenstall, 1996) assessed 170 school beginners using phonological tests and were able to predict 100% accurately which students would have reading difficulty two years later. Similarly, Badian (1994 cited in Hempenstall, 1996) predicted with 91% accuracy which students she had tested using phonological tests would be good or poor readers two years later.

The relationship between acquisition of phonological awareness and later ability in learning to read is still under investigation, although research indicates that phonological awareness plays a causal role in reading acquisition, and is foundation ability underlying the learning of spelling-sound correspondences (Snider 1997; Stanovich (1993-94), cited in Sensenbaugh, 1996). Yopp (1995) discusses the work of Griffith, Klesius and Kromway (1992) that shows that the importance of phonemic awareness is consistent regardless of the instructional approach used to teach reading. This phonemic awareness forms the bridge that translates squiggles on a page into spoken language (Snider, 1997) and enables children to make links between what they hear and say, and what they read.

Castle, Riach and Nicholson (1994) and Harvey (n.d.) suggest that phonemic awareness training improves reading progress. Chard and Dickson (1999) suggest that phonological awareness training improves reading progress, and Chapman et al. (2001) suggest that explicit instruction in phonics improves reading progress.

Confusion can be caused by inconsistency in the use and definition of the terms, phonemic awareness, phonological awareness and phonics. These inconsistencies can add to teachers' lack of knowledge and understanding of the skills, and their place in the reading process. Chard and Dickson (1999), Moats (2000), Nicholson (1999), Rath (1995) and Thompson (2001) all suggest that many teachers were unclear about the difference between phonics, phonemic awareness, and phonological awareness, and many had difficulty understanding what 'phonemes' were (Nicholson, 2000).

As a teacher of more than 25 years, it is with some embarrassment that I acknowledge that until I undertook this research project, I was unaware of the differences between these three. This is in spite of the fact that I have completed considerable professional development with literacy (mainly reading and writing) over the years, with most of this professional development of a long-term nature such as Advanced Studies for Teachers (ASTU) papers. I feel safe in making a generalisation that many of my colleagues would have similar knowledge as me.

Defining phonological and phonemic awareness and phonics

Within literature, there are conflicting or overlapping definitions for these terms, and at times they are used for one and the same thing. The International Reading Association (1998) defined the difference between phonemic awareness and phonics. Phonics was defined as knowing the relation between specific printed letters and specific spoken sounds, whereas phonemic awareness was defined as an understanding about spoken language. Castle, Nicholson and Riach (1994) quote Stanovich (1992) and Yopp's (1988) definition of phonemic awareness as knowing about sound patterns in words (e.g. rhyme and alliteration) and the ability to play with sounds in words (segment, blend, delete and insert phonemic segments).

Munro (1998) distinguishes between phonological and phonemic awareness. Phonological awareness is the knowledge of sound patterns, but phonemic awareness is knowledge of individual speech sounds, which is one aspect of phonological awareness. Tunmer, Chapman, Ryan and Prochnow (1998) define phonological awareness as the ability to hear and remember various units of sound within a word, (these sounds may be a syllable, rime, fragment or a phoneme) and the ability to use mappings between letters and sounds to read and write unfamiliar words, with sensitivity to the subcomponents of spoken words.

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Chard and Dickson (1999, p. 261), though, define phonological awareness as "the understanding of different ways that oral language can be divided into smaller components and manipulated". They go further than Munro (1998) to state that phonemic awareness is "the most sophisticated level of phonological awareness" (p. 262) and is the ability to manipulate phonemes by segmenting, blending, or changing phonemes within a word. Snow, Burns and Griffin (1998, cited in Chard & Dickson, 1999, p. 51) state that phonological awareness is a general appreciation of sounds of speech, whereas phonemic awareness is "finer-grained sensitivity" and awareness that words can be divided into phonemes in a sequence.

McGuinness and McGuinness (1998) clarified misconceptions of both phonics and the nature of the phonetic code. Phonetics is about sounds, whereas phonics is about letter names. Phonetics is about teaching children the code for the sounds of their language, not teaching those sounds they already speak. It is about teaching children that there are many ways to show a sound, or pictures of sound. It is not about rules or the numerous exceptions to rules. It is about each sound, and how each sound can be blended and segmented to read and spell words. It is not about families or groups of sounds.

For this research project I will use the definition of phonological awareness as a general awareness of sounds, phonemic awareness as involving understanding and manipulation of the smallest units of sound, and phonics involving the relationship between letters and sounds. I will also use the term phonological-processing skills as a generic term to cover the skills such as segmenting, blending and manipulating sounds, which phonemically aware readers use when decoding.

Phonics/phonemic awareness and learning to read
Why then, is teaching phonemic/phonological awareness/phonics skills and knowledge so important in order for children to learn to read? Learning to read is not natural (Nicholson, 1998). Proponents of whole language will argue that learning to read is as natural as learning to speak (Goodman, 1993; Smith, 1978). Yet the alphabetic writing systems used to represent print are a cultural invention (McGuinness, 1997). As McGuinness (1997) stated, inventions are not natural, they are devised.

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A child must be taught to read, through a process where they are made aware of sounds and the symbols that represent them. How this is done, is the centre of the whole language/phonics debate. Once a reader is able to automatically link the symbols with the sounds, they are able to apply this knowledge, and the skills required, to attend to meaning. If a reader cannot automatically apply this knowledge then he spends valuable time on decoding to the detriment of gaining meaning from reading texts.

Phonological knowledge is needed for readers to make connections between written words and spoken knowledge (Munro, 1998). Munro further found that readers use phonological knowledge to link letter clusters with what they know about how words are said, and to detect sounds in spoken words. The sounds provide the hooks to attach letter clusters. Knowledge of sound patterns helps a reader learn individual sounds and letter cluster sounds such as onsets, syllables, morphemes and word stems. Readers need to be able to transfer knowledge of individual sounds and sounds of letter clusters from known words to help them read unknown words. As they scan text, readers must notice which letters work together, and which do not. For example, when confronted with the word /teach/ a child needs to know that /e/ and /a/ work together to form /ea/. Beginning readers may need explicit instruction in the 'code', which is the visual representation of sounds spoken.

In order to decode, a reader must be aware of the order of phonemes in words. He/she must be able to segment these phonemes in order to identify them, and then blend them together, in order to "create" a word. A reader must also be able to manipulate phonemes in order to decode accurately. For example, if confronted with a word such as chief, he must be able to take out the more common sound of /ie/ as in tie, and replace it with /ie/ as in believe. The use of context should alert a child of the need to manipulate phonemes, but of course the child needs to have the code knowledge necessary, plus the skills in order to do so.

A beginning reader must have a grasp of many skills. He/she must be able to visually discriminate letter shapes. He/she does this by moving his/her eyes around them, letter by letter, from left to right across the word, if reading, or use his/her hands if writing. The reader must be able to follow or copy letter shapes in a left to right sequence. These skills, though, are of little use in the process of reading, if the reader is unable to discriminate aurally, the exact sounds the letters represent, and then to link his auditory and visual skills, by matching sounds to letters and letters to sounds.

To do this he/she must know that an abstract symbol can represent a sound, that this symbol stands for that sound anywhere in a word, and that this code is reversible. The reader can then decode symbols into sounds, and encode sounds into symbols. However, once the reader has mastered knowledge of the basic code, the code becomes more advanced. He/she must learn that there is more than one 'picture' for a sound. Consider the /i/ sound in bit, gym and build. He must also learn that there is more than one sound for a picture, or code overlap. Consider the /ie/ sounds in believe and tie.

Adams and Bruck (1993, cited in Ryan & Openshaw, 1996) concluded as a result of reviewing reading research, that while most children enter kindergarten able to easily discriminate individual speech sounds or phonemes, they do not make progress with reading until they can manipulate them in thought and speech.
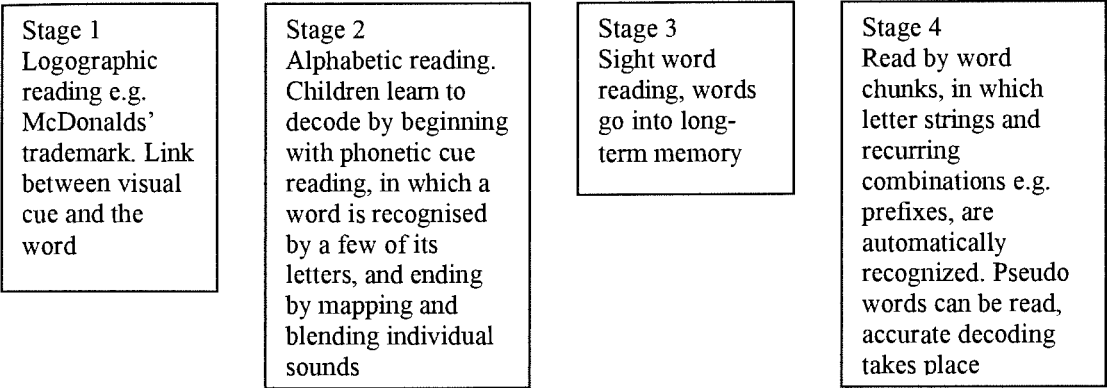
| Stage 1 Logographic reading e.g. McDonalds' trademark. Link between visual cue and the word | Stage 2 Alphabetic reading. Children learn to decode by beginning with phonetic cue reading, in which a word is recognised by a few of its letters, and ending by mapping and blending individual sounds | Stage 3 Sight word reading, words go into long-term memory | Stage 4 Read by word chunks, in which letter strings and recurring combinations e.g. prefixes, are automatically recognized. Pseudo words can be read, accurate decoding takes place |

Figure 2- Developed from Pressley's (1998) version of reading acquisition (cited in Harvey, n.d.)

Several models of reading have aspects in common. For example, Pressley's (1998) model in Harvey (n.d.) shows stage two as the stage where children are beginning to decode (Figure 2). Spear-Swerling and Sternberg's (1998:99-104) version of reading acquisition, (cited in Harvey, n.d.) also shows stage two as the stage where children begin to decode, (Figure 3) whereas Nicholson's (1997) model, shows decoding as starting at the first stage (Figure 1a).

None of these models (Figures 1a, 2 or 3) show the first stage as one where children have yet to achieve alphabetic understanding, yet they have the expectation that this alphabetic understanding is beginning. These models do not make direct reference to the prior skills that a beginning reader needs in order to learn to read and progress through the stages. These are the phonological processing skills. No acknowledgement has been made of the influence of contextual cues in the early stages of these models.

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| Stage one: |
| Visual-cue word recognition, where children have not discovered the alphabetic principle |

| Stage two: |
| Phonetic-cue word recognition where children use some, but not all of the letter information in a word |

| Stage three: |
| Controlled word recognition that is accurate but not automatic |

| Stage four: |
| Automatic word recognition. Readers focus mental resources on understanding text, rather than deciphering words. |

| Stage five: |
| Strategic reading that includes strategies to aid comprehension, such as the use of a dictionary, rereading and reading ahead |

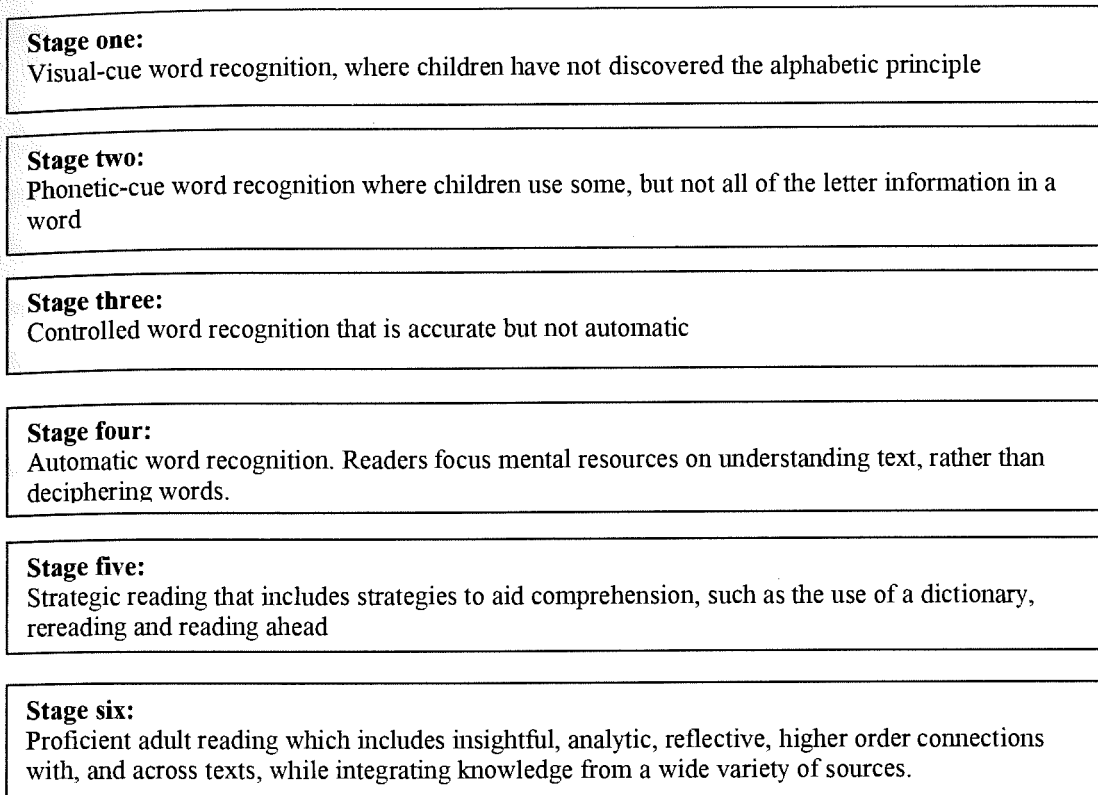| Stage six: |
| Proficient adult reading which includes insightful, analytic, reflective, higher order connections with, and across texts, while integrating knowledge from a wide variety of sources. |

Figure 3 - Developed from Spear-Swerling and Sternberg's (1998, pp. 99-104) version of reading acquisition, (cited in Harvey, n.d.)

All models have specific stages. These different stages of reading acquisition require different strategies of teaching. Moats (2000, p.14) stated that "the most important skill in the beginning stages of reading is the ability to read single words competently, accurately and fluently," and that "letter-to-phoneme knowledge is primarily responsible for driving the development of word-recognition skills" (p. 19). When children are able to read single words, then they can read several single words in sequence, and through this reading, gain meaning from the text.

Many students rely on whole-word memory recognition to retrieve words when reading (Hempenstall, 1996). This method is similar to trying to remember every phone number in a telephone book. Obviously this method is doomed to fail, as the memory hasn't an infinite storage capacity. As texts become more complex, children need strategies other than relying on memory, in order to be able to access unknown words. If children haven't developed other strategies, then they are likely to need reading assistance. This usually becomes obvious after three years at school, when texts often rapidly increase in complexity. Hempenstall (1996) suggested that if it is not discovered until this stage of

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their education, that a child has difficulty in reading, then this child must develop twice as fast as his peers in order to eventually catch up with them.

Considering the skills a beginning reader needs to acquire, and the given definitions of phonological and phonemic awareness, then it would appear that it is necessary for beginning readers to receive instruction in phonological and phonemic awareness, as well as in alphabetic understanding. It would seem, also, that instruction is needed to attend to these skills of reading in a specific, explicit, and overlapping sequence.

Munro (1998, p.16) refers to Ball and Blachman (1988) when stating that "teaching letter-sound correspondences with phonemic awareness is more useful than either phonemic-awareness or phonics teaching only". Letter-sound correspondence teaching alerts children to the alphabetic code.

It would seem sensible, then, that training, which encompasses all of the above skills, within a balanced literacy instruction approach, would be more beneficial to a beginning or remedial reader, than just phonemic awareness training. If, as the author suggested on page three, children who have difficulty in learning to read do decode less effectively than their more successful peers, then for these readers, specific explicit instruction may be needed to gain insight into the alphabetic writing system or code. Key findings from the Progress in International Reading Literacy Study (PIRLS) state that "the spread of scores for New Zealand students was wider than the spread for students in most other countries" (Ministry of Education, 2003). Do the students who score at the lower end of this range need specific explicit instruction with phonological-processing skills?

What does the relationship between phonemic awareness and reading acquisition mean in terms of reading instruction?
The International Reading Association's (1998) position is that phonemic awareness must be taught. The degree to which it is taught, and the method used may be different for different children, but it stresses that it is important that other aspects of a balanced literacy curriculum must not be left out. Interaction with print combined with explicit attention to sound structure in spoken words is suggested as the best method for teaching phonemic awareness, and that more systematic instruction is needed to reduce the number of children who do not achieve phonemic awareness. Adams and Bruck (1993, cited in Ryan &

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Openshaw, 1996) warn that if children are not able to discover the alphabetic principle independently, and are denied explicit instruction, then reading-disability may result.

The International Reading Association cites concerns about possible policies that require teachers to spend specific amounts of time or use specific programmes for phonemic awareness instruction. The Ministry of Education (2003), cites Phillips, McNaughton, and MacDonald (2000, p.18) who state that "... effective teachers use a variety of strategies in an informed way ... What this means is that different instructional activities and forms of guidance are employed, not as a recipe but as an integrated whole, and these are changed and adjusted to suit individual needs".

> There is ... no place for programmes with prescriptive methods and materials or for predetermined, recipe –style literacy activities that claim to fit the needs of all learners. There is no evidence of a single sequence of literacy development. The evidence shows clearly that there are many pathways that lead to the desired goal of learning to read and write. (Thompson, 2003, p. 21)

The National Reading Panel (2000a, 2000b) in the United States of America, reviewed the experimental research on teaching phonics and determined that explicit and systematic phonics is superior to non-systematic or no phonics, but that there is no significant difference in effectiveness among the kinds of systematic phonics instruction" (Cunningham & Cunningham, 2002, Chapter 5).

Hempenstall (1996), in his involvement with the RMIT Bundoora Psychology Clinic in Australia, argues that "a well-constructed, direct instruction phonics program should be the first line of attack", but goes on to cite Adams and Bruck (1993) in suggesting that this could be alongside a whole language programme. McGuinness (1997) strongly advocates a specific programme, Phono-Graphix™.

Hempenstall (1996) when suggesting that a well-constructed direct instruction phonics programme should be the first line of attack, cites Rosenshine (1986) who advocates that the principles of Direct Instruction result in rapid progress, which is essential for children who need reading assistance. Because it takes some time for children to reach a stage of needing reading assistance (or identified as needing this assistance) then conversely, it takes some time to reverse the situation, especially with usual reading instruction programmes. A

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programme that results in rapid progress will result with children reaching age-appropriate levels sooner.

The RMIT Bundoora Psychology Clinic usually recommends Direct Instruction programmes for their clients who are predominantly children experiencing difficulty in learning to read. These programmes have a strong emphasis on developing phonological-processing skills. The Clinic has found that children in Year 3 or above may be likely to be resistant to tasks because of their history of reading difficulty, and may need to develop alternate strategies to overcome this (Hempenstall, 1996).

McGuinness (1998) stated, *"There is only one right way to teach an alphabetic writing system*. The evidence from other research …… suggests that not only is there a right way, but that this right way can be subverted if it is mixed up with wrong ways, such as trying to teach a linguistic-phonetic approach combined with phonics and 'real books'" (p. 221).

McGuinness and McGuinness (1998) in advocating the Phono-Graphix™ programme, argue that the debate needs to move from whether the code is taught to how the code is taught. They state that numerous phonetic methods have failed to teach the code because they don't make the link between the "nature of the code" (alphabetic code) and the "nature of the child" (how children learn). Because children try to make sense of everything they do, they must receive specific instruction from a teacher who is able to make sense of what she is trying to teach, or the children will try to develop their own logic, which will not necessarily be based on sound and relevant understanding.

Cunningham and Cunningham (2002) argue that children need 'cognitive clarity' about what they are learning. This argument would support McGuinness and McGuinness' (1998) call for a teacher who is able to make sense of what she is trying to teach. This teacher would be able to help children gain cognitive clarity through making explicit links between the specific skills and knowledge taught, and their application in the reading process.

The above discussion has focused on the role of phonemic awareness in learning to read. It is important not to lose focus on the purpose of reading, though. As stated earlier, this author believes that the purpose of reading is to gain meaning from text through the information, ideas, and insights and understandings into other peoples and their worlds that are provided in written text.

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Phonemic awareness and alphabetic understanding are foundation skills in order to be able to 'read.' This author strongly agrees with Pressley et al. (2002) when they state that all students need to be taught to read via a balanced reading programme. The specific needs of individuals, dictates the exact balance of any such programme.

Research Question

As stated in the introduction, data gathered and analysed indicated that there was a gap in decoding skills with many children at this author's school. Using information gathered from the tutor of the Phono-Graphix™ programme, and from the principals of other schools who had implemented the programme, and had similar needs met (gap in decoding skills and knowledge) through this implementation, the decision was made to implement Phono-Graphix™ school-wide. This decision was not made, I am embarrassed to admit, on sound research data, but on the recommendations of colleagues and the programme tutor only.

This study aimed to examine the effect of the Phono-Graphix™ programme on the development of phonological-processing skills and alphabetic knowledge, and, because of the need for children to gain meaning from reading, and the interaction and interdependency of word recognition and comprehension, (Gough & Juel, (1991), in Harvey, n.d.) the effect this had on children's reading comprehension.

The study asked the following questions:

1) In what ways does the Phono-Graphix™ programme influence the development of reading ability?

> How does it influence children's ability to decode?
> How does it influence their ability to comprehend?
> How does it alter their perception of themselves as readers?

2) Are there any common characteristics amongst those whose reading ability has been influenced?

Methodology

Participants

The children who participated in this study were in a class of twenty-five Year 3, 4, 5, and 6 children in a school of approximately 110 children ranging from Year 1 to Year 8. Although there were students achieving below, at and above expected reading level in all classrooms, the school had identified a major problem with student's ability to decode, and had made a decision to introduce the programme to all its students.

The parents of the twenty-five students in one class were approached to request permission to use the data that had been gathered as part of the school wide programme implementation. Fourteen parents gave permission.

The participants' school was a Decile* 2 school in a small urban town in New Zealand with an ethnic makeup of 81% Māori, 2% Cook Island Māori and 17% New Zealand European.

English was spoken as the first (and for most, the only) language at home. At the start of the study these children ranged in age from 7 years 7 months to 9 years 9 months, so had had between 2 years 7 months and 4 years 9 months at school.

The children were selected from one class in order to restrict variables, in particular the varying approaches, or methods of teaching reading. This class of children also had a range of abilities and achievement. The participants fitted into three broad groupings; those achieving at expected level, i.e. a reading age** of six months either side of their chronological age, those achieving above, and those achieving below expected level, i.e. a reading age greater than six months above or below chronological age. In this way any influence of the Phono-Graphix programme on the reading ability of under, normal and over achieving children could be identified. It was important to identify if the programme influenced readers other than those achieving below expected level because of the decision to implement it school wide.

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*In New Zealand, schools are placed in a decile according to economic status of families enrolled. Decile 1 schools are centred in areas that are least affluent, Decile 10 schools in areas most affluent.

**For the purposes of this study, reading age is defined as decoding accurately at 96% or greater and comprehending at 80% or greater, using the *PROBE Reading Assessment Kit* (2002).

Design

This is a multiple subject design study. Data from each individual participant was combined and treated as a small group quantitative study. This quantitative data related to the specific phonological-processing and alphabetic skills, and comprehension ability of the children. Qualitative data was gathered through observations, questionnaires, and surveys. Gathering a wide range of data through different approaches allowed some triangulation of data. The author acknowledges her "ignorance" in this research project, and recognises that alternative methods of data collection would have allowed a more reliable result. This is expanded on in the discussion section.

Because the need for improving decoding skills was consistent throughout the school, the programme was implemented school-wide. Having a control group could have made the results more valid, but would have meant that we would have needed to choose some students to miss out on the potential benefit of the programme, and explain this to their parents!

Behavioural and other measures

Tests were conducted of the participant's phonological-processing skills, alphabetic knowledge, and reading comprehension three times during the year. Either the author, or the classroom teacher working with children in a one-to-one situation, conducted these tests. Both the classroom teacher and author took some time to practice working with these tests before administering them. No thought was given to discuss and compare any issues with the administration of the tests before starting.

Children completed a self-assessment survey on their attitude to reading twice during the year. Twice a year the author made observations of the teacher and participants as they were involved in their normal classroom instructional reading programme. These observations focused on the children's reading strategies and behaviours, and the teaching and reinforcing of phonological-processing skills from the teacher. The teacher was issued with a survey of her perception of the Phono-Graphix™ programme later in the year and this was followed up with an informal interview. At the end of the programme implementation period, the author issued parents with a written questionnaire of their child's, and other family members', home reading behaviours.

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The following tests were conducted. The first four tests, the PST, PBT, PMT, and the CKT tests, were all designed by the authors of the Phono-Graphix™ programme, although they are similar to the tests designed by Yopp, (1995). The author designed the PST, SLRT and RT.

Phoneme Segmenting Task: The PST task required children to segment phonemes from words given orally. – e.g. 'dog' is segmented into /d/ /o/ /g/. Difficulty ranged from 3 phonemes to 4 phonemes and then nonsense words of up to 4 phonemes (pim and sept)

Phoneme Blending Task: The PBT task required children to blend together sounds heard, into a word – e.g. /c/ /a/ /t/ is blended into 'cat'. Difficulty increased from words that contained three phonemes (pig) to words that contained 5 phonemes (crunch).

Phoneme Manipulation Task: The PMT required children to say a given word without a particular phoneme – e.g. say 'pim' w/o the /p/. Again this task increased in difficulty from 3 to 4 phoneme words, and from removing an initial phoneme to removing a medial phoneme.

Phoneme Substitution Task: The PST required children to say a word given orally with a phoneme substituted – e.g. change /a/ to /o/ in 'cat' to say /cot/.

Code Knowledge Task: For the CKT, children needed to give an appropriate sound for the 50 given 'sound pictures' or symbols representing those sounds.

Sound/Letter Recognition Task: Children were asked to identify a letter that made a given sound for the SLRT. These letters were both upper and lower case letters.

Rhyming Task: The RT identified three levels of rhyming. At the first level children needed to identify if given pairs of words rhyme, at the second level children needed to identify which of three given words didn't rhyme and at the third level children were asked to give a word that rhymed with one given.

Word Attack and Word Identification Tasks: Students' ability to use their phonological-processing skills was assessed using *Woodcock Reading Mastery Tests-Revised, 1987,* Word Attack and Word Identification subtests. These tests were developed in the United

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States of America. The WA task required children to read nonsense words of increasing difficulty, and the WID task required children to read known words.

These *Woodcock Reading Mastery Tests-Revised,* (1987) Word Attack and Word Identification subtests were the only tests used that were norm referenced, although this norm referencing was undertaken nearly 20 years ago in the United States of America. Hempenstall (1996) discusses findings by Hoover and Gough (1990) Siegel (1993) and Wood and Felton (1994) which suggest that the decoding of non-words is considered the most appropriate measure of phonological recoding, because it provides an indication of the ability to apply phonological-processing skills to the task of decoding print.

Comprehension: To ascertain reading age, all children involved in the study were tested using the *PROBE Reading Assessment Kit* (2002). Children were asked to read texts of progressing difficulty of either fiction or non-fiction, and answer a range of questions that were literal, evaluative, inferential, reorganisational, and reactionary or vocabulary. As a result of this testing, children are given a reading age, which is a combination of decoding at 96% or more accuracy and comprehending at greater than 80% accuracy on a given levelled text.

For the purposes of this study, the author decided that children considered to be achieving above their chronological age were those comprehending 6 months or more above their age and children considered to be low achievers were achieving 6 months or more below their chronological age. This was an arbitrary decision made by the school, following discussion with the teaching staff. It is acknowledged that grouping these students into three broad groups; achieving above, at and below, was based upon student's results in a test that is not norm referenced, and that was administered by either the class teacher or the author.

Other measures included the following:
Attitude: In order to identify if involvement in the programme altered children's perception of themselves as readers, children completed a self-evaluation of their attitude to reading. Children chose one of four faces that best represented their feelings about a number of aspects about reading. This was adapted from an attitude to reading and speaking test developed by the National Educational Monitoring Programme (NEMP) (2000). A comparison was able to be made between the sample and Year 4 New Zealand children.

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Observations: The author conducted two observations of the classroom reading period, one in June and one in November. These observations took place when the teacher was involved working with small groups delivering instructional reading while the rest of the class was working individually or in groups, on set tasks. Observations were made of both the participants and the teacher. The participants were observed to note what strategies they were using when confronted with an unknown word, and to observe their reading behaviours and attitudes while completing set reading activities. The teacher was observed to note if the strategies and skills of Phono-Graphix™ that had been taught in the classroom, were reinforced during instructional reading sessions, and what expectations the teacher had of the children, re the use of these strategies and skills.

Questionnaire/Interview: After nine months of the programme the parents/caregivers of the children involved were asked to complete a questionnaire. This questionnaire gathered data on children's reading behaviours and attitude at home, the reading behaviours of others in the child's home, and general data about the child's age, gender and so on.

The class teacher was given a questionnaire that gathered qualitative data on her impressions of the programme, the influence she perceived it had/had not had to the development of reading for the children in her class, and the differences/changes she perceived she had made to her reading programme as a result of analysing ongoing formative, and summative mid-year data. This was followed up by an informal interview that expanded upon this questionnaire, by requesting oral descriptions of her written responses.

Procedure

In early February, before the programme was implemented, baseline data on all fourteen participants was gathered on the following dependent measures: phonemic awareness tests of segmenting, blending, phoneme manipulation and substitution, and rhyming, alphabetic knowledge skills of code knowledge and sound/letter recognition, the Woodcock Johnston decoding tests of Word Attack and Word Identification, a comprehension test and a reading attitude survey.

Either the class teacher or the author of the study administered the tests. Both the teacher and the author had discussed the administration of the instruments with the tutor for the

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Phono-Graphix™ programme, and had trialled these instruments before administering them with the participants. Attention was paid to ensure children understood the reasons for the testing, and that they felt comfortable in the situation. Because of the range of tests to be administered, care was taken to ensure that each testing occasion was no more than 15-20 minutes duration.

The programme was implemented once this baseline data was gathered, and the implementation continued all year. The children received explicit and specific instruction in segmenting, blending and phoneme manipulation skills and code knowledge through the implementation of the Phono-Graphix™ programme. The implementation of the programme also involved curriculum activities that reinforced the skills and knowledge taught.

During late June and mid-November all tests, except the rhyming, sound-letter recognition and phonemic substitution tests, were repeated. These were not repeated in November because all children had achieved maximum marks in the June retest.

In June and November, observations of the classroom reading period were undertaken. The observer (author) used a tick list with qualifying statements to record what was observed. Observation focused on both the participants in the study and the teacher. The main purpose was to observe what strategies the participants were using when confronted with a reading problem such as an unknown word, and to observe what strategy children used first, whether it was decoding, reading on, re-reading, or any other strategy. Observation also focused on if and how the teacher helped children see the links between the skills and knowledge they had been taught in the Phono-Graphix™ sessions and instructional or other reading activities, and to observe what strategies the participants were encouraged to use.

A written survey, followed up by an informal interview was conducted with the teacher of these children in November. Also in November, parents of the participants were issued with a questionnaire designed to gather data on the participants, and their family's, reading habits.

Description of the programme

As briefly discussed in the introduction, McGuinness and McGuinness (1998) designed the programme as a structured explicit and specific approach to help struggling readers acquire phonological-processing skills and alphabetic code knowledge and understanding.

The general aim of the programme is to improve children's phonological-processing skills in order to reduce the incidence of reading failure. Although designed as a remedial programme, it is appropriate to be delivered to children from the time they are ready for reading instruction, and is also able to be adapted for any level of reading instruction. The programme principally teaches the skills of segmenting and blending, and of phoneme manipulation, along with alphabetic knowledge and understanding. Teaching focuses initially at Basic Code, or CVC (consonant, vowel, consonant) words. As children are taught the skills of segmenting and blending, they are also taught to automatically link the pictures of the sounds with their sounds. This way, they learn the alphabetic code – (approximately 44 sounds and their pictures). The programme is supported by a curriculum, based on the structure of the spelling code and sequenced to match children's developmental level.

This supporting curriculum provides activities which encourage children to make the links between specific skills taught and the use of these in the reading process. These activities utilise the text children are reading, in order to help to reinforce skills and knowledge learnt, and to apply these learnt skills and knowledge. Utilising the text children are using, rather than using highly predictable text only, supports findings that this is more effective and relevant for children as they learn to read (Allington & Woodside-Jiron, 1997; Hiebert, (1999), cited in Cunningham & Cunningham, 2002).

Children are expected to buddy read daily. When buddy reading, children work in pairs, with one child reading out loud, and the other observing. These buddies are reading at a similar level to each other. The observer's task is to check the accuracy of the reader, stopping him when an error occurs if the reader hasn't already stopped and corrected himself. While this practice may not be congruent with practices suggested in reading support material supplied to New Zealand schools; for example "Learner as a Reader" or Effective Literacy Practices" this approach was strongly recommended by the tutor of the Phono-Graphix™ programme who worked with the staff of the school.

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Phono-Graphix™ stresses the importance of accurate reading. The tutor suggested that this is to help children attend to every phoneme in a word. This practice and application of skills in meaningful context increases children's cognitive clarity, and thus increases their "feeling of being capable of learning" (Cunningham et al. 2002, Chapter 5). When children feel capable of learning they develop self-confidence and feel engaged with the task (Cunningham et al. 2002).

Another activity is sound searching. Children search for a particular 'sound' as they are reading text, and record the word, noting the specific pictures of this sound. In this way they learn to recognise the sound in realistic situations, and make the link between sounds taught in words in isolation and real words read in text. They also learn to recognise the different pictures there are for the same sound, for example /o/, /oa/, /ow/, /o-e/, /oe/, /ough/.

A behaviourist view has been used to develop the programme, where direct instruction is applied to teach piece-by-piece, specific skills. Once students learn simple skills, they can apply these as the learning becomes more complex. Thus students, for example, learn to identify specific 'pictures of sound' or symbols, learn to identify these in known words, and then learn to use this knowledge to decode unknown words. McGuinness and McGuinness (1998) suggest that reading, like all skills, needs to be taught, from the simple parts to the complex whole.

The Phono-Graphix™ programme is based on four discoveries or principles.

> The way the writing system is designed determines how it should be taught.
> Children must be trained to hear individual sounds and be able to disconnect sounds in words in order to use an alphabetic writing system.
> The English alphabet code encompasses four systems of sound-to-letter mapping logic: reversibility (one-to-one mapping) and propositional logic (one-to-one (two), one-to-many, and many-to-one mapping)
> Learning to read and spell proceeds rapidly for all children if the sequence of reading and spelling instruction is compatible with the logic of the alphabet and with the child's linguistic and logical development.
>
> (McGuinness, 1998, p. xiii)
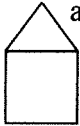
McGuinness (1998) goes on to state that neither the whole language or phonics methods of teaching reading are based on these principles or discoveries.

Using the work of Piaget and Flavell (1997), McGuinness and McGuinness (1998) discussed the 'nature of the child'. They believe that children cannot perform propositional logic, which they would need to be able to do, to utilise a rule such as 'when two vowels go walking the first one does the talking'.

They state that children can assess and reuse visual figures. A child can identify ☐ as a square, and △ as a triangle, and does not need a rule to identify ⌂ as a house.

They believe that children learn better if the information is in meaningful context rather than by rote drill, so children shouldn't learn the code with songs, animal shapes and so on. They believe that the nature of the child dictates that children need explicit instruction.

Classroom reading programme

Although the programme was implemented throughout the school, because the data for this study was gathered specifically from the participants in one classroom, the author will describe the reading programme in this classroom only.

For the first six months of the intervention, the children continued to participate in their usual classroom instructional reading programme. The normal classroom instructional reading programme consisted of one hour sessions four to five times a week. During this hour children took part in some of the following: specific guided reading instruction, comprehension and vocabulary activities, further reading, newspaper study, or silent reading. The class was divided into reading groups of similar levels. The 'reading age' was the main decider of what children were in what group. The skills of Phono-Graphix™ were also taught for approximately 15 minutes during this hour.

As a result of analysis and discussion of data in June, changes were made to the reading programme. During the first six months of the year, the teacher had been teaching Phono-Graphix™ skills for 15 minutes during the daily hour's reading session. This reduced the

time available for teaching guided instructional reading to the groups in her classroom. Changes made to the programme were substantial. The teacher doubled the amount of time dedicated to teaching reading, from one hour to two hours daily. The revised programme saw one hour of guided instructional reading with follow-up activities, working specifically with 1-2 groups per day. A second hour consisting of three 20 minute sessions for Phono-Graphix™ teaching, buddy reading, and reading by the teacher to the children was added to the reading programme.

Thus, as a result of the changes made mid-year, the 'normal' reading programme was resumed within the first hour of reading, plus an additional hour of reading was added which allowed time for activities considered vital when implementing Phono-Graphix™.

It is interesting to note that the additional hour for reading was implemented across the school principally because the teachers felt that their ability to deliver a quality instructional guided reading programme was being compromised. What is of greater interest, though, is that analysis of school-wide data mid-year, indicated that the students in the classroom being studied made significantly less gain with reading comprehension, than did the students in the other classrooms.

During the first half of the year, the lower reading group in this classroom received guided reading instruction twice a week, and the other reading groups received specific guided reading instruction once a week. The higher achieving group was given independent research activities as follow up to reading instruction. During the second half of the year, the focus for guided reading instruction for all children was on how to gather information and ideas from text using inferential and reorganisational skills, and they were given activities to practise these skills.

Phonological-processing skills and alphabetic code instruction
Each day the class had 15 minutes (first 6 months) or 20 minutes (second 6 months) direct instruction on phonological-processing skills, mainly segmenting and blending, and alphabetic knowledge and understanding. The instruction started at the basic code level (consonant-vowel-consonant - CVC words) and worked through until by the end of the year

all levels had been covered, (advanced code, and multi syllables) An overview of the levels and their progressions is included in Appendix A.

As prescribed in the manual, each lesson, in the initial stages, would encourage the links between aural and visual skills by word building, and then mapping the word built ten times. Word building consisted of the letters of a word being written on the board in a muddled order, and then the children being asked what sound they heard first, second and so on in a word. As children said the sound, its visual representation was erased from the board and written again in the correct order. Once all sounds were written up, children would blend the sounds. Children would then map the word. Mapping consisted of the child saying each individual sound as he was writing it, and again blending these sounds together at the end. Each word was mapped 10 times. During these sessions children were also taught and practised how to manipulate phonemes.

As the code became more advanced, children also completed other activities during this time. The focus on these activities was to develop automaticity with the code. An overview of activities has been included in Appendix B. See also, the description of the programme.

Intervention also included daily 20-minute buddy reading sessions. Children from the same classroom, and reading at a similar level as their buddy worked in pairs to read to each other for 10 minutes each. The goal was to read a passage accurately. The buddy's role was to check the accuracy, and stop the reader, demanding a correction, or help the reader to make the correction, if the reader hadn't self corrected.

Homework was set each night. Children were expected to map 10-15 words, 10 times each, and read aloud to a family member. At times other activities, such as sound searching, were expected. (See Appendix B)

The tutor provided ongoing support and guidance by working in each classroom once a week for the first six weeks and then, as teachers became more and more confident with teaching the skills, fortnightly, stretching to monthly as the year progressed. While in each classroom, the tutor would demonstrate/model how to deliver particular aspects of the programme, or work as a trouble-shooter to help the teacher address specific individual issues for children or the teacher.

Results Analysis/Synthesis

Most of the discussion and analysis of data that follows looks at a general summary or average of the three groups' results. Results of specific participants are also discussed. There were three children in the group identified as underachieving at the outset of the study. These children are in Group A, and are identified as A1, A2, and A3. Six children were identified as achieving above expected level. These children are in Group B, and identified as B1, B2, B3, and so on. The five children achieving at their expected level were in Group C, and identified as C1, and so on.

Phonological awareness skills:

After initial testing in February, there was a wide range of results of the three main phonological awareness skills; blending, segmenting and phoneme manipulation. The wide range was consistent across the study group regardless whether children were achieving at, below or above their chronological age for reading. During the initial testing many children had difficulty with segmenting words such as /stop/ where children would identify /st/ as a phoneme.

Most of the difficulty with segmenting was the result of children identifying the onset and rime, not each specific phoneme in a word, for example /c/ and /at/ rather than /c/ /a/ /t/. The participants were better able to manipulate phonemes that required them to remove the initial phoneme rather than medial or end phonemes, and were more competent with blending CVC words rather than CVCC or CCVC words.

By the end of the data-gathering period (Feb – Nov) all but one participant had attained the maximum possible when tested for the phonological-processing skills; blending, segmenting, and phoneme manipulation. Most attained these results during the first 4 months of the programme. The words used for testing the skills of blending, segmenting and phoneme manipulation were either CVC or CVCC/CCVC real or nonsense words. Of the three author generated tasks; phoneme substitution task (PST), sound/letter recognition task (SLRT) and rhyming task (RT); most children had little difficulty with the rhyming task, a small number confused /a/ and /u/, and /e/ and /i/ with the SLRT and also got confused when asked to substitute /a/ and /u/, and /e/ and /i/ on the PST task. (See Table 1 in Appendix C)

When asked to orally manipulate phonemes, in particular substitute them, children tended to confuse vowel sounds, those of 'u' and 'a' in particular. So, if a child was asked to change the /o/ in cot to /u/, they would then verbally give the word cat, instead of cut. It would seem that they mentally transferred from using their knowledge of sounds, to using their 'knowledge' of the visual representations of the sounds they heard. Once the programme was implemented, the development of segmenting and blending, using written symbols, was hindered until the confusions with vowel sounds were rectified. Alphabetic knowledge was vital for children to move through the levels or stages of the programme.

Comparison February/November Phonological-Processing Skills Data

Child/ Ability Groups	Blending / 15		Segmenting / 63		Phoneme Manipulation / 10	
	Feb	Nov	Feb	Nov	Feb	Nov
Participants Achieving Below Expected Level						
A1 Maori/Female	10	15	4	63	4	10
A2 Maori/Male	12	15	8	63	9	10
A3 Ck Island/Male	4	14	14	63	8	10
Average Score	8.6	*14.6*	8.6	*63*	7	*10*
Participants Achieving Above Expected Level						
B1 Maori/Female	11	15	28	63	6	10
B2 Maori/Female	4	15	25	63	3	10
B3 Maori/Male	15	15	14	63	7	10
B4 Maori/Male	15	15	22	63	10	10
B5 Maori/Male	11	15	52	63	9	10
B6 NZE/Male	15	15	24	63	9	10
Average Score	11.8	15	27.5	63	7.3	10
Participants Achieving At Expected Level						
C1 Maori/Female	7	15	20	63	10	10
C2 Maori/Female	14	15	2	63	10	10
C3 Maori/Male	12	15	39	63	8	10
C4 Maori/Male	11	15	3	63	8	10
C5 Maori/Male	15	15	19	63	8	10
Average Score	11.8	15	16.6	63	8.8	10

Table 1

Only two children didn't attain maximum results when retested in June. B2 had the lowest base line data for blending and phoneme manipulation. C1 had a low base line score for blending. A1, C2, and C4 all had very low base line scores for segmenting. A1 also had a low base line score for phoneme manipulation. The tutor of the programme had informed us that students who struggled to blend sounds together to say a word were potentially of most concern. She stated that it is easier for a student to hear individual sounds, than it is to blend them together. (See Table 1)

Word Attack and Word Identification Data:

Child Ability Group	Word Attack Score & age			Word I.D. Score & age		
Below	Feb	Nov	Increase in score	Feb	Nov	Increase in score
A 1	19	33	14	46	62	16
Māori	8y 1m	12y 4m	4y 3 m	7y 10m	9y 4m	1y 6m
A 2	25	41	16	62	80	18
Māori	9y 1m	18y 6m	9y 5m	9y 4m	11y10	2y 6m
A 3	25	40	15	62	74	12
Cook Island	9y 1m	18y 6m	9y 5m	9y 4m	10y11	1y 7m
Average	23	38	15	56.6	72	15.3
			7y 8m			1y 10m
Above						
B 1	27	39	12	60	77	17
Māori	9y 8m	18y6m	8y 10m	9y 2m	11y4m	2y 2m
B 2	13	39	26	55	68	13
Māori	7y 8m	18y6m	10y 10m	8y 7m	9y10m	1y 3m
B 3	35	45	10	77	96	19
Māori	13y 11m	18y 6m	4y 7m	11y 4m	18y 8m	7y 4m
B 4	32	41	9	66	87	21
Māori	11y 8m	18y 6m	6y 10m	9y 10m	13y 3m	3y 5m
B 5	31	44	13	69	90	21
Māori	11y 4m	18y 6m	7y 2m	10y 2m	14y 1m	3y 11m
B 6	30	40	10	72	91	19
NZ European	10y 9m	18y 6m	9y 9m	10y 7m	14y 7m	4y
Average	31	41.3	13.3	66.5	84.8	18.3
	28 including B2s results		8y 1m			3y 7m
At						
C1	15	38	23	54	72	18
Māori	7y 9m	17y	9y 3m	8y 6m	10y 7m	2y 1m
C 2	28	39	11	65	77	12
Māori	9y 11m	18y 6m	8y 7m	9y 8m	11y 4m	1y 8m
C 3	22	38	16	59	78	19
Māori	8y 7m	17y	8y 5m	9y	11y 6m	2y 6m
C 4	19	32	13	58	68	10
Māori	8y 1m	11y 8m	3y 7m	8y 11m	9y 10m	11m
C 5	24	41	17	69	83	14
Māori	8y 10m	18y 6m	9y 8m	10y 2m	12y 3m	2y 1m
Average	21.6	37.6	16	61	75.6	14.6
			8y			1y 9m

Table 2

Word attack and word identification testing

The word attack and word identification testing (Woodcock Reading Mastery Tests-Revised 1987) results showed improvement from February to November. Word attack is using the skills of segmenting and blending to 'say' a non-word. Word identification is the automatic decoding of 'real' words. These tests provide an indication of a child's ability to apply phonological-processing skills to the task of decoding print (Hempenstall, 1996).

There was a wide range of achievement growth over the implementation period, in word attack: between 3 years 7 months and 10 years 10 months, and for word identification: between 11 months and 7 years 4 months. It is important to note that because the maximum score possible for word attack was 18 years 6 months, and some children had already achieved this during the first testing period, progress wasn't clear during the second testing period for these students.

It is interesting to note that Group B had significantly higher base line scores with both word attack and word identification. The base line scores for Groups A and C were similar. Final scores with word attack show similar average results for the three groups, although Group B maintains a higher average. Consideration of the method of scoring and the relationship between raw score and given ages is necessary. Yet Group B maintained a gap in scoring from the other two Groups with both base line and final scores with word identification.

B2 made the biggest increase with word attack and one of the smallest gains in word identification. B3 and B4 made the least gains (score wise) with word attack, and larger gains with word identification. C4 made the least gains with both word attack and word identification. It is difficult to compare increase or otherwise, in results because of the nature of scoring with these two tests.

There was no consistent corresponding improvement between word attack and word identification. Children, who made greater gains than average with word attack, didn't necessarily make similar gains with word identification. Of the three groups, Group B improved least with word attack, (using the score as an indication) yet increased most with word identification. There was the greatest range in testing results for both word attack and word identification with students in Group B.

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Refer to Appendix C, Table 2 for a comparison between phonological-processing skills and word attack and word identification changes from initial to final testing. A1, B2, and C1 were low in most areas at initial testing time. B3, B4, B5, and B6, scored relatively high in most areas at initial testing.

Code knowledge:

The participants' knowledge of code increased, with the greatest increase, for most students, from February to June. Apart from some 'special' sounds such as 'xious' as in anxious, the 50 pictures of sounds cover the sounds in most words in English usage. Children made greater gains in the first testing period with code and word attack, and a greater gain during the second testing period with word identification. Both the word attack and word identification tests present words in isolation.   (See Appendix C, Tables 3 & 4)
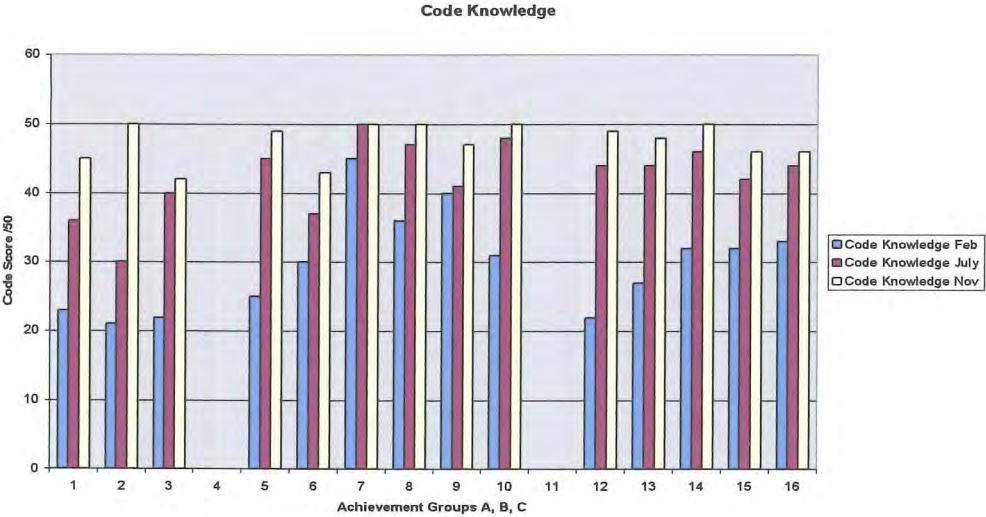
Chart 1

Comprehension:

Comprehension ages, as measured by administering the Probe test, improved during the testing period. They improved from an average 9.53 years in February, to 10.10 years in June, and to 11.07 years in November. The average improvement in comprehension from February to November was 1.54 years. The 3 children in Group A (low achieving) all gained 1.5 years in comprehension ability. Group B (achieving above) children gained between 1-2 years, with the average 1.3 years. Group C (achieving at) children gained from 1.5 – 2.5 years, with an average of 1.8 years. Although a school year is 10 – 11 months, i.e. from February to mid-December, it is expected that all children would gain a year in reading level within that period.

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The gains in reading comprehension for the second testing period of 5 months was greater than for the first testing period of 4 months, as shown in Table 4 in Appendix C. The lower achieving group made greater gains with comprehension during the first period, whereas both the higher and average achieving groups made greater progress during the second period.

There was no consistency between the groups' achievement with comprehension, word attack and word identification. For example Group B increased least on both comprehension and word attack, yet increased most with word identification. (See Table 2 and Chart 2).

Comprehension Gains with February Chronological Age
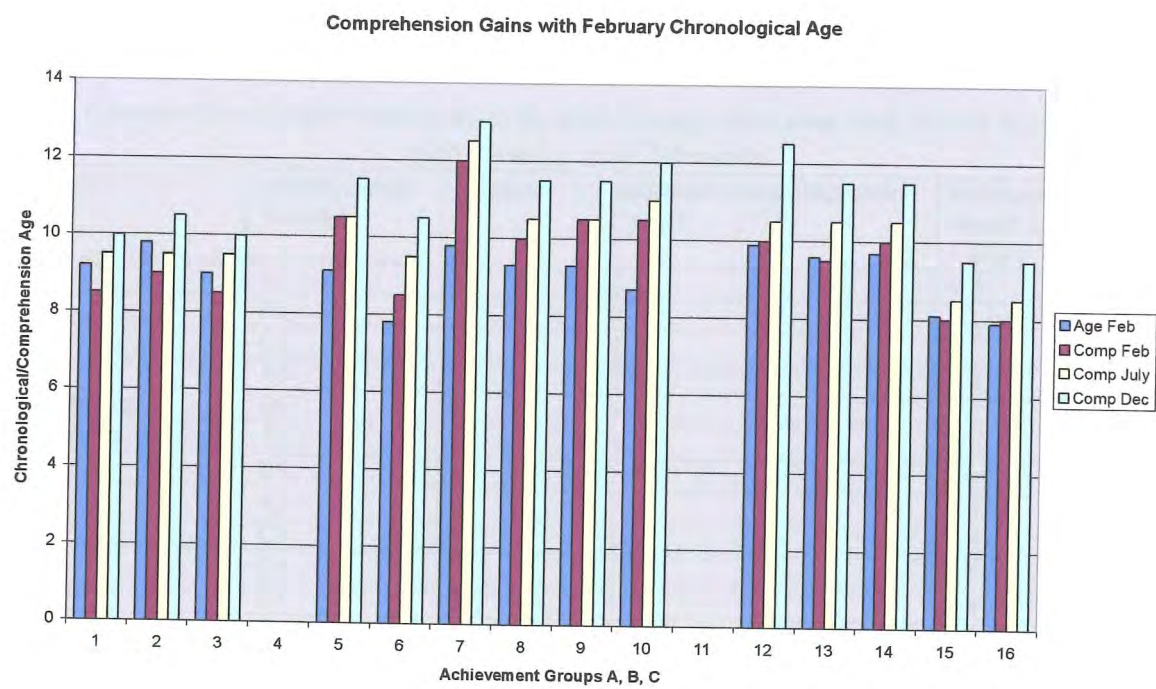
Chart 2

Percentage of Children achieving in each ability group

Changes in % of children achieving in each group		February	November
Achieving below	% of children	21.4%	-----
	average reading age below	7 months	-----
	number of children	3/14	0/14
Achieving above	% of children	42.85%	71.42%
	average reading age above	14 months	18.1 months
	number of children	6/14	10/14
Achieving at	% of children	35.71%	28.57%
	average reading age at	1.8 months	.666 months
	number of children	5/14	4/14

Table 3

At the beginning of the study, 21.4% of the participants were reading 6 – 8 months below their chronological age, and 42.85% were reading 6 – 26 months above their chronological age. At the end of the study 71.42% of the participants were achieving above their chronological age for reading comprehension, (9 - 30 months) and 28.47% of the study were achieving at their chronological age using the Probe test.

Three Māori girls were most successful at raising their achievement with comprehension. Five of the fourteen children involved in the study were girls. The average increase in comprehension ability was 1.53 years. The girls' (all Māori) comprehension increased on average by 1.8 years, and the boys by an average of 1.38 years. This was during a period of 10 months. There appears to be no direct link between increase in word attack and comprehension growth.

Comparison Achievement growth with Comprehension and Word Attack with Gender and Ethnicity

Ethnicity	Achievement Group	Gender	Increase Comprehension / years	Increase Word Attack / years
Māori	C1	F	2.5	9.3
Māori	B2	F	2	10.10
Māori	C2	F	2	8.7
Māori	A1	F	1.5	4.3
NZ European	B6	M	1.5	9.9
Cook Island	A3	M	1.5	9.5
Māori	B4	M	1.5	6.10
Māori	A2	M	1.5	9.5
Māori	C3	M	1.5	8.5
Māori	C4	M	1.5	3.7
Māori	C5	M	1.5	9.8
Māori	B5	M	1	7.2
Māori	B3	M	1	4.7
Māori	B1	F	1	8.10

Table 4

Of potential significant interest is the rate in achievement growth related to ethnicity. 12 of the 14 students involved in this study were Māori. The average rise in reading comprehension achievement with these Māori students was 1.54 years, within a 10-month period. Remember that it is expected that all children would gain 12 months within this period.

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Observations:

During observations completed in June, it was noted that there was a discrepancy between what children did when confronted with an unknown word when buddy reading, and when reading in instructional groups. The skills of the buddy and/or the conscientiousness of the reader affected whether the child applied his decoding skills during buddy reading. (See Appendix C Table 5)

Observations completed during the first half of the year revealed that when children were asked to read a passage for a specific purpose, e.g. for evidence to support their answer when questioned, the teacher often allowed group members to provide a word for a child who had difficulty with automatically reading this word, before the child had time to attempt to decode it. The second half-year observations showed that group members would attempt these words silently to themselves, and provide support only when asked. It was noticeable that the children who conscientiously followed the "rules" of buddy reading were applying the skills of decoding more consistently than others. (See Appendix C, Table 6)

Children were more likely to use letter and word information to decode as the first attempt at reading an unknown word in November than in June. There was improvement in their word-level strategies. They were more attentive to all phonemes, rather than just to the initial and/or final phonemes. There was a need for the children to be aware of the need to manipulate phonemes when a picture could represent more than one sound, for example /ow/ in allow, /g/ in rigid, or /i/ in slipped. Children tended to repeat their initial decoding attempt instead of manipulating or substituting phonemes, which suggests that they were not using the context of the text to support their decisions of which strategy to use.

Children were often unable to make the links between sounds they knew in familiar words with the same sounds in unfamiliar words, for example /eir/ in their and weird, /ur/ in fur and hurdle.

Attitude to reading:

At the beginning of the data-gathering period, the children completed a self-evaluation of their perception of their reading ability and attitude. This self-evaluation was repeated in November.

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Children selected one of four faces, smiley, half smile, half sad face, and sad face. For this analysis, results from the first two faces were combined and seen as positive, and the last two faces combined to give negative results. Positive results only, are shown. This test was adapted from an attitude to reading and speaking test developed by the National Educational Monitoring Programme (NEMP) (2000). Because of this, a comparison could be made between the sample and Year 4 New Zealand children.

Generally, this sample of children is positive about reading at school, and about their ability to read, and believe they are good at reading. They scored higher in these areas than their New Zealand peers. They are less likely to enjoy receiving a book as a gift or going to the library.

Reading Self Reflection	NZ Year 4 Comparison 2000	Feb	Nov
How much do you like reading at school?	85%	96%	95%
How good are you at reading?	89%	91%	95%
How good does your teacher think you are at reading?	69%	74%	86%
How good does your Mum or Dad think you are at reading?	87%	91%	85%
How much do you like reading in your own time	84%	74%	82%
How do you feel about getting a book for a present?	91%	87%	81%
How do you feel about going to the library?	94%	87%	91%
How do you feel about how well you read?	90%	96%	82%

Table 5

Interesting changes in reading beliefs from February to November are the rise in their perception of their reading ability, their perception of how good they think their teacher thinks they are at reading, and their enjoyment of reading in their own time. Yet they perceive that their parents' perception of their reading ability isn't as high, and they also believe that they can be better than they are at reading. It would seem, then, that after a period of Phono-Graphix instruction, that children are positive about their reading ability, yet perceive that their reading can still improve. It would be interesting to find out if children's cognitive clarity about the reading process has developed, and if this has resulted in a less positive perception of their ability to read.

Common reading characteristics of students:

In November, all parents were asked to complete a questionnaire about their child's reading habits and attitude towards reading. Nine of the fourteen questionnaires were returned.

Parents indicated that six children were now more independent with attempting to decode unknown words. This perception by parents is reinforced with the observations done by the author of this study.

Six of these children receive substantial support and guidance with their homework. (Only B 1 would be expected to complete homework tasks independently) The school expected students to spend approximately 10 minutes each night in mapping words, and 10 – 15 minutes reading aloud to a parent or other adult. As well as this, children may have been asked to spend time sound searching or completing other tasks.

Reading Characteristics – Home Observations

Child/ Group	Increase Rdg Age	Change in strategies	Change in attitude
C 1 Female Māori	2.5	Sounds out words more	Enjoys being read to, more confident
B 2 Female Māori	2	Tries to sound out words a lot, but still guesses	More interested in reading, especially other genre
A 2 Male Ck Island	1.5	Changed from asking for help to working words out himself	Reads more because of type of homework
B 6 Male NZE	1.5	Tries to sound out words first, then checks	
C 3 Male Māori	1.5	Notices own mistakes more, stops when silent reading, and sounds words out	Reads far more challenging text, as reading improved, interest increased
C 4 Male Māori	1.5	Asks first before attempting himself	Is reading harder books than brother was at same age
B 1 Female Māori	1	Tries more now, rather than giving up	
B 3 Male Māori	1		Improvement in reading and understanding

Table 6

Table 7 below, shows an inconsistency between the time a child spent practising reading activities at home, and their increase in reading ability, as indicated by comprehension level. Parents mentioned that both B 2 and C 4 either still guess or still ask for help when confronted with an unknown word. Both these two children spent less time on mapping than did their peers.

All children are read to regularly, at least twice a week. Only C 3 has no family members who read regularly. All but B 1 watch T.V. for 1-3 hours a day, usually children's programmes and documentaries, and if they use the computer or Play Station their time is restricted.

All parents indicated that reading is either important or very important to their children.

Home Reading Habits

Child	Increase in Comp /years	Time spent Mapping daily	Time spent reading aloud daily	Time spent reading silently (to self) daily	How often read to at home	Who reads to child
C 1 Female Māori	2.5	15 mins	5 mins	30 mins (varies)	Daily	Mother
B 2 Female Māori	2	10 mins	10 mins	15 mins	1-2 week	Mother Father
C 2 Female Māori	2	15 mins	20 mins	30 mins	3-5 times a week	Mother Father
A 2 Male Māori	1.5	15 mins	10 mins	30 mins	1-2 times a week	Mother Father Grand parent
B 6 Male NZ European	1.5	15 mins		45 mins	1-2 times a week	Mother Father
C 3 Male Māori	1.5	15 mins	15mins	45 mins	3-5 times a week	Father
C 4 Male Māori	1.5	5 mins	10 mins	30 mins	1-2 times a week	Mother Father
B 1 Female Māori	1		10 mins	30 mins	1-2 times a week	Grand parent
B 3 Male Māori	1	10 mins		30 mins	1-2 times a week	Father
Average time spent		**12.5 mins**	**11.42 mins**	**31 mins**		

Table 7

The two children from these nine who have made least gains (one year) in reading comprehension are both achieving above their chronological age. B 1 receives the least support from home. B 3 had the highest results at the time of initial testing. The tutor commented that while it is necessary to have high expectations of children's achievement in reading, that conversely, children of 8 or 9 or … years have generally not had the

experiences, maturity or intellectual understanding that would enable them to fully comprehend text at a much higher level. Thus, a one-year's growth in reading comprehension within a 10 month timeframe, maintaining achievement above expected level may be a satisfactory outcome, when one considers the increasing complexity of text.

Individual students' data

All of the above results have tended to look at results using group data. It is necessary to see if there are any common characteristics amongst the individuals who have either achieved particularly well, or who have not made as many gains as their peers. I analysed the data from the three students who made most gains and the three students who made least gains in reading comprehension during the implementation period. It is important to note that all these students made satisfactory growth in reading during the implementation period. This data can be viewed in Appendix C, Tables 8 & 9.

The three students who improved most during the year (using the Probe reading comprehension test), all made greater gains in the second testing period with word attack. These gains were significant; 8 years 7 months, 9 years 3 months and 11 years 2 months. They were all consistent with mapping and reading homework, and were read to often. C1 made significant gains in both reading comprehension (2 years) and word attack (7 years) in the second implementation period.

Three students made less growth with reading comprehension than their peers, although still satisfactory at one year within a 10 month period. Two of these students made no gains in reading comprehension in the first implementation period. All three increased their word identification score considerably; 2 years 2 months, 3 years 11 months, and 7 years 4 months, as well as their word attack score; 8 years 10 months, 4 years 6 months, (this child had achieved maximum score by June) and 7 years 2 months. These three students were already achieving with reading comprehension, above their comparative chronological age at the beginning of the implementation period. B1 was achieving 7 months above, B3 2 years 4 months above, and B5 1 year 2 months above. The intervention was not focused on comprehension, but the teacher did make changes to her reading programme which affected her instructional programme.

Also interesting here is B5 who got 40 out of 50 at initial Code Knowledge testing, and 52 out of 63 for the initial segmenting testing. Both these scores are significantly above other results. B3 knew 45 of the 50 Code at initial testing.

Teacher's perception of the Phono-Graphix™ programme:

In November, the teacher involved with this sample of children was asked to complete a written questionnaire. (see Table 8) The author also had an informal discussion with the teacher about her comments in the questionnaire, and undertook informal observations and discussions during the year.

At the end of the first implementation period, the teacher had stated in an informal conversation with the author that the children found the repetitiveness of Phono-Graphix™ activities 'boring', and because they were not enthusiastic, she often lost enthusiasm for teaching it. This was compounded by the fact that she had a wide range of ages, abilities and behaviour in her classroom. The data gathered and analysed school wide in June indicated that the students in this classroom had made fewer gains in reading comprehension than the students in any other class in the school. This was sufficient for the teacher to refocus on teaching the skills of both phonological-processing and comprehension. The tutor for the Phono-Graphix™ programme then spent time with the teacher, suggesting new approaches and activities, in order to help her maintain the momentum for teaching phonological-processing skills. The teacher also made other changes to her instructional reading programme. (See classroom reading programme description)

The teacher and the author had several informal discussions about the value or otherwise of the programme. The teacher was not fully convinced in the value of the programme. She stated, "Phono-Graphix™ has certainly made a difference to some students' reading, but I believe it is just one part of many reading programme changes that have contributed to reading age improvements".

During the period immediately before and during the implementation, most professional development the teacher received was geared around how to implement the programme. The teacher was a recent trainee, and had been teaching for one year at the beginning of the study. She reported that the pre-service training she received for the teaching of reading

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contained only brief references to teaching 'phonics'. Most theoretical professional development during her pre-service time, focused on the 'top down' approach to teaching reading. Most instruction related to how to teach strategies, such as re-reading or questioning, and approaches such as instructional reading, and shared reading.

Consequently this teacher had limited knowledge of phonological-processing skills and their place in the reading process. This aspect of a teachers training is worthy of a fuller investigation. The author's experiences would suggest that this is the case regardless of the experience of teachers in many situations.

Questions and the teacher's responses at end of Phono-Graphix™ programme implementation period.

What do you see are the advantages of the Phono-Graphix™ programme?	Gives students the skills they need to decode unknown words
What do you see are the disadvantages of the Phono-Graphix™ programme?	Very difficult to cater for new students Whole class teaching (of specific sounds, at specific level) means some are working above or below the level they should be
What, if anything, have you observed about the readers in your classroom since you have implemented Phono-Graphix™?	More willing to attempt unknown words
As a consequence of teaching children the specific skills of the Phono-Graphix™ programme, have you noticed the influence of Phono-Graphix™ in any other aspect of your classroom, either through what you do, or what the children do?	Has an influence on children's writing
Apart for the specific Phono-Graphix™ programme in your classroom, have any other aspects of your reading programme changed in any way, for example your approach to teaching reading?	Yes, much more detailed specific questioning during guided reading, and reading worksheets on inference and reorganization skills
Are there any other comments you wish to make?	Phono-Graphix™ has certainly made a difference to some students' reading, but I believe it is just one part of many reading programme changes that have contributed to reading age improvements.

Table 8

Results summary

In summary then, the students in this study showed that their reading ability (both phonological-processing and comprehension skills) was developed during the implementation period of the Phono-Graphix™ programme, but there are many questions about the causes of this development.

Discussion

As an inexperienced researcher, and as a principal of students who needed to raise their achievement in reading, this research study has raised one overwhelming concern with me. This is the absolute necessity for teachers to have a micro-knowledge of all the skills a reader needs to be taught within the reading process. For example, it is not enough to know that a reader needs development with the skills of decoding. The teacher must know what skills and knowledge are necessary for decoding, what specific gaps the reader has with these skills and knowledge, and then have sufficient knowledge of the learner to know how best to teach these skills and knowledge. The teacher must have this micro-knowledge of every skill necessary for children to read.

What part does a teacher's beliefs and prior training have on the success of a programme or approach?

The author believes, as a result of discussions with the teacher, that even though ongoing professional development was provided to enable the teacher to develop a theoretical and practical understanding of the role phonological-processing skills play in learning to read, and in how to teach these skills through implementing Phono-Graphix™, that the teacher was not committed to the value of the programme. It was only when school wide data was compared on a class-by-class basis half way through the implementation period, showing her class to have gained the least, that the teacher increased her efforts to explicitly and specifically teach reading skills.

This raises questions about what training pre-service teachers receive for the teaching of reading. The International Reading Association (1998) suggests that interaction with print combined with explicit attention to sound structure in spoken words is the best method for teaching phonemic awareness, and that more systematic instruction is needed to reduce the number of children who do not achieve phonemic awareness, but stresses that it is important that other aspects of a balanced literacy curriculum must not be left out.

New Zealand is a proponent of the 'whole language' approach to teaching reading. The discussion the author had with the teacher about the training she received for the teaching of reading from her pre-service provider, suggests this facility may still focus on the 'whole language' approach.

Pressley et al. (2002) discuss the need for balanced literacy instruction. If teachers don't know what they don't know, then how can they implement a balanced literacy programme?

The relationship between the commitment or otherwise to a/the programme or necessity for teaching the phonological-processing skills by educators and the resultant development of skills would be worthy of investigation, as would the relationship between pre-service programmes and teachers' ability or willingness to use specific approaches to teaching reading. Teachers' familiarity of suggested practices with teaching phonological-processing skills as written in support material such as "Ready to Read' and 'Effective Literacy' is worth consideration also.

Experience the author has developed since undergoing this research project has led her to believe that if a teacher has not got the micro-knowledge of the specific skills, knowledge and understanding that a reader needs to be able to learn to read, then experience with the professional learning that goes hand in hand with the implementation of any programme designed to teach children these skills and knowledge may be a necessary way for teachers to develop this micro-knowledge. Once they have this, then they will be in a position of adapting any such programme or approach in such a way as to help meet specific student's needs.

Phonological-processing skills and comprehension growth

At the end of the 10-month implementation period, the participants had developed their phonological-processing skills and their ability to comprehend. But improvement or otherwise in the specific skills and aspects of reading tested in this study are insufficient in themselves to indicate if the implementation of the Phono-Graphix™ programme is solely responsible for the development of these skills, because of changes the teacher made to other aspects of her reading programme during the implementation period.
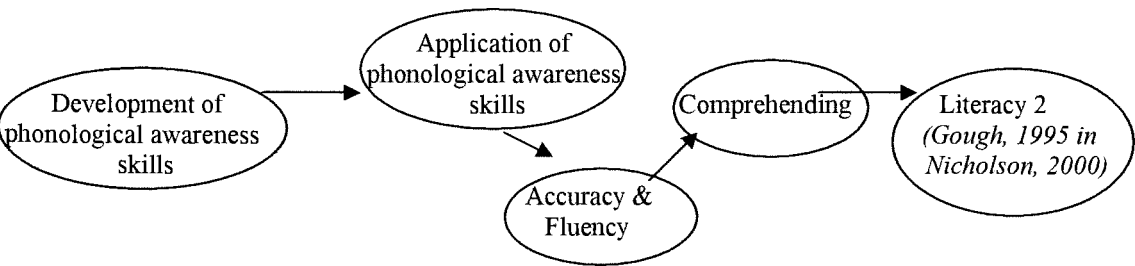

Figure 4- The Literacy Process

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The participants developed their phonological-processing skills, and applied these successfully as indicated through the Woodcock-Johnson word attack and word identification test results. Phonological-processing skills must be able to be applied to meaningful situations where children need to decode words; i.e. reading text.

The ability to decode affects the ability to comprehend text read. The purpose of reading is to achieve Literacy 2 (Gough (1995), as cited in Nicholson, 2000) which is to access and process ideas and issues from text, and to think critically. The question is; did the explicit, specific teaching of the phonological-processing skills, and the supporting curriculum, result in improved phonological-processing skills only, or also in improved comprehension? Or was the improvement in comprehension a result of other interventions, or a combination of both?

At the beginning of the implementation period, the 14 children were grouped into ability groups as has been discussed. On average, children in the higher ability group made less gain in comprehension, than did the participants from the other groups, yet made most gains with word identification. At the end of the implementation period the children could be regrouped using testing on their comprehension ability (using Probe) as the main decider. If this were the case, it would result in significantly different groupings. (See Appendix C, Table 10) The question is whether this regrouping is a more accurate indication of a child's reading ability.

Comprehension age increased by an average of 1.5 years within the 10 month period, with the greatest gains for the Groups B and C during the second testing period, and for Group A during the first testing period.

There may be a number of reasons why participants in Groups B and C made greater gains with comprehension in the second period, rather than the first. As discussed in the classroom reading programme description, the teacher made many changes to her reading programme following the analysis of data in June. During the first testing period, Group A (achieving below) received instruction in reading twice a week. This instructional reading was followed by comprehension or word study activities related to the text studied. During this same period, Group C (achieving at) received instruction once a week. Their follow up activities were not always as specific as were Group A's; e.g. activities such as current

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events questions. Group B, who were achieving above their chronological age, were often given individual tasks or research topics to complete.

The exact nature of the instructional reading sessions are not able to be described because observation was focused on the use of strategies by students, in particular using word-level strategies, and what part the teacher played in linking the strategies and skills they had learned with their use in a real-life situation – reading.

Analysis across the school using data gathered in June revealed that the teacher's class had made less improvement in phonological-processing skills and comprehension than any other class. Because of this, during the second testing period, the teacher specifically and explicitly taught the comprehension skills of inference and reorganisation to all children. She made other changes to her reading programme, the most significant being the increase of time spent daily on reading from one to two hours. (See classroom reading programme description)

The National Reading Panel (2000, p.10), stated that "Programs that focus too much on the teaching of letter-sound relations and not enough on putting them to use are unlikely to be very effective," and McGuinness (1997, p.151) stated that "having good phonemic awareness is no guarantee that someone will automatically use it." During the first testing period, the teacher did not consistently help the children make links between the skills she had taught during phonological-processing skills instructional time and the need to apply these skills during meaningful reading. She did not encourage or expect the children to apply these skills and knowledge. During the second testing period, the teacher helped children apply the skills and knowledge learned through specific and explicit teaching of phonological-processing skills, to reading text.

The third major change during the second testing period was the renewed energy placed on the teaching of the phonological-processing skills. The teacher requested support from the tutor of the programme for ideas and approaches to renew children's interest in the activities, and to help her teach the skills.

The author hypothesises that this more focused teaching of phonological-processing skills via the Phono-Graphix™ programme, and comprehensions skills, and the extra time spent on teaching and practising these skills, resulted in the increase of reading achievement for

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this second period of time. Therefore, because the teacher changed other aspects of her reading programme as well as implementing Phono-Graphix™, it is not possible to fully attribute the increased achievements in reading comprehension to the acquisition of phonological-processing skills developed through the implementation of Phono-Graphix™.

Validity of the phonological-processing tests

The author has concerns about the phonological-processing tests used in this study as a means of showing progress in the acquisition of these skills, even though there was definite development in score results. The tests for blending, segmenting and phoneme manipulation/substitution, all use basic code sounds, and pictures of sounds. Because the children in the study had been at school between 2 years and 7 months and 4 years 9 months, they had been exposed to, and were expected to know, many advanced code sounds and pictures of sounds. The basic code words used in the testing are CVC, (consonant, vowel, consonant) CVCC, leading to CCVCC words such as dog, hand, and crunch. The advanced code includes words such as boat, shout, receive and note, and also contains multi-syllable words. Advanced code words were not included in the testing.

Because the phonological-processing skill tests are designed to be administered to beginning readers or diverse learners, the author believes that each individual child's decoding age should have been identified in February, June and November. The decoding age is where children are 96% or more accurate when reading levelled text. When ascertaining decoding age, no attempt is made to identify if text is understood. Testing children's decoding age would give another opportunity for children to apply their learned skills of decoding, and a meaningful situation to test.

The McGuinness and McGuinness (1993) tests were designed as diagnostic tools for beginner or remedial readers, in order to identify a starting point for teaching the Phono-Graphix™ programme. The length of time these children had already had been at school, and therefore their literacy experiences during this time demanded more complex test items. If the author had more experience at the beginning stage of the study, she would have added multi-syllable, and advanced code words to the words children were asked to segment, blend and manipulate phonemes with. The ability to manipulate phonemes, and the ability to segment and blend, becomes vital when children are confronted with words containing syllables and/or advanced code.

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During the initial testing period, the main problem children had when asked to segment words was to identify phonemes such as /st/ and /bl/ as one phoneme. This is consistent with having been taught blends. /s/ and /t/ are two separate phonemes. The scoring development during the year in these instances cannot be seen, totally, as a development of phonological awareness.

Although both the teacher and author had trialled administering the tests, the validity of this testing would have been strengthened, if the author and teacher had carried out reliability comparisons before commencing testing, as both were new to the tests.

The relationship between practice and acquisition of skills

Findings from reading habits at home and in the classroom suggest that the children who spend more time mapping are more likely to independently attempt to decode unknown words. Time spent mapping reinforces the skills of segmenting and blending, but does not develop the practice of manipulating phonemes. The relationship between time spent practising the skills of segmenting and blending, and independence in applying these, would be worthy of follow-up investigation.

The need for automaticity with the code

The confusion some children had with /a/ and /u/, and /e/ and /i/ hindered the development of children's ability to segment and blend, because even at basic code level, they were unable to apply the skills learned. Fluency with segmenting and blending was only possible when children could recognize any picture of a sound in any word, and apply this knowledge. This demonstrates the need for automaticity with the code as discussed by Kame'enui, Carnine, Dixon, Simmons and Coyne (2002).

Attitude to reading

This is an area that needs to be further investigated. It would be easy to make assumptions that the differences in the participants' perceptions of how good their parents think they are at reading from February to November, is because the parents are now considerably better informed. One can also make an assumption that the more specific information given to the child by the teacher has alerted them to the fact that they can also be better than they are at

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reading. Yet children perceive that they are good readers and are positive about reading in their own time. Is this perception because they have cognitive clarity? Cunningham et al. (2002) discusses the need for children to feel capable of learning, and how this capability relates to their attitude to learning, and their self-confidence.

It is also interesting to note that children have a more positive perception of how their teacher sees their reading ability. Is this because the teacher was more focused in her teaching of reading, and therefore her feedback to the students?

The repetitiveness of the Phono-Graphix™ programme has already been commented on. The teacher struggled to maintain enthusiasm for teaching it, because of its repetitiveness, and in the first testing period, because of a lack of belief in the programme. Some children were more consistent than others in practicing the skills at home and in the classroom. How does the repetitiveness of the programme influence the children's attitude to reading, and how much is this compounded by the teacher's attitude?

The influence of Phono-Graphix™ on children's ability to decode?
Because the tests used basic code words, improvements in score are more relevant if children improved their knowledge of code, and used their phonological-processing skills, hand in hand with this increased knowledge of code, in order to 'read' unknown words when given the Woodcock Johnson word attack test, and consequently, improve the word attack results.

Differences in achievement developments for the different groups in word attack and word identification (Table 2) indicate another area that warrants further investigation. The author hypothesises that Group B, the higher achieving group, has had greater exposure to a range of vocabulary through reading mileage as well as through other opportunities such as oral discussions. Nicholson (1997) stated that slow decoders read less and are therefore less likely to learn new words. Because of this prior vocabulary knowledge, was Group B then able to apply their improved phonological-processing skills and code knowledge when given later word identification tests? If the author's hypothesis is correct, then this would support an argument for children being exposed to a wide vocabulary through a range of experiences. This prior knowledge would then enable children to apply their decoding

skills, especially that of phoneme manipulation, more effectively. Oral vocabulary testing would be required to test this hypothesis.

It is also interesting to note that the aspect of the Probe comprehension test that many children across the school scored less on was vocabulary. In theory, all unknown words are nonsense words until a reader is able to decode them. In reality, though, a reader also has his memory of words already heard, or the context of text to help read unknown words in text. It would be interesting to investigate the relationship between the development of phonological-processing skills, prior and developing vocabulary knowledge, and reading comprehension achievement.

The effect of support from home on the development of reading skills
The author hypothesizes from the information provided from the parents' survey that support at home to complete set homework activities, and the reading habits of the families, has helped children acquire effective phonological-awareness skills, and a positive attitude to reading. Because all families provided this support, in order to check out this hypothesis, it would be necessary to gather more data, especially from those who do not receive the amount of help that these respondents received.

Biddulph, Biddulph, and Biddulph (2003) discuss Wylie's (2001a) research findings demonstrating the importance of school and home experiences and the interactions between children and adults. Fletcher, Parkhill and Fa'afoi (unpublished paper, 2005) discussed Biddulph et al.'s (2003) findings about the importance of the role parents play in children's development of literacy skills. They go onto discuss Cairney's (1999) statement that where parents are involved with their children's learning, and where these schools are culturally sensitive, then children make greater gains in literacy.

The explicit and specific nature of the programme and its supporting curriculum make it easily accessible for parents to support their children's development through working with them as they complete activities. The interplay of home support, cultural diversity, and programmes that rely on specific, explicit instruction and follow up activities is worthy of further investigation.

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I stated in the introduction, that prior to this research project, I had considered myself an experienced and reasonably effective teacher of reading. During my teaching years, in particular more recent times, I had been fully involved with comprehensive professional development with literacy. Yet neither my day to day experiences in the classroom, nor any courses nor papers I undertook, opened my eyes the way this small research project has.

During these years of experience, I spent many hours in other teachers' classrooms in an observational capacity. In retrospect, these observations lead me to believe that many of my teaching colleagues are in a similar state of ignorance. This raises the vital question: What part does the teacher's micro-knowledge of the specific skills necessary to read affect a child's success in learning to read?

Conclusion

The author is hesitant to make conclusions because of a number of limitations to the study. The sample size, especially when making comparisons between different ability groups, was very small. The study attempted to identify the influence of the programme on too many aspects of reading, and consequently lacked depth in any one area. The final limitation was the interventions that the teacher introduced to her reading programme during the period of study.

This study has raised more questions than answers. The overall gains in phonological-processing skills, and comprehension ability at the end of the period of time were substantial. Yet there were too many contributing factors to be able to attribute all gains to the implementation of Phono-Graphix™.

The author suggests five provisional conclusions. First, it appears that children who practised the skills taught are more likely to decode automatically. In this study children who spent more time mapping, decoded without prompting, and as the first strategy when meeting unknown words.

Secondly, results suggest that having good vocabulary knowledge, hand in hand with awareness of the context of text read, provides students with the opportunity to apply their decoding skills more effectively. Segmenting and then blending, is not always useful if the

reader pronounces a word that is foreign to them. It may be that phoneme manipulation is necessary, but if a child has not heard the word before they will be unaware of this need.

Thirdly, automaticity with the code appears to be very important for children to be able to transfer knowledge of a picture of a sound within a known word, to the same picture of a sound in an unknown word. Children must also be able to recognise the specific pictures of sounds within a word and know automatically which letters go together to create these pictures. So, if a child is confronted with a word such as weird, they would know to segment it thus, /w/ /eir/ /d/, not as /w/ /ei/ /r/ /d/ or /w/ /e/ /i/ /r/ /d/. In this example, automatic knowledge of the sound /eir/ and this particular picture of the sound, is necessary for this process to be successful. Use of context is also vital to support this understanding.

Fourthly, the results strongly suggest that the implementation of the Phono-Graphix™ programme did influence the development of reading ability. The acquisition of phonological-processing skills influenced decoding skills, which in turn influenced the development of comprehension skills. It would seem that the teacher's efforts in helping children make the links between the skills and knowledge gained through Phono-Graphix™ instruction and application to meaningful reading situations aided this development. Interventions in the reading programme, other than implementing the Phono-Graphix™ curriculum make it difficult to identify the extent that comprehension was influenced.

Lastly, the improvement in reading achievement, with both phonological-processing and comprehension skills, suggests that this programme is effective for Māori and, although only one participant was a Cook Island Māori, for these students also.

Specific, explicit teaching of segmenting, blending, and phoneme manipulation, resulted in all children gaining competence with these skills, although children did need to be reminded about the need to manipulate phonemes when necessary. Children also received specific and explicit teaching of basic and advanced code, which involved links being made between oral sounds and their visual representations, which enabled children to grasp alphabetic understanding. This dual teaching of knowledge and skills is vital for children to be able to decode efficiently. Post test results on the word attack test indicated that children were able to apply their phonological-processing skills to the task of decoding print.

The International Institute for Advocacy for School Children (n.d.) states that if children (groups, not individuals) unnecessarily fail to develop adequate foundation skills in reading then this is 'academic child abuse.' Phonological-processing skills are foundation skills for reading, because if children are not able to decode then they will not be able to access information from text adequately. When children fail to learn how to decode efficiently, they fall behind in reading, as well as in other areas; they develop a low self-image and negative attitudes to school and learning. Unless they make dramatic improvements, they are unlikely ever to catch up with their peers (Hempenstall, 1996).

The International Reading Association (2000, p. 10) quote the National Reading Panel (2000) when they warn, "... there is a need to be cautious in giving a blanket endorsement to all kinds of phonics instruction". For any programme to be successful in a classroom there needs to be commitment from the teacher implementing it. For a programme such as Phono-Graphix™ to be successfully implemented, the author suggests that a teacher needs to have a strong theoretical understanding of phonological and phonemic awareness, and alphabetic understanding, and the part these play in learning to read. The teacher would also need to have an understanding of how the programme teaches these and other skills, and the instructional format used to deliver them. Armed with this knowledge, a teacher could then adapt any programme and approach to plan to meet children's needs.

This author argues that it is necessary to assess beginning readers' knowledge and skill with pre-reading skills, i.e. phonological and phonemic awareness, then, provide specific, explicit instruction as is necessary. The specific nature of the instruction is dependent on each individual child's specific needs. As readers become proficient with segmenting, blending and manipulating phonemes orally, then specific, explicit instruction is necessary to help readers to gain alphabetic understanding and knowledge, and to extend and apply their phoneme manipulation skills to advanced code.

The Phono-Graphix™ programme was designed as a remedial programme. The author suggests that this programme can be used for remedial purposes, as designed, but can also be used to teach beginning readers phonological-processing skills and alphabetic understanding until they are competent with applying the skills and knowledge to both basic and advanced code words.

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In this study, children of all abilities benefited from the implementation of the programme. The programme does provide specific explicit instruction for teaching letter-sound correspondences with phonemic awareness as suggested as necessary by Munro (1998). It meets the International Reading Association's (1998) suggestion that interaction with print combined with explicit attention to sound structure in spoken words is the best method for teaching phonemic awareness, although this Association warns against using commercial programmes. The programme also meets Hempenstall's (1996) suggestion that a direct instruction programme should be the first line of attack because direct instruction programmes usually result in rapid progress.

This educator had a limited understanding of the role that decoding played in reading, of specific phonological-processing skills, and of the difference between phonological and phonemic awareness and phonics. Involvement in this study has clarified for the author the absolute necessity for all educators to have micro knowledge and understanding of the skills they are teaching.

As the author has developed the micro knowledge of the skills and knowledge necessary for children to learn to read, then she has seen ways to adapt programmes such as Phono-Graphix™ in order to provide approaches that will help meet individual student's needs with learning to read.

As the role of phonemic and phonological awareness and alphabetic understanding in the development of reading ability is better understood, then interventions, such as Phono-Graphix™ may be adapted and implemented for children, although further research is desirable before such a blanket statement can be made with some conviction.

Three years on from the decision to implement the programme into the school, this author has learnt a tremendous amount. The decision was based on the fact that many children had a gap in their reading ability, and information gathered showed that implementation of the programme had addressed this gap in other schools, one predominantly Māori and the other, predominantly New Zealand European students.

At the time of the decision she felt strongly that the purpose of reading was to gain information and ideas from text. This belief hasn't changed. She also felt that it was very important for children to learn how to decode. This belief hasn't changed either. What has

changed is the depth of the author's knowledge of the reading process and the part that decoding plays in this, and of course, the skills and knowledge necessary for decoding to take place.

During the intervening three years, this author, as principal of a school, has withstood tremendous pressure from people acting in the role of 'expert,' to drop the programme because they believed that we shouldn't be teaching a 'programme'. Rather, we should be teaching specific skills incidentally, as individual students needed these skills taught.

It was only through the specific explicit teaching of phonological-processing skills and alphabetic understanding through this prescribed programme, and the research and reading required to complete this project, that this author gained her own knowledge and understanding. This author is now able to specifically plan to teach to meet students' individual decoding needs. This process has been similar with the teachers I have worked with. These teachers use their professional judgement when planning to meet individual needs, and do not rely on any specific programme to do so.

As this author's knowledge and understanding has grown, she is better able to articulate her beliefs and understanding. This author agrees wholeheartedly with Pressley et al. (2002) in their call for balanced literacy instruction. No teacher, though, can deliver a balanced literacy programme if they haven't got micro-knowledge of each aspect of reading instruction.

If, as Stanovich (1993b) stated in Hempenstall (1996), literacy development is closely linked with the development of intelligence, and vocabulary development and higher-order comprehension are advanced through reading, then it is vital that all children receive such instruction as is necessary for them to be able to access and process ideas and information available through written text.

Excellent literacy teachers do it all! They balance skills teaching and holistic experiences while flooding their classrooms with motivation (Pressley et al. 2002, p. 153).

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Appendix A
Overview of Phono-graphix Levels and their progressions

Basic Code Pink Level (CVC)
Teaching the Basic Code in Three Sound Words - CVC
- this level teaches a progression of vowel and consonant 'pictures of sound' and their sounds in three stages.
- The order is intended to establish the sound to sound picture correspondence of the sounds in each set.

Goals:
- ✓ The child understands that letters are pictures of sounds
- ✓ The child knows the correspondence between all the sounds and the sound pictures that make up the basic code
- ✓ The child understands that spoken words are made up of sounds
- ✓ The child understands that written words are made up of sound pictures which represent the sound in words
- ✓ The child understands that the sound pictures in written words occur in a sequence from left to right
- ✓ The child is able to segment the sounds in spoken words
- ✓ The child is able to blend the sounds in words
- ✓ The child is able to recognise capitalization

Fat Cat Sat
/a/, /o/, /c/, /f/, /s/, /t/, /p/, /m/,

Bug On Jug
/u/, /i/, /j/, /b/, /d/, /g/, /h/, /r/

Ben Bun
/e/, /n/, /v/, /w/, /z/, /l/

Blue Level (Adjacent Consonants)
Teaching Adjacent Words with consonant Sounds
- this level uses students knowledge of basic code 'pictures of sound' and their respective sounds to extend students skill with segmenting and blending, and phoneme manipulation

Goals:
- ✓ To perform the basic reading skills while articulating adjacent consonant sounds
- ✓ To recall all the sounds in longer words when blending
- ✓ To avoid the tendency to add or omit sounds in words

VCC words
e.g. ant, asp, end

CVCC words
        e.g. send, must, left

CCVC words
        e.g. frog, trip

Advanced Code Purple Level
Theoretical Overview of the Advanced Code Level
        - this level introduces students to different sounds, and/or pictures of sounds in a progressive order
        - the skill of phoneme manipulation is strengthened during this level

Goals:
        ✓ To understand that sometimes two or more letters represent a sound
        ✓ To understand that most sounds can be represented in more than one way
        ✓ To understand that there is overlap in the code, that some components of the code can represent more than one sound

Introductory Word Lists
        e.g. x, qu, ch

Advanced Code
        e.g. /ow/, /er/, /ee/, /a-e/
        e.g. /r/, /s/, /l/

Multi-Syllable Management
Theoretical Overview of the Multi-syllable Level
        - this level introduces students to the concept of chunks of sound, and extends their skill with blending and segmenting in order to decode multisyllable words

Goals:
        ✓ To understand that sometimes words have "chunks" of blended sounds
        ✓ To understand that the chunks of sounds in words are determined by linguistics not orthography
        ✓ To understand that we can read multisyllable words by blending sounds into chunks, and then chunks into meaningful words
        ✓ To understand that we can spell multisyllable words by building the sounds into chunks, and then the chunks into words
        ✓ To understand that multisyllable words contain a dominant chunk
        ✓ To understand that many multisyllable words contain a weak vowel sound
        ✓ To understand that many multisyllable words have "special endings"

Two syllable
Three syllable
Special word endings
        e.g. xious, tion, sion

Appendix B
Overview of Phono-Graphix Activities

The following are the recommended instructional guidelines for word work.

- ✓ The correspondence between sound and symbol should be taught within the context of real and invented words, alone or in sentences and stories
- ✓ The correspondence sound and symbol should be well established before letter names are taught
- ✓ Lessons should include hearing the word, saying the word, and writing the word, but not necessarily in that order
- ✓ Each lesson should include segmenting and blending of isolated phonemes using real and invented words
- ✓ Off lessons that teach the child to isolate and manipulate single phonemes in real and invented words
- ✓ Attention to rhyme should only be drawn after attention to individual phonemes
- ✓ Lessons should reinforce that sounds are represented by letter figures and that many of these contain more than one letter
- ✓ Representations of sounds should be presented as a unit regardless of the number of letters used to represent the sound
- ✓ Avoid the use of contingent logic that attempts to explain why two or more letters can represent a sound. Instead lessons should rely on organized and repeated exposure to real and invented words alone, and in sentences and stories
- ✓ Lessons should reinforce the variation in the code – most sounds can be represented in more than one way
- ✓ Lessons should reinforce the overlap in the code – many representations of sounds can also represent other sounds

Specific Activities:
Word Building
Children are asked to listen to a word. As the word is said slowly the teacher runs her finger slowly under three lines. They are asked to see if they notice what sound they hear when the finger is under the first of the lines. Ask the children if they know which of the pictures of sound is /m/ When the picture of sound is identified from the choice then it is written on the first line. And so on. When the complete word has been written, then the word is segmented again, and then blended together.

e.g.   with the word mop, children are shown the example below

o p m
1 2 3

— — —

N.B. the letters are numbered so children can refer to a number rather than a letter name

Mapping
Children work with words that have already built. They are asked to write down these words letter by letter. As they write each picture of sound, they are expected to sound the sound this picture represents. When the whole word has been written in this way, they are asked to blend the sounds together to say the word.

Children would be expected to map approximately 10 words each day. Each word would be mapped 10 times. This is dependent on ability.

During the pink level children are asked to find rhyming words; e.g. mop, cop, top, and chyming words; e.g. map/mop, pot/pat.

Reading Sentences
At each level, children are given sentences to read which predominantly include words from that respective level. As children move through the levels, the sentences get longer, and turn into stories.

Phoneme Manipulation
This is a predominantly oral exercise. At the earlier stages children are asked to say a word without a particular sound, e.g. say cat w/o the /c/, moving to e.g. say kept w/o the /p/, or say send w/o the /d/.

Once children are able to do this level of phoneme manipulation, they maybe asked to e.g. change the /a/ in cat to /u/.

Initial/Vowel/Final sound word completion
Children are given a picture of an object with two of the three (or three of the four) pictures of sounds given. Using the picture to identify the word, they then segment, identify which picture is missing, replace it, then blend the word together.

Spelling
Children are given spelling tests at any of the stages. At the simplest stage (Pink Level) children may be given a list of the pictures of sound they have been working with, and then asked to write down words using those pictures.

Reading Three/Four Sound Words for Meaning
Children are given a word. They talk about this word and decide what this word means/represents. They then draw a picture of the word. In this way they are learning that words represent something.

Find Pictures of Words
Children are asked to find pictures of the CVC words they have been building and mapping. These pictures can be found in magazines and cut out and pasted under the words.

Sound Search
Once at Advanced Code children are asked to search for the sounds being focused on, in the books they are reading. For example the sound may be the /a-e/ sound. Children would find words with this sound and place them in appropriate columns, such as ay, ai, a-e, eigh, ey, a, ea, ei.

Younger children may be asked to e.g. clap when they hear a sound as a story is being read to them.

Story Writing
Children are asked to write a story using words with the particular sound being focused on. E.g. I hate to wait, in case I am late. My neighbour is always late.

I Spy
Children play I Spy looking for things that start with a particular sound, not letter as it is usually played.

Sound Around
Using a target sound, get each child in turn to give a word with that sound, developing a chart as you go.

Sound Off
A child thinks of a sound. The next child then has to think of a word with that sound, and so on.

Segmenting or Blending
Children either have to segment a word you have given, or blend the segmented sounds you have given.

Buddy Reading
Children work in pairs. Both children have a copy of the text. One child reads orally for approximately 10 minutes. The focus for reading is accuracy and fluency. If the reader makes a mistake and makes no attempt to correct this, then the buddy is expected to stop the reader for him to make the correction.

Appendix C
Tables of results

Comparison February/November Data
Author generated tasks

Child/ Ability Group	Rhyming Task		Phoneme Substitution Task		Sound/Letter Relationship Task	
Below	Feb	Jun	Feb	Jun	Feb	Jun
A 1	16	16	3	5	21	26
A 2	16	16	3	3	18	26
A 3	16	16	3	5	23	26
Above						
B 1	15	16	4	5	21	26
B 2	14	16	3	5	22	26
B 3	16	16	4	5	23	26
B 4	14	16	2	5	21	22
B 5	15	16	4	5	22	26
B 6	16	16	4	5	23	26
At						
C 1	13	16	4	5	23	26
C 2	15	16	3	5	22	26
C 3	16	16	3	5	21	26
C 4	16	16	5	5	23	26
C 5	16	16	3	5	25	26

Table 1

Code Knowledge: Study Group Averages

Average Results	Feb	June	Nov
Code /50	29.9	42.42	47.5
Word Attack /years	9.68	13.6	16.8
Word I.D. /years	9.52	10.5	12.78
Chronological Age	9.08	9.46	9.96

Table 2

Testing Period Average Changes

	Feb–Jun	Jun - Nov
Code	12.52	5.08
Word Attack	3.92	3.2
Word ID	.98	2.28

Table 3

Data Comparison February to November:

Child Ability Group Below	Word Attack Score & age Feb	Nov	Word I.D. Score & age Feb	Nov	Code Knowledge Feb	Nov	Blending /15 Feb	Nov	Segmenting /63 Feb	Nov	Phoneme Manipulation F	N
A1	8y 1m	12y4m	7y10m	9y 4m	23	45	10	15	4	63	4	10
A2	9y 1m	18y6m	9y 4m	11y10	21	50	12	15	8	63	9	10
A3	9y 1m	18y6m	9y 4m	10y11	22	42	4	14	14	63	8	10
Above												
B1	9y 8m	18y6m	9y 2m	11y4m	25	49	11	15	28	63	6	10
B2	7y 8m	18y6m	8y 7m	9y10m	30	43	4	15	25	63	3	10
B3	13y1m	18y6m	11y4m	18y8m	45	50	15	15	14	63	7	10
B4	11y8m	18y6m	9y10m	13y3m	36	50	15	15	22	63	10	10
B5	11y4m	18y6m	10y2m	14y1m	40	47	11	15	52	63	9	10
B6	10y9m	18y6m	10y7m	14y7m	31	48	15	15	24	63	9	10
At												
C1	7y 9m	17y	8y 6m	10y7m	22	49	7	15	20	63	10	10
C2	9y11m	18y6m	9y 8m	11y4m	27	48	14	15	2	63	10	10
C3	8y 7m	17y	9y	11y6m	32	46	12	15	39	63	8	10
C4	8y 1m	11y8m	8y11m	9y10m	32	42	11	15	3	63	8	10
C5	8y10m	18y6m	10y2m	12y3m	33	44	15	15	19	63	8	10

Table 4

Comprehension Growth, February - November

Child	Comp Feb-Jun /years		Comp Jun-Nov		Increase Comp Feb - Nov
Group A average gains	**.83**		**.66**		**1.5**
A 1	8.5 – 9.5	1 yr	9.5 - 10	.5	1.5
A 2	9 – 9.5	.5	9.5 -10.5	1	1.5
A 3	8.5 - 9.5	1	9.5 -10	.5	1.5
Group B average gains	**.41**		**.916**		**1.3**
B 1	10.5-10.5	--	10.5-11.5	1	1
B 2	8.5 – 9.5	1	9.5 – 10.5	1	2
B 3	12 – 12.5	.5	12.5 - 13	.5	1
B 4	10 –10.5	.5	10.5-11.5	1	1.5
B 5	10.5	--	10.5– 11.5	1	1
B 6	10.5 - 11	.5	11 - 12	1	1.5
Group C average gains	**.6**		**1.2**		**1.8**
C 1	10 – 10.5	.5	10.5-12.5	2	2.5
C 2	9.5– 10.5	1	10.5-11.5	1	2
C 3	10 – 10.5	.5	10.5– 11.5	1	1.5
C 4	8 – 8.5	.5	8.5 – 9.5	1	1.5
C 5	8 – 8.5	.5	8.5 – 9.5	1	1.5

Table 5

Observation Notes from First Half Year

Child	Buddy Reading	Reading in Group
A 1 -7mth	Read through errors	Read through errors, needed reminded to attempt decoding
A 2 -8mth	Conscientious with "good" buddy. Attempted decoding but some guessing, after initial sounds or when needing to manipulate phonemes.	Aware of errors, needed confirmation on right track
A 3 -6mth	Aware of errors & need to attempt to decode. Hesitant to attempt decoding without support	Stopped at unknown words, hesitant to attempt
B 1 +6mth	Preferred to observe, rather than read. Needed reminded to correct errors	Usually aware of need to decode, and accurate
B 2 +9mth	Needed reminded to stop, guessed many	Used first letter/s to guess. Rushes, gets confused with blending, syllables
B 3 +26mth	Got impatient with buddy for stopping for a/the type errors	Decodes well, confident
B 4 +9mth	Got sidetracked often,	Capable, but needed teacher to demand he attempt decoding
B 5 +12mth		Made initial rushed attempt, not happy with need to retry
B 6 +22mth	Tends to make errors such as a/the, or omit or insert words. Guesses some words	Needs reminded to stop and decode. Decodes well, yet needed confirmation
C 1 +3mth	Aware of errors and stopped, attempted decoding but unsure if accurate	Segmented methodically, some blending difficulties with syllables
C 2 -1mth	Stopped and attempted when with conscientious buddy	Attempts not attentive to all phonemes
C 3 +5mth	Pedantic reading, attempts very thorough, confused when needing to manipulate	Slow decoding to detriment of comprehension
C 4 -1mth	Buddy needed to demand he attempt to decode	Automatically asked for help, or waited for help. Needed regular reminders to attempt
C 5 +3mth	Got "anti" with buddy when asked to stop	Needed "pinned down" to attempt decoding. Capable when cooperative

Table 6

Observation notes from second half year

Child	Buddy Reading	Reading in Group
A 1 ----	Stopping and attempting to decode, some confusion with sound knowledge	Attempts decoding without prompting
A 2 -1mth	Attentive to all phonemes, managing phoneme manipulation better, but needs reminded to do so	Confident with attempts to decode, checks when needs to
A 3 +3mths	Aware of errors & need to attempt to decode. Attempt decoding checks whether correct	Attempts without encouragement, still needs confirmation
B 1 +9mths	Proactive with attempting decoding. Confident with phoneme manipulation	Decoding becoming more automatic
B 2 +24mth	Stopping and decoding without needing reminder. Some rushing	Still rushes, but tries to slow down, attentive to all phonemes. Managing syllables
B 3 +30mth	Got impatient with buddy for stopping for a/the type errors	Decodes well, confident
B 4 +16mth	Needs strong buddy, then attentive and accurate	Decoding becoming more automatic
B 5 +16mth		Made initial rushed attempt, not happy with need to retry
B 6 +29mth	Tends to make errors such as a/the or omit or insert words. Attentive to all phonemes	Decoding becoming more automatic
C 1 +22mth	Automatically stops and decodes	Confident with decoding, asks for help when necessary, but not for reassurance
C 2 +13mth		Attentive to all phonemes, manipulates phonemes, handles syllables well
C 3 +12mth	Pedantic reading, attempts very thorough, confused when needing phoneme manipulation	Slow decoding to detriment of comprehension
C 4 +5mth	Decodes, but still expects support	Decoding not automatic. Needs to consider need to manipulate phonemes
C 5 +10mth	Decodes independently Not always positive response to buddy	Decodes independently, needs to use text to confirm accuracy

Table 7

Data from three students who raised achievement most (with comprehension)

C1 Maori, female	February	June	November	Increase in score	
Word Attack - age	15	28	38	*23*	
	7y 9m	10y	17y	*9y 3m*	
Word Identification	54	62	72	*18*	
	8y 6m	9y 4m	10y 7m	*2y 1m*	
Comprehension growth	Feb – June .5		June – Nov 2 years	Total growth 2.5years	
	Code Knowledge /50 **Feb Nov**		**Blending /15** **Feb Nov**	**Segmenting /63** **Feb Nov**	**Phoneme Manipulation /10** **Feb Nov**
	25	49	11 15	28 63	6 10
Time spent mapping	15 minutes daily				
Time spent reading at home	5 minutes daily (aloud) 30 minutes silently				
Time being read to	Daily by Mother				
Reading strategy *(Author observation)*	Automatically stops and decodes when buddy reading Confident, decodes as first strategy, asks for help when necessary, not for reassurance				
Parent Observations	Enjoys being read to more, sounds out words unsure of				
Family attitude to reading	All family read regularly 2-3 times a week				

C2 Maori, female	February	June	November	Increase in score	
Word Attack – score	28	34	39	*11*	
- age	9y 11m	13 y 2m	18y 6 m	*8y 7m*	
Word Identification	65	74	77	12	
	9y 8m	11y	11y 4m	1y 8m	
Comprehension growth	Feb – June 1 year		June – Nov 1 year	Total growth 2 years	
	Code Knowledge /50 **Feb Nov**		**Blending /15** **Feb Nov**	**Segmenting /63** **Feb Nov**	**Phoneme Manipulation /10** **Feb Nov**
	27	48	14 15	2 63	10 10
Time spent mapping	15 minutes				
Time spent reading at home	20 minutes orally, 30 minutes silently				
Time being read to	3-5 times a week by Mother and Father				
Reading strategy *(Author observation)*	Attentive to all phonemes, manipulates phonemes, handles syllables well				
Parent Observations	*No response*				
Family attitude to reading	Other family members read from 0 (Father) through to 3(older brother) times a week				

B2 Maori, female	February	June	November	Increase in score	
Word Attack – score	13	25	39	*26*	
- age	7y 8m	9y 1m	18y 6m	*11y 2m*	
Word Identification	55	61	68	*13*	
	8y 7m	9y 3m	9y 9m	*1y 2m*	
Comprehension growth	Feb – June 1year		June – Nov 1 year	Total growth 2 years	
	Code Knowledge /50 **Feb Nov**		**Blending /15** **Feb Nov**	**Segmenting /63** **Feb Nov**	**Phoneme Manipulation /10** **Feb Nov**
	30	43	4 15	25 63	3 10
Time spent mapping	10 minutes daily				
Time spent reading at home	10 minutes orally, 15 minutes silently				
Time being read to	1-2 times a week by Mother and Father				
Reading strategy *(Author observation)*	Stops and decodes without needing a reminder. Some rushing, but tries to slow down. Attentive to all phonemes. Manages syllables				
Parent Observations	More interested in reading things like the newspaper Still guesses, but tries to sound out more				
Family attitude to reading	Father, Mother, and younger sister all read daily				

Table 8

Data from three students who raised achievement least (with comprehension)

B1 Maori, female	February	June	November		Increase in score	
Word Attack – score	27	33	39		12	
- age	9y 8m	12y 5m	18y 6m		8y 10m	
Word Identification	60	67	77		17	
	9y 2m	10y	11y 4m		2y 2m	
Comprehension growth	Feb - June --		June - Nov 1 year		Total growth 1 year	

	Code Knowledge /50		Blending /15		Segmenting /63		Phoneme Manipulation /10	
	Feb	Nov	Feb	Nov	Feb	Nov	Feb	Nov
	25	49	11	15	28	63	6	10

Time spent mapping	No response
Time spent reading at home	10 minutes orally, 30 minutes silently
Time being read to	1-2 times a week by Grandparent
Reading strategy (Author observation)	Proactive with attempting to decode. Confident with phoneme manipulation. Decoding first strategy used
Parent Observations	Attempts to decode, rather than giving up
Family attitude to reading	All family members read daily

B3 Maori, male	February	June	November		Increase in score	
Word Attack – score	35	41	45		10	
- age	14y	18y 6m	18y 6m		4y 6m	
Word Identification	77	83	96		19	
	11y 4m	12y 3m	18y 8m		7y 4m	
Comprehension growth	Feb - June .5		June - Nov .5		Total growth 1 year	

	Code Knowledge /50		Blending /15		Segmenting /63		Phoneme Manipulation /10	
	Feb	Nov	Feb	Nov	Feb	Nov	Feb	Nov
	45	50	15	15	14	63	7	10

Time spent mapping	10 minutes
Time spent reading at home	30 minutes, silently only
Time being read to	1-2 times a week by Father
Reading strategy (Author observation)	Got impatient with buddy for stopping for a/the type errors. Decodes automatically with confidence
Parent Observations	Has improved reading and understanding
Family attitude to reading	Other family members read 2-3 times a week

B5 Maori, Male	February	June	November		Increase in score	
Word Attack – score	31	40	44		13	
- age	11y 4m	18y 6m	18y 6m		7 years 2 months	
Word Identification	69	83	90		21	
	10y 2m	12y 3m	14y 1m		3 years 11 months	
Comprehension growth	Feb - June ---		June - Nov 1 year		Total growth 1 year	

	Code Knowledge /50		Blending /15		Segmenting /63		Phoneme Manipulation /10	
	Feb	Nov	Feb	Nov	Feb	Nov	Feb	Nov
	40	47	11	15	52	63	9	10

Time spent mapping	No response
Time spent reading at home	No response
Time being read to	No response
Reading strategy (Author observation)	Made initial rushed attempt, not happy with need to retry
Parent Observations	No response
Family attitude to reading	No response

Table 9

Comparative Groupings using Comprehension Age
February and November

Group Name	Chronological Age February	Comprehension Age February	Chronological Age November	Comprehension Age November
A1	9.2	8.5	10	10
A2	9.8	9	10.6	10.5
A3	9	8.5	9.9	10
B1	9.11	10.5	10.8	11.5
B2	7.8	8.5	8.6	10.5
B3	9.8	12	10.6	13
B4	9.3	10	10.1	11.5
B5	9.3	10.5	10.1	11.5
B6	8.7	10.5	9.5	12
C1	9.9	10	10.7	12.5
C2	9.6	9.5	10.4	11.5
C3	9.7	10	10.5	11.5
C4	8.1	8	9	9.5
C5	7.9	8	8.7	9.5

Table 10a

Group Name	Chronological Age November	Comprehension Age November
Group Achieving at Expected level (i.e. up to six months below or above chronological age)		
A1	10	10
A2	10.6	10.5
A3	9.9	10
C4	9	9.5
Group Achieving above Expected level (i.e. more than six months above chronological age)		
B1	10.8	11.5
B2	8.6	10.5
B3	10.6	13
B4	10.1	11.5
B5	10.1	11.5
B6	9.5	12
C1	10.7	12.5
C2	10.4	11.5
C3	10.5	11.5
C5	8.7	9.5

Table 10b

Appendix D
Background explanation for implementing programme in school

The Phono-Graphix™ programme was implemented throughout the school from where the sample of children was taken. The participants in the study were from one classroom of the school. Intensive information sharing with all parents had been undertaken, through written letters and notices, meetings and opportunities for observation. All parents of the school were asked to be involved with this programme by teaching them about it, and asking them to ensure children completed regular homework activities related to the Phono-Graphix™ curriculum. These opportunities gave all parents a sound basic knowledge of the programme and its philosophy.

When consent was requested for the use of data for this research project, this prior information helped parents give informed consent. It was noticed that parents who had been more involved with the above activities were more likely to give consent. In many cases, the author was able to make personal contact, and in this way was able to better clarify issues of confidentiality and privacy.

Before a final decision was made on which group of children to gather data from, the teaching staff and the author had a discussion about the intended study and the possible implications for the class teacher. A request of the classroom teacher was made, only when it was evident that she was supportive of the author's role in the study. The discussion made potential issues very clear. One particular issue discussed was the possibility that the teacher may have felt coerced because the author was the classroom teacher's principal.

When a decision was made on the class from which the sample of children would be studied, an explanation was given to these children prior to a specific request for involvement from their parents. This explanation made it very clear that there was no obligation, and also allayed any concerns there may have been.

All teachers at the school were involved in the information dissemination about the school's involvement with the implementation of the Phono-Graphix™ programme, and the purposes for it. The teaching staff took part in intensive professional development. All staff attended either a one-day or three-day workshop prior to introducing the programme, and the Tutor provided continued ongoing support during the year.