

Abstract

Reading is a dynamic process. Good readers appear to read with ease and be largely unaware of the cognitive multi-tasking going on in order for them to gain meaning from the text, whilst for others, reading appears difficult and frustrating. For those children who find reading difficult, assisting them to develop their phonological knowledge is one way of helping them, by broadening the repertoire of strategies they have to draw on when decoding text.

This study investigates the effects of teaching elements of phonological knowledge to a group of poor readers. The hypothesis is that **explicit teaching of segmenting and blending skills to a group of poor readers in Year 4 will improve their word reading accuracy at prose level.**

The investigation took place as action research within a primary school setting. Eight children were chosen to participate, four of these received intervention teaching and the other 4 acted as the control group. The intervention consisted of 10 lessons focused specifically on the skills of segmenting words into sounds and blending individual sounds into words.

Findings from this study revealed that the intervention did indeed help the students to improve their ability to manipulate sounds within words however this did not transfer to prose reading where the students failed to show any significant gains.

This study does raise some questions for further consideration including what interventions are appropriate for underperforming students and how these students can be monitored and supported throughout their school years.

Introduction

Reading is a dynamic process requiring the reader to operate at a number of levels in order to gain meaning from the text. Ashman *et al* (1999) pursue the notion that as readers operate on text in multiple and interactive ways, learning or lack of learning in any one domain will affect development in another and hence, the readers overall reading development (Stanovich and Beck, as cited in Ashman et al 1999).

This study is particularly concerned with the decoding or code-breaking aspects of reading and specifically the role and importance of phonological knowledge to this facet of the reading process.

The work of many authors and researchers places phonological knowledge high on the list of factors contributing to reading success. Jenkins et al (2000) describe phonological awareness as a “foundation for the development of reading fluency and comprehension” (p76) while Ashman et. al (2005) clearly state that Phonological awareness is a strong indicator of later reading success.

Phonological knowledge allows the reader to quickly and effectively decode unfamiliar words by identifying and then segmenting and blending the syllables or individual phonemes within the word. This is important knowledge to have at one’s disposal for it allows the reader to move on with his/her reading and thus maintain the overall meaning of the text. The ability to rapidly decode and gain meaning from the text can also help to build a positive experience of reading for the child.

The use of phonological knowledge when attempting to decode unfamiliar words is a good strategy for readers to apply (Ashman,2005). Yet what about those readers who lack phonological knowledge? Their attempts at reading fluently and accurately as well as their subsequent reading development may be hampered by their limited range of reading strategies compared to those of their peers.

Phonological knowledge develops in sequence. Munro (1998) draws on the work of a number of researchers (Lenchner et al.1990; Maclean et al.1988; Vandervelden and Siegel 1995;Yopp 1998;) to describe the developmental sequence in the following six steps

1. oral communication
2. recognition of sound patterns in words
3. recognition of syllables and individual sounds in words
4. ability to combine sounds in words
5. ability to recode letters and strings of letters to sounds and vice versa
6. ability to manipulate sound patterns in more intricate ways.

This developmental sequence has an added dimension in that children learn to apply their knowledge to words with a smaller number of sounds before words with a larger number of sounds.

Students can be assessed in comparison to this sequence to determine what elements of phonological knowledge they have and are able to use effectively. From this assessment a teaching or intervention pathway can be structured to develop the student's phonological knowledge.

Much of the research consulted focuses on early reading development, particularly for students in the first two years of Primary Education. Whilst the participants in this study are in their fifth year of Primary Schooling there is some evidence related to working with children of such an age; Rohl cites The National Reading Panel finding that “explicit and systematic phonics teaching enhances the success of K-6 children of all abilities...” (Rohl, 2006, p7)

Research examined by Rack, Snowling & Olson (as cited in Jenkins et al 2000) compares the reading of older students (such as Year 4) with reading difficulties to younger students (eg. Year 2) whose reading is developing appropriately. Rack et al. found that these studies reliably demonstrated that in relation to younger, normally developing readers the older struggling readers show a “deficit and not a developmental delay” (Rack, 2000, p76) on tasks that require children to use decoding skills instead of memory (ie. pseudo word reading).

The present study will examine the decoding skills of a group of struggling Year 4 readers in order to build an intervention that will help to lessen their phonological knowledge deficit.

An understanding of the subjects reading difficulties can be gleaned through running records of these children reading aloud which show that word attempts are largely based on distinctive visual features (DVF) of a word and very few attempts are made at segmenting words. The reading aloud is often stilted word-by-word and there are few attempts at self correction. Possible causes of these behaviours include poor letter cluster knowledge which prevents segmenting into manageable parts and poor phonological knowledge which prevents the children actually identifying that they have made a sound/letter error.

This investigation aims to build on previous research by examining the influence of phonological knowledge on word reading accuracy. The prediction is that teaching Year 4 students who have reading difficulties to segment and blend individual phonemes in words leads to an improvement in their overall word reading accuracy at prose level.

Method

Design

The study uses a case study OXO design in which word reading accuracy at the students instructional text level is measured prior to and once again following the explicit teaching of phonemic segmentation skills and repeated practice with words of three, four and five sounds.

Participants

Students who participated in the study were nominated by their teachers as being ‘at risk’ in the area of Literacy. They were below the expected reading level for their age and below the reading levels of their peers. The allocation of students to either the Intervention or Control group was deliberate, in order to ensure an even mix of ESL and Gender across both groups.

All participants are currently in Year 4 and their age, ESL background, Reading Recovery experience and other information relevant to their Literacy achievement is shown in Table 1.

Student	Age	Gender	ESL	Reading Recovery?	Other relevant intervention/assessment
INTERVENTION GROUP					
Student 1	9Years 4months	Male	Yes	No	n/a
Student 2	10Years 2months	Male	No	Yes	*Ongoing language intervention with Speech Pathologist *Eligible for 'Evenstart' program due to Numeracy benchmark not achieved in 2007 AIM testing
Student 3	9Years 5months	Female	Yes	Yes	*Eligible for 'Evenstart' program due to Numeracy benchmark not achieved in 2007 AIM testing
Student 4	9Years 11months	Male	Yes	Yes	n/a
CONTROL GROUP					
Student 5	9Years 7months	Male	No	Yes	*Currently attends SPELD for reading difficulties *Eligible for 'Evenstart' program due to Literacy benchmark not achieved in 2007 AIM testing
Student 6	10 Years	Female	Yes	Yes	*Ongoing language intervention with Speech Pathologist
Student 7	9 Years 11 months	Male	Yes	No	n/a
Student 8	9 Years 9 months	Female	Yes	No	n/a

Table 1: Participant information

Materials

PM Benchmark kits were used to determine each student's instructional text reading level. The running record at this instructional level was then analysed to determine the student's word reading accuracy rate.

Students instructional reading text level prior to undertaking instruction was determined through use of the *PM Benchmark Kit* of leveled texts. Post instruction, the *PM Benchmark Kit 2* was used in order that students could read at the same text level used in the prior testing, yet still be faced with an unseen text. Texts of the same level from the PM Kits also have the same word count.

The Assessing and Teaching Phonological Knowledge test and the Orthographic word reading test (Munro, 1998) were also administered at both the beginning and conclusion of the study. The phonological test involved four separate segmenting tasks and one blending task. The orthographic test required students to read the target words as quickly as possible.

Procedure

The entire project consisting pre intervention and post intervention assessment of all children and intervention sessions with the teaching group was conducted over 5 weeks. During weeks 1 and 5 assessment was conducted and during weeks 2, 3 and 4 the teaching intervention program of 10 lessons was conducted. Where possible, teaching sessions were conducted daily during the 9am-11am learning block. Students were withdrawn from the classroom for the teaching sessions and each session was between 30 and 40 minutes in length.

At the onset of the project, students were assessed individually. During this time the assessment tasks described above were undertaken by the students in the following order: PM Benchmark text level testing, Orthographic Word Reading test, Phonological Knowledge Assessment. The Phonological Knowledge Assessment was begun at task 2.5 and 3.2 (suggested in the test manual as an acceptable starting point of administration for older students)

Assessments were taped in order to provide further reference if required.

The intervention consisted of a teaching program focused on building phonological knowledge, specifically; segmenting and blending. Sessions were planned with reference to the teaching model developed by Collins et al. (1989) and each session followed a similar format to that outlined in Table 2.

An important consideration in the planning of each session was the choice of words to be presented to children for segmenting and blending practice. Reference was made to each child's achievement on the Phonological Knowledge Assessment task in order to determine their sound segmentation span. None of the children were able to successfully segment words of more than 3 sounds, so only three sound words were used in the initial sessions.

Step 1. Review learning from previous session
Step 2. Introduce/revisit and demonstrate segmenting strategy to students
Step 3. Children copy demonstrated strategy
Step 4. Children practise using strategy with words presented by the teacher
Step 5. Children generate words and check that they are of the same sound span as the focus words
Step 6. Teacher presents more complex words but with the same number of sounds and steps 3-5 are repeated Or Prose reading of a decodable text .
Step 7 Children articulate their learning
Step 8 Children give examples of how their learning today may be helpful in reading and writing

TABLE 2: Intervention teaching session format

Further detailed information on the content of the sessions is contained in the Appendices. (Appendix 1)

Data analysis

Discussion in this paper centres on children's general ability in segmenting and blending and therefore student achievement on the Phonological Knowledge Assessment is recorded in this paper as an overall score in segmenting and an overall score in blending.

Student results on the Orthographic word reading test are recorded as an overall raw score.

In the assessment period prior to intervention, student's reading was assessed in order to find their instructional text level. The decision was made to assess students reading, post

intervention, at the same instructional level achieved at pre testing in order to ensure that the requirement of the reading tasks was consistent in both assessment situations.

Results

Table 3 shows a comparison of student scores on the phonological assessment tasks of segmenting prior to and after intervention. The maximum score attainable in the segmenting tasks was 11.

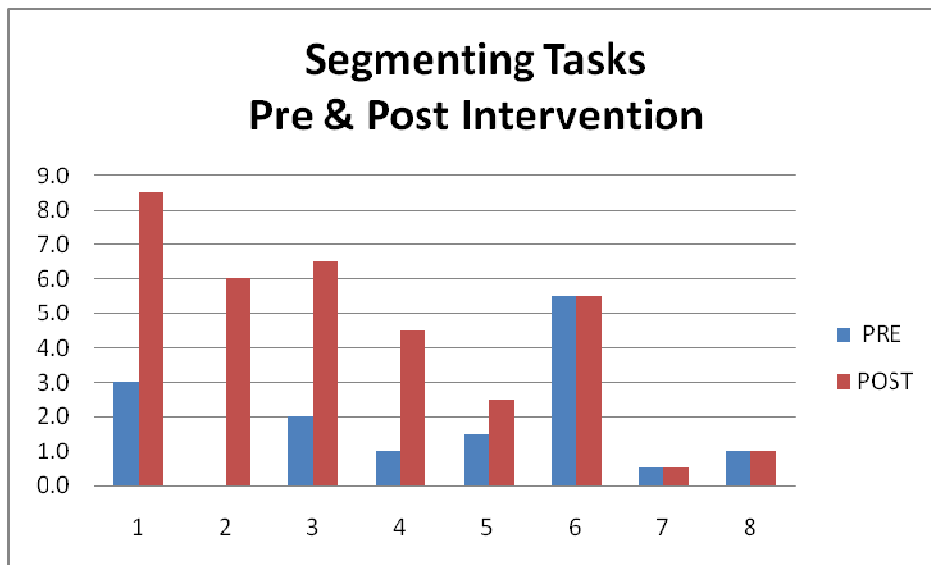


Table3 : Student achievement – Phonological assessment segmenting task

All children in the intervention group demonstrated an improvement in the skills of segmenting. The initial assessment demonstrated that none of the children was able to segment words of greater than three sounds. By the post teaching assessment all children had mastered this skill and were reliably working with complex words of 4 sounds. Some were beginning to work with simple 5 sound words.

The targeted teaching of segmenting and blending had a positive impact on the children's ability to segment and blend sounds in isolated words. The same improvement was not present in the

control group, with only one student in the segmenting tasks scoring greater in the post testing than in the initial testing.

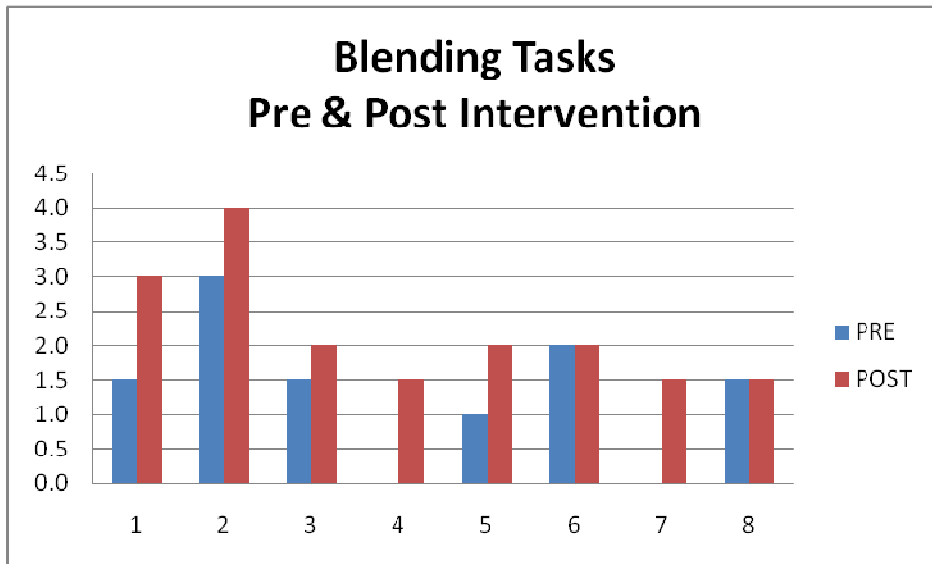


Table 4: Student achievement – Phonological assessment blending task

Table 4 shows a comparison of student scores on the phonological blending task.

The maximum score attainable on this task was 4.

For most children the difference in results between pre intervention and post intervention assessment was less dramatic when compared to the segmenting tasks. A key difference was that children scored higher on the blending tasks in the initial assessment so there was less ground to ‘make up’ between pre and post assessment.

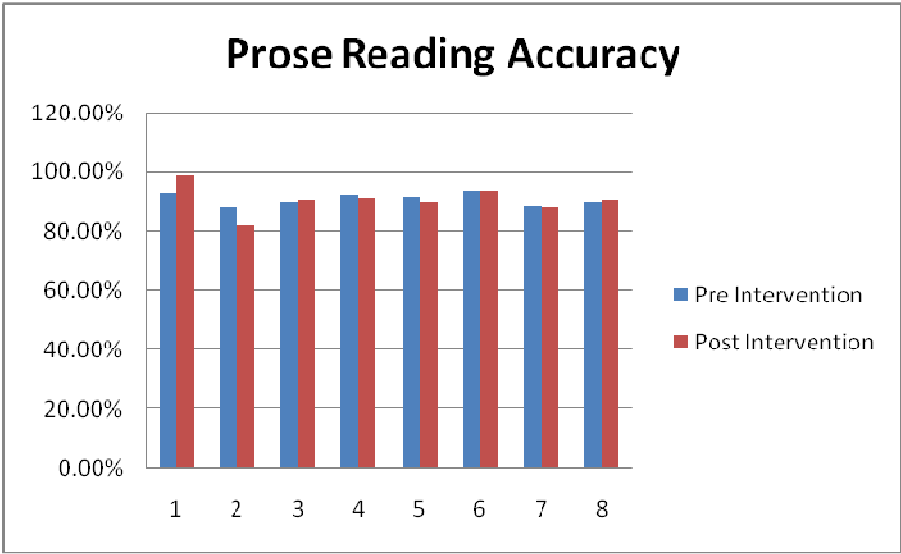


Table 5: Prose reading accuracy pre and post intervention

When prose reading accuracy was compared there were no recognizable trends for either group. Neither the teaching nor control group performed better overall. In both groups some students improved their word reading accuracy at post intervention assessment and some students scored less on the post intervention assessment.

Student	Text Level	Reading Accuracy	Demonstrated attempts at segmenting to decode word	Text Level	Reading Accuracy	Demonstrated attempts at segmenting to decode word
	Pre test	Pre test	Pre test	Post Test	Post Test	Post Test
TEACHING GROUP						
Student 1	30	93.00%	4	30	99.00%	6
Student 2	30	88.00%	1	30	82.25%	6
Student 3	16	90.00%	0	16	91.00%	2
Student 4	26	92.50%	0	26	91.40%	6
CONTROL GROUP						
Student 5	25	92.00%	6	25	90.00%	5
Student 6	21	94.00%	1	21	94.00%	3
Student 7	28	89.00%	0	28	88.00%	0
Student 8	30	90.00%	8	30	91.00%	7

Table 6: Student prose reading and number of attempts at word decoding using segmenting

Whilst this table (6) presents only a raw score comparison of the student's pre and post intervention attempts at segmenting to decode unfamiliar words, it is interesting to note that all students in the teaching group demonstrated this as a strategy in post intervention assessment. During the teaching sessions, segmenting was repeatedly practiced and discussed as a word attack strategy. Student 3 and Student 4 had not demonstrated use of this strategy in the initial assessment but did demonstrate it during the post intervention assessment.

Student	Orthographic Reading Test Maximum possible score: 84	
	Pre test	Post Test
TEACHING GROUP		
Student 1	77	80
Student 2	75	77
Student 3	13	45
Student 4	41	54
CONTROL GROUP		
Student 5	39	53
Student 6	40	48
Student 7	66	68
Student 8	69	73

Table 7: A comparison of the total number of words on the orthographic word reading test correctly read by students in the pre intervention and post intervention assessment.

A comparison of student achievement on the orthographic word reading test simply indicates that all students, both in the control group and intervention group, scored better in the post intervention assessment.

What is more useful is a look at the types of errors made by some of the students.

Student 3 clearly made significant gains in isolated word reading over the course of the intervention and a breakdown of the types of errors made by student 3 can be seen in table 8.

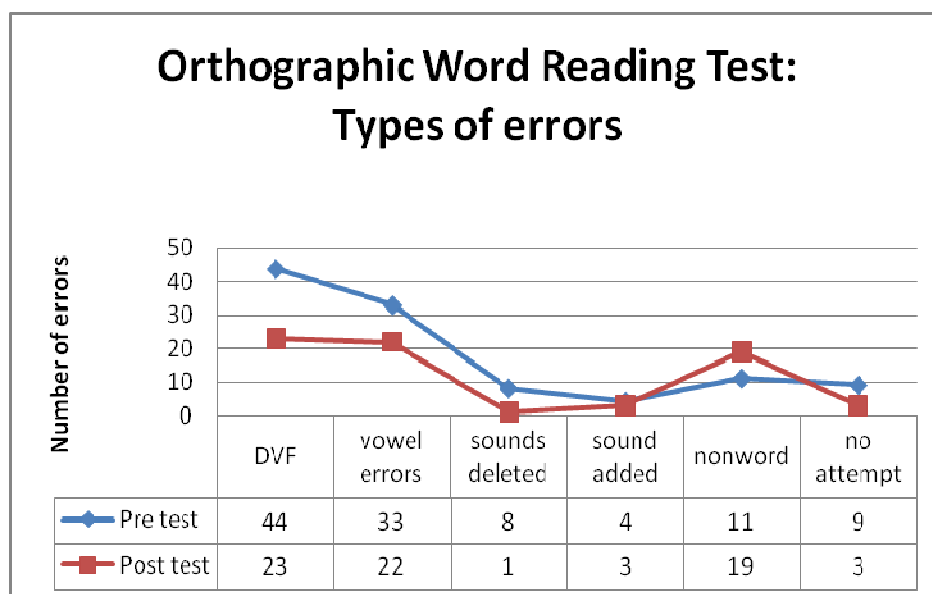


Table 8: Student 3 Orthographic Word Reading Test error analysis

The considerable difference in the number of DVF errors made by the student pre and post intervention may be attributed to explicit teaching in phonological knowledge. Readers rely on the distinctive visual features, such as the initial letter, when trying to decode an unfamiliar word. This is an unsophisticated strategy for word reading and can be due to the reader's lack of phonological knowledge. Not being able to break words into letters or letter clusters and being unable to attribute sounds to these letters prevents a reader from detecting when the sounds in the word they have read do not match the written symbols on the page.

Overall, Student 3 showed improved results in the segmenting assessment tasks, prose reading accuracy and increased the number of times that segmenting was used to decode words in prose reading, further evidence that the teaching of phonological knowledge improved this student's word reading ability.

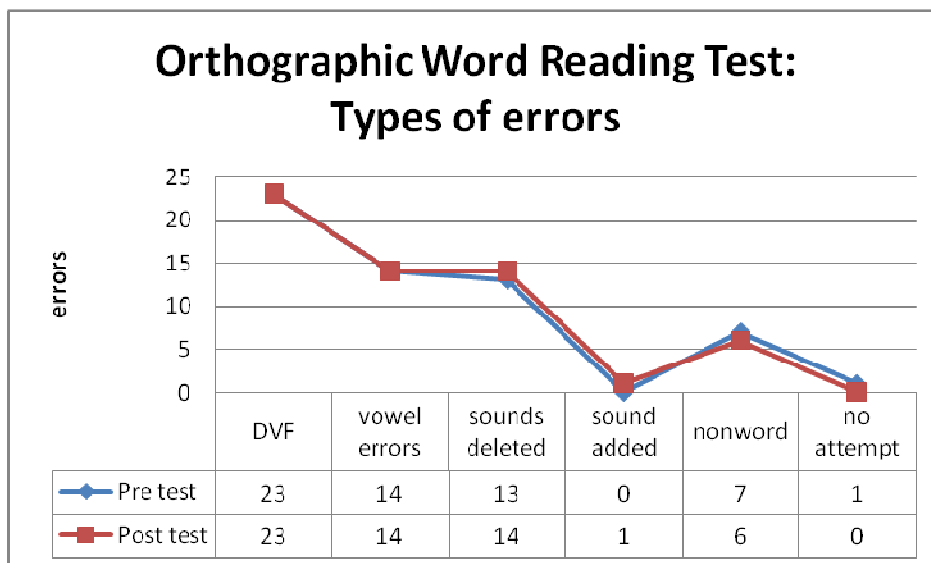


Table 9: Student 4 Orthographic Word Reading Test error analysis

Whilst student 4 made less errors overall in the post intervention assessment when compared to their pre intervention assessment, it is interesting to note that the types of errors made are consistent from pre to post intervention assessment. This student is an ESL student and has many dysfunctional representations of sounds. Vowel sounds are particularly problematic for

student 4. Furthermore, this student has a fairly small word bank of English vocabulary, this means that some non-word errors go completely undetected by the student as the student is not aware that there is no such English word.

Discussion

In this study the results indicate that explicitly teaching children to segment words into sounds and blend sounds into words, improves their ability to do these tasks. However there was not conclusive support for the hypothesis that improving phonological knowledge through teaching children to segment and blend leads to increased word reading accuracy in prose.

The obvious gains made by the teaching group in the skill of segmenting did not impact in any significant way to their word reading accuracy at prose level. Possibly the intervention lessons did not place enough emphasis on practicing the skills of segmenting and blending within prose reading. Gustafson cites a study in which 7 year olds who received phonological training only, made the greatest gains on phonological tasks and those 7 year olds who received phonological training along with reading instruction and letter sound matching instruction made the greatest gains in reading. However, the progress in reading made by this second group was mild and considered significant only when compared to the control group (Hatcher et al as cited in Gustafson 2000)

During the intervention sessions the students who were identified as having ESL backgrounds demonstrated a common misunderstanding. To varying degrees, these students did not have functional representations of many of the sounds encountered during the sessions. This made it difficult for them to separate words into individual phonemes. It also hampered their ability to correctly identify the number of sounds in a word. Vowel sounds, vowel digraphs and vowel/consonant clusters were particularly difficult for these students. Asking the students to identify where they could “feel the sound” (i.e. on their lips, in their throat) and to look and feel what their mouth and lips did when making the sound was useful to them and they were observed using this method on many occasions.

Analysis of the orthographic word reading test showed that some student's errors were a result of confusion or lack of knowledge of the various vowel sounds. Perhaps intervention which focused on this would have been better suited to these children and have shown greater impact on their word reading accuracy. It is certainly an area for further teaching and intervention.

The orthographic word reading test was used in this study as an insight into children's word attack strategies and how they used their phonological knowledge to help decode words. Analysis of this assessment gave insight into the types of errors children were making (e.g. based on distinctive visual features of the word or due to vowel confusion) and was to this end valuable. In hindsight a pseudo word reading test would have been a better choice of assessment tool for gaining evidence of children's ability to use phonological knowledge in word reading.

Little difference was noted in a comparison of the students self correction rate prior to intervention and post intervention. This again may point to the fact that the intervention was not explicit enough in teaching children to transfer the ability to segment and blend words into a word attack strategy when reading prose. The children in the intervention group made significant gains in segmenting and blending skills and may require further time and instruction in order to consolidate these skills and develop automatic use of them. A further complication may be that these students lack self monitoring skills and are not listening to what they read and checking for meaning as they go.

Gustafson (2000) states that by Year 4, students have been receiving formal reading instruction for a number of years and as a result they may have learnt to rely on strategies other than phonological knowledge for word reading. So it may be argued that the students in this study are relying on orthographic or meaning strategies to assist with reading. Closer analysis of individual results is required as many students are not correcting for meaning, whilst others are basing word attempts largely on the distinctive visual features of a word.

During the intervention sessions children had difficulty applying the segmenting skills they had learned to prose reading. In many cases they tended to once again rely on DVF for word attempts. For some children it was helpful to have small cards of paper which they used on the text to help them segment the words. Other children required reminders to look at all the letters in the word not simply the initial one or two.

The findings of this study, that in this case a clear improvement in isolated phonological knowledge tasks did not transfer to any real improvement in word reading accuracy in prose seem to be at odds with the assertions and findings of many authors and researchers (see introduction) who assert that improving phonological knowledge will have a direct bearing on reading ability.

However the results of this study do seem to support the conclusion made by Gustafson et al (2000) that “it is by no means certain that an improvement in phonological awareness is accompanied by an improved reading skill” (p158). The important difference between Gustafson’s study and the studies of differing findings is that Gustafson et al. worked with Year 4 students and the other studies involved younger students in their first two or three years at school.

Another interesting feature of the students in this study that has not been discussed is the high proportion of former Reading Recovery students. Future inquiry into how well these students retain and continue to use the skills and strategies for reading that are taught during Reading Recovery is important and could lead to the development of a support and monitoring process.

As stated in the introduction, reading is a dynamic and multi layered process and the results of this study tend to be supportive of good teaching practice, that is, interventions planned for low achieving students (particularly of the higher grade levels) need to take into account the many strategies readers draw upon in their everyday reading. Development and practice of these strategies must delivered in a way that replicates authentic reading and explicit links made between what the students are practicing and how this is useful in everyday reading.

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Appendices

Appendix 1: Intervention Lesson Outlines

Lesson 1

Focus: orally segmenting 3 sound words into separate sounds

1. Explain strategy: segmenting words into sounds
2. Demonstrate with 'cat'. Show the children a picture of the target word (eg picture of a cat NOT the written word) First say the word in a 'stretched out way' and then break into 3 sounds pushing a counter forward for each sound
3. Ask children to repeat this action using picture of a 'hat'. (Ensure that children say the word first, teach them that in order to hear sounds we must say them)
4. Practice as above with rat, cap, pig, bed
5. Ask children to generate more words with 3 sounds – record these words. Encourage the group to check each word that is suggested by moving their counters as they say the word
6. Repeat above process with, face, nose, feet,
7. Ask children to articulate their learning
8. Ask children to suggest how this skill might be helpful to them in reading and writing. Ask children to be aware and try to 'catch themselves' using this skill

Lesson 2

Focus: Orally segmenting words of 3 sounds. Match sounds to letters/letter clusters

1. Ask children to say what they remember from last lesson. Did any of them 'catch themselves' practicing the skill?
2. Revise segmenting words from previous lesson eg. Bed, pig, duck, fish (follow the outline of session 1 where teacher demonstrates and children then follow)
3. Demonstrate new procedure using picture of feet – show picture, orally segment word using counters, teacher scribes word onto whiteboard – children suggest how to spell
4. Discuss how some sounds are represented by more two or more letters
5. Children practice the above procedure using fish, feet, sheep, lake, sign
6. Ask children to articulate their thinking and doing process for peers
7. Discuss how this skill could be useful in reading or writing

Lesson 3:

Focus: To orally segment 3 sound words without the use of counters

1. Ask children to say what they remember from last lesson. Did any of them 'catch themselves' practicing the skill?
2. State today's intention: to separate words into sounds without using counters
3. Demonstrate with 'fish' – ie. Say the word slowly, hear and 'feel' the different sounds
4. Children practice with the word 'cake'
5. Ask children to articulate how they do this (shared learning)
6. Practise with make, take, ant, end
7. Play a game of round robin ; going around the table, one at a time children generate 3 sound words, when a child 'runs out' of words they are out.
8. Encourage children to check each others words
9. Ask children to articulate their thinking and doing process for peers
10. Discuss how this skill could be useful in reading or writing

Lesson 4

Focus: accurately segment more complex 3 sound words using counters if needed

1. Ask children to say what they remember from last lesson. Did any of them 'catch themselves' practicing the skill?
2. State today's purpose and remind children to think about where they hear and 'feel' the sounds
3. Demonstrate breaking of word: deer ie. Say aloud, separate orally
4. Children practice with fear, beer, gear, car, square, bowl
5. Game: pairs of children take it in turns to generate 3 sound words, score one point for each correct word, keep going until one team scores 10 points.
6. Encourage children to check each others words
7. Ask children to articulate their thinking and doing process for peers
8. Discuss how this skill could be useful in reading or writing

Lesson 5

Focus: orally segmenting 4 sound words into separate sounds (only move to 4 sound words when children are fairly automatic with 3 sound words)

1. Ask children to say what they remember from last lesson. Did any of them 'catch themselves' practicing the skill?
2. Revise segmenting 3 sound words and revisit 'feeling' sounds. Revisit complex words such as blow, snow, cry, dry, tire wire
3. State today's purpose and remind children to think about where they hear and 'feel' the sounds
4. Demonstrate saying and segmenting 'crab'
5. Children repeat
6. Talk about the tricky part of the word (cr) get children to articulate how they were able to segment this word

Lesson 6

Focus: to practice segmenting and blending in prose reading

1. Ask children to say what they remember from last lesson. Did any of them 'catch themselves' practicing the skill?
2. State today's purpose and ask children how they will work out words in the text that are difficult
3. Shared reading of 'Aramanga' pages 1 and 2 (text contains many words which would be unfamiliar to children yet make good examples for children to practise segmentation)
4. Look at one or two words in particular from text and discuss how we look at the whole word not just the first letters
5. Ask children to articulate their thinking and doing process for peers
6. Game: Round Robin this time children must generate 4 sound words
7. Discuss how this skill could be useful in reading or writing

Lesson 7

Focus: to practice segmenting and blending in prose reading

1. Ask children to say what they remember from last lesson. Did any of them 'catch themselves' practicing the skill?
2. State today's purpose and ask children how they will work out words in the text that are difficult
3. Shared reading of 'Aramanga' pages 3 and 4
4. Look at one or two words in particular from text and discuss how we look at the whole word not just the first letters
5. Ask children to articulate their thinking and doing process for peers

Lesson 8

Focus: to read individual words using skill of segmenting and blending

1. Ask children to say what they remember from last lesson. Did any of them 'catch themselves' practicing the skill?
2. State today's purpose and ask children how they will work out words that are difficult
3. Game: concentration. Pairs of words of 3 and 4 sounds are written onto cards and placed face down on the table, children turn over cards and must say the word correctly (aim: to find a pair and say it correctly) Most pairs wins.
4. Look at one or two words in particular discuss how we look at the whole word not just the first letters
5. Ask children to articulate their thinking and doing process for peers

Lesson 9

Focus: to practice segmenting and blending in prose reading

1. Ask children to say what they remember from last lesson. Did any of them 'catch themselves' practicing the skill?
2. State today's purpose and ask children how they will work out words in the text that are difficult
3. Shared reading of appropriate text
4. Look at one or two words in particular from text and discuss how we look at the whole word not just the first letters
5. Ask children to articulate their thinking and doing process for peers
6. Game: first one out! Teacher says a word (3 or 4 sounds) children must correctly identify if it has 3 or 4 sounds (may use counters if necessary). Go out if respond incorrectly. Winner is last child left in game

Lesson 10

Focus: Revision of what has been learnt

1. Ask children to say what they remember from last lesson. Did any of them 'catch themselves' practicing the skill?
2. Game: first one out! Teacher says a word (3 or 4 sounds) children must correctly identify if it has 3 or 4 sounds (may use counters if necessary). Go out if respond incorrectly. Winner is last child left in game
3. Revisit last text read and students demonstrate how they did and can use the skill of segmenting to work out unfamiliar words

Appendix 2: Resources used in intervention lessons

Aramanga text contained within *Whirlwind* (1993), New Zealand Ministry of Education, Learning Media Ltd, Wellington.

Pictures used as prompts from *Phonological Awareness language program*, date unknown, Catholic Education Office (Speech Pathology)