Does the Oxford Reading Pen Enhance Reading Accuracy and Comprehension for Students with Reading Difficulties in a Classroom Environment?

An implementation trial

Ian Johnson
Resource Teacher: Learning & Behaviour, Hokitika School

ABSTRACT

This article was undertaken to determine whether the Oxford Reading Pen (ORP) could enable students with reading difficulties to read and comprehend text at their chronological age. A small sample of students with reading difficulties was involved in a trial to ascertain the impact of using the ORP within their classroom reading activities. The results gained were positive and the potential of the ORP as an effective complementary tool for classroom use is discussed. The importance of carefully matching assistive technologies to student needs is highlighted as "one size does not fit all".

Practice Paper

Keywords

Assistive devices, classroom practices, dyslexia, evaluation, information and communication technology, learning difficulties, reading difficulties.

INTRODUCTION

This implementation trial set out to identify if the ORP is an appropriate and effective compensatory Information and Communication Technology (ICT) to assist students with reading difficulties in their classrooms. The aim of this study was to investigate if the ORP could be used by students independently in their classroom to:

- enhance comprehension
- increase reading accuracy
- enable reading for meaning at chronological age.

The writer approached the trial from the perspective of a practicing Resource Teacher: Learning and Behaviour (RTLB) seeking to identify if the ORP was an appropriate compensatory ICT for students with reading difficulties. Whilst a variety of ICT solutions are available to assist students with reading difficulties the ORP appeared to be able to assist such students at a fraction of the cost, with minimal training time and little classroom disruption. An experimental approach was used to test the effectiveness of the ORP during this small scale implementation trial.

BACKGROUND TO THE TRIAL

Many of the referrals RTLB receive are for students who require assistance and support with their reading. Whilst a variety of remediation programmes are readily available within schools, such as Rainbow Reading (Pluck, 1996) and Reading Recovery (Reading Recovery New Zealand, 2006), these interventions require time for students to develop their reading skills. In contrast, the ORP has the potential to enable immediate decoding and comprehension of unfamiliar vocabulary, allowing students to engage in reading at their chronological age immediately. This may help students with reading difficulties to avoid disengagement and disaffection, which are common features of students who are struggling to read (Dyslexia Foundation, 2007). Complementary ICTs such as the ORP have the potential to overcome such difficulties.

The ORP is claimed to assist people with reading difficulties (see Appendix) and as such, links closely with the Ministry of Education ICT policy which highlights the importance of people using ICT to participate fully in society, including school (Ministry of Education, 2003). With the recent recognition of dyslexia within New Zealand (Ministry of Education, 2007) and the government pledge to assist students diagnosed with dyslexia, ICTs such as the ORP may become more common within schools. This trial seeks to clarify the ORP's effectiveness in assisting New Zealand students to overcome reading difficulties.

ICTs combining text-to-speech software and scanners have been used in New Zealand since the early 1990s. The literature search examined studies which investigated ICTs which could assist people to overcome their reading difficulties. The majority of this originates in the United Kingdom (United Kingdom Parliament, 2007) and the United States of America (Slaughter, 2001). These countries have historically recognised and provided specific screening and ongoing support for students with reading difficulties and/or dyslexia.

Balajthy (2005) completed a study summarising the use of text-to-speech technology as it utilises scanning and speech technology. He identifies a range of literature which highlighted the success of computers and text-to-speech software in enhancing reading and comprehension. Balajthy identifies that students with the greatest difficulties make the best gains using these sorts of technologies. An important factor highlighted is the close matching of the user's needs with the technology they are to use. As an example, Balajthy identifies that text-to-speech software is more successful for students with low reading ages, but that students with attention deficits do not generally do any better when using the ICTs.

Higgins and Raskind (2005) investigated the effectiveness of one compensatory option, the ORP, for increasing the comprehension of students with learning difficulties. They identify a variety of research that shows the ORP as a viable tool for compensating for reading deficits with American students. Their study used a sample of 30 students, training them over two weeks to use the ORP. They received comprehension tests with and without the ORP and the results were compared. Their results indicated that the students did increase their reading comprehension with the use of the ORP and that it could be used successfully across curriculum subjects by a variety of students at high school.

Within the research presented above there was wide praise for the gains which occur in reading comprehension when text-to-speech software is utilised. The only issue raised by the authors related to a mismatch between equipment and the users' needs. This should not be seen as a criticism of the use of ICTs, rather that of improper implementation. Balajthy (2005) identifies a major problem when utilising laptops or text-to-speech software and scanners being the time for preparing the equipment and training, as well as the expensive purchase price.

ICTs are not only valuable in aiding comprehension, but outcomes of studies suggest that, when used appropriately, ICTs can facilitate other outcomes. The British Educational Communications and Technology Agency (Becta, 2004, 2007) identifies that ICT can motivate children with specific learning difficulties to acquire literacy skills and give support across the curriculum. They add that ICTs such as text-to-speech software (handheld or tabletop), spellcheckers and wordlists can also foster integration within the classroom and enhance student independence and self initiated learning. These are described by Becta as the hidden benefits of portable ICTs.

Perry's (2003) research on the use of Personal Digital Assistants (PDAs) within schools supports the ideas of Becta (2004, 2007). This is relevant as Personal Digital Assistants are small handheld devices which are relatively inexpensive and have positive impacts upon student learning. In this respect they may be seen as comparable to the ORP. With this in mind, pedagogy must be developed around their use in schools as has been for graphical calculators. For instance, could handheld devices be used instead of a human reader in examinations?

The ORP has the ability to be used only as a text-to-speech device with the dictionary switched off and locked by the password feature. This could enable a student with reading difficulties to work independently of a human reader, although they still could not be used in examinations as presently there are no guidelines for use. This is an ongoing issue with new compensatory ICTs as the technology outpaces the processes which need to be developed for the usage within examination situations. Luckily, reader-writers are available and students with reading difficulties can use their complementary ICTs at other times.

Perry (2003) indicates that many schools aim to have students accessing school websites (for homework for instance) and that PDAs could be used to achieve this. ORPs could enable students to access their homework and school tasks independently as long as they are presented in a manner in which the ORP could recognise the text. This would certainly be a cheaper method for both families and schools to enable students with reading difficulties to access age-appropriate homework tasks.

Finally, Becta (2004) indicates that a variety of factors must be considered when using portable ICTs such as adequate training for staff and students, as well as ongoing commitment from teacher, parents and student. This aspect, along with Higgins' and Raskind's (2005) article, helped shape the training aspect of this trial.

METHODOLOGY

Description of the ORP

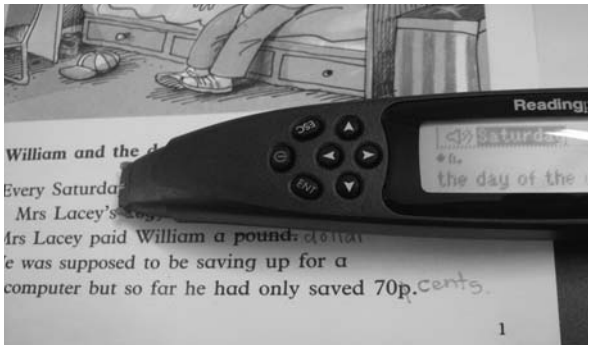
The ORP is of similar size to a board marker and uses two AAA batteries. It combines Optical Character Recognition technology with an on-board scanner, speaker and liquid crystal display window. It is able to scan printed text and read either individual words or sentences the user wishes to read (see Appendix for a full description).

Why was the ORP selected?

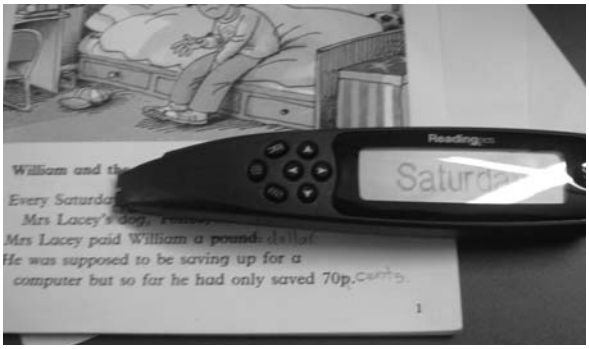
For a number of years, the writer has been using a variety of compensatory ICTs to assist students with reading and written output including predictive text, speech recognition, laptops and text-scanning software. When matched correctly to a student they are highly effective. The major barriers to successful implementation are the cost of the software and hardware, as well as the training time for the student and the adults around them. A further barrier faced by high school students is that of mobility as a laptop, scanner and headphones takes time to set up in each class and are difficult to move around school.

The ORP came to the writer's attention following a conversation with a colleague who recommended it. Following a quick demonstration and "hands on" experience, and an exploration of relevant research, the potential of the ORP to assist students with reading difficulties was apparent and one was purchased to trial in the RTLB cluster. Higgins' and Raskind's (2005) study provided a framework for this trial and clarified the writer's ideas with regard to how the trial could be implemented.

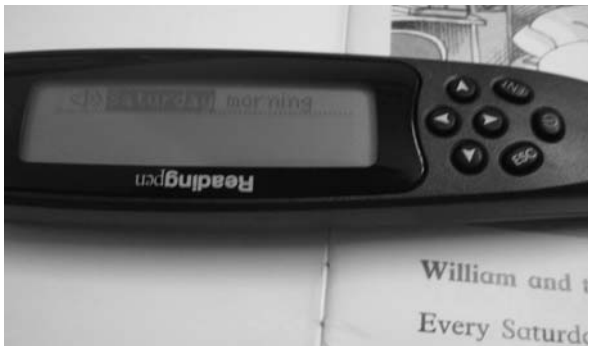
Saturday has been scanned and definition is displayed.



Saturday has been scanned and is displayed in large text.



ORP in left hand format – note screen reversal.



ORP in left hand mode being used to scan.

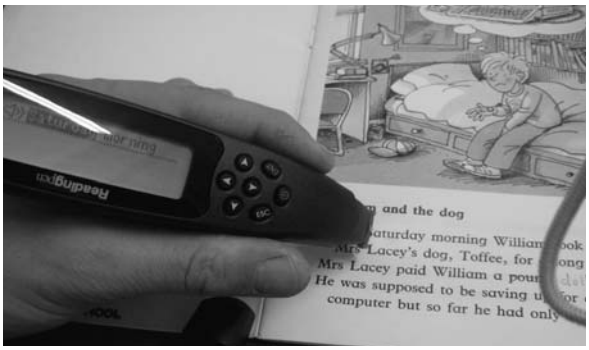


Figure 1. Pictures of the ORP in use. (Pictures courtesy of Westland RTLB)

An initial literature search located a study completed by Hardy (2004) who did not identify how she had obtained her viewpoints on the ORP, yet highlighted some potential pitfalls for this trial. She notes difficulties with scanning if the ORP is not held correctly, especially if the user does not have good motor skills. A further difficulty identified is that of the ORP only scanning from certain papers and being not appropriate for scanning large tracts of text. These views I feel are not well-founded as the ORP instruction manual highlights what it is possible to scan and how much it will scan in one attempt.

Selection of Participants

Four students who were already participating in reading remediation programmes were selected as subjects. The sample of four students represents a quarter of the writer's current cases. All four students were open RTLB cases on the writers caseload and are referred to as Students or 'S' 1-4 in this article. All the students were selected because they were reading below their age. The students were of different chronological ages to each other, enabling a wider cross section of users to be assessed. Gender differences were not considered relevant to this trial: three boys and one girl were selected.

Excellent relationships were already established with the students, teachers and their parents. The writer approached the teachers and parents, and explained the scope of the trial and demonstrated the ORP to them. Permission was gained from all parties and the writer asked each student if they were willing to participate, following a clear explanation of what was to occur. All four students agreed to participate verbally and written consent was gained from the teachers and parents.

The ethical dimension of testing the students' reading accuracy and comprehension at their chronological age may be questioned: all students were reading more than 1.5 years below their chronological age (all participants, parents and students were made aware of this prior to participation in the trial). It was important to test at the chronological age for a variety of reasons. Firstly, the students were presented with chronologically appropriate written material during their school day as it was an aim of the trial to identify if the ORP could help them overcome their difficulties.

Secondly, by using the ORP with the texts at their chronological age, the pre-ORP trial identified the difficulties experienced by the students on a daily basis and enabled a direct comparison to be made when they used the ORP. Thirdly, the students were well aware that they struggled with reading at their age and it was important for them to identify during the post-trial questions if they felt the ORP helped them. A final ethical consideration was that of the students being trained and tested within their regular classroom. This may have been an issue for the students so it was discussed with them prior to their agreeing to participate. It was important as the writer sought to identify if the ORP could be used effectively within a busy classroom environment.

This trial aimed to assess the potential benefits of using the ORP within the writer's cluster to enable an informed decision about its utilisation within cluster schools. Readers may relate this trial's findings to their situation but should be aware that the sample size of this trial is limited and is relevant only to the writer's cluster.

Data Collection

Baseline data was collected on the students' reading and comprehension levels using the Prose, Reading, Observation, Behaviour and Evaluation of Comprehension (PROBE) (Pool, Parkin & Parkin, 1999) assessment in the pre- and post-experimental phases.

Each student received a PROBE test at their chronological age within their regular classrooms. Following this, a one-to-one training session with the writer on using the ORP was conducted, again within their respective classrooms. By the end of their sessions all the students were able to scan effectively and use the basic functions readily. The students were then given the ORP to use for a day each within their classes. Time constraints only allowed for one day's practice for each student.

The following week the students were again visited by the writer individually in their regular classroom settings and given the ORP for a five minute refresher session and then tested again using a different PROBE at the same reading level. The students were then asked questions about their experiences and thanked for their participation. Quantitative data (PROBE testing) and qualitative data (individual interviews) were combined to evaluate the effectiveness of the ORP.

ORP Training Outline

All individual training sessions took place between 0900 and 0930 enabling all four students to practice with the ORP for the remainder of the day. The training session covered demonstration and hands-on practice scanning text, and adjustment of the ORP to match left- and right-handed users. Following this, scanning of individual words and then sentences was practised along with their playback. The students were instructed how to use the definition and history features as well as connecting and using the headphones as required. Finally, the students were left with the ORP for the remainder of the day to practise using it.

Each student was asked six questions to gather insight into what they thought of the ORP. Each student was asked to describe what they thought of it, what they liked about it, how they thought it could help them, if they would use it with their peers around them, if there were any problems and finally, if they had $500.00 of their own money, would they buy an ORP?

RESULTS

The results were analysed and shared with the students, teachers and parents.

Figure 2 compares the chronological age, reading accuracy with and without ORP, self correction and comprehension scores for all four students. Figure 2 indicates that all four students increased their reading accuracy when using the ORP. Students 1, 3, and 4 also show increased comprehension scores when using the ORP. Conversely, Student 2 shows a significant decline in comprehension.

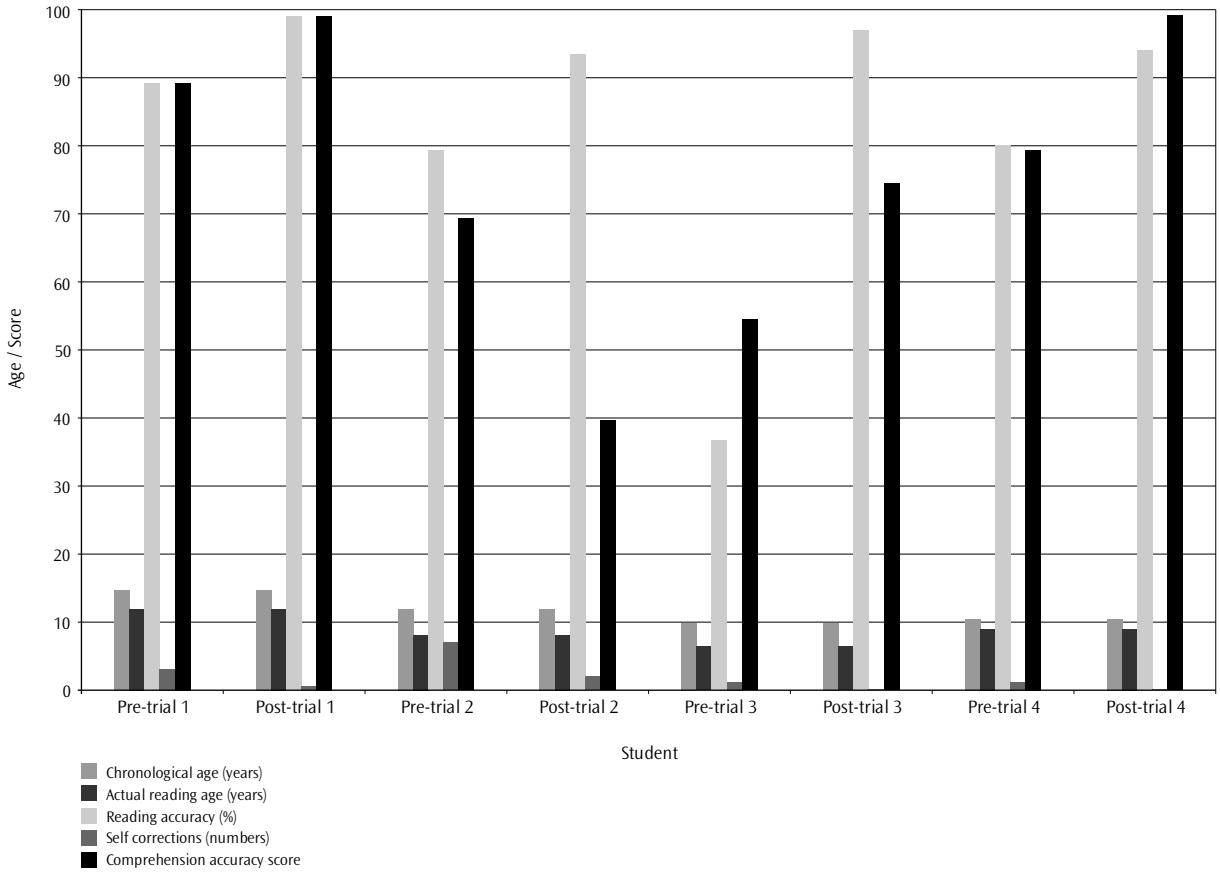


Figure 2. Reading Accuracy and comprehension scores using the PROBE student assessment.

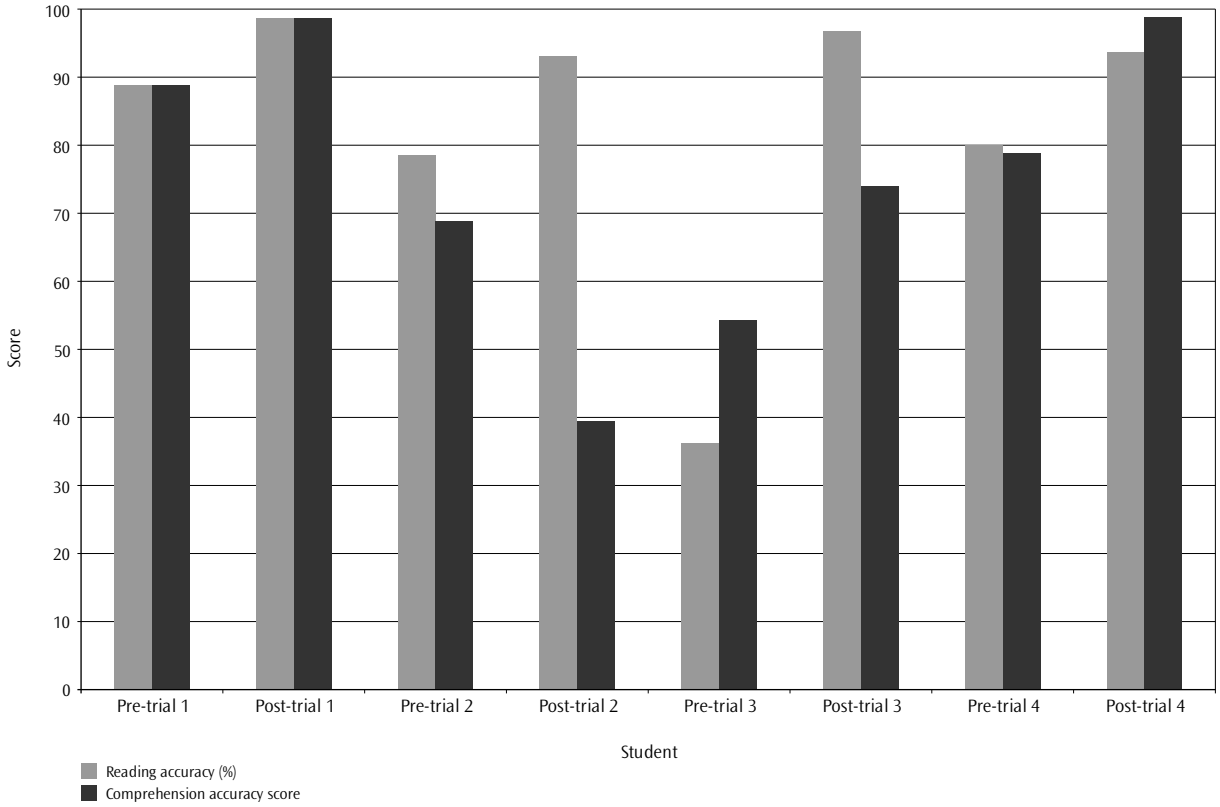


Figure 3. Reading accuracy and comprehension results with and without the ORP.

Figure 3 shows pre-trial and post-trial reading accuracy and comprehension results with and without the ORP. Student 1 gained 100% reading accuracy and comprehension when using the ORP, whilst Student 2 showed a 15% increase in reading accuracy with the ORP yet reading comprehension declined by 30%. Student 3 had a 60% increase in reading accuracy with the ORP and an increase of 20% in reading comprehension. Student 4 results show a 12% increase in reading accuracy with the ORP and enhancement of reading comprehension by 20%.

Figure 4 shows some of the student comments regarding their experiences when using the ORP. Positive comments from the students indicated that they felt the ORP helped them to read and understand more text. The comments show that the use of the headphones to assist hearing was down to personal choice, rather than students indicating it was better with or without them. Some preferred headphones whilst others did not utilise them. The students identified the ORP could be used in all subjects and at home and school. They added that it was acceptable to use with their peers around, with one indicating that he would ask his friends to read the definitions to him.

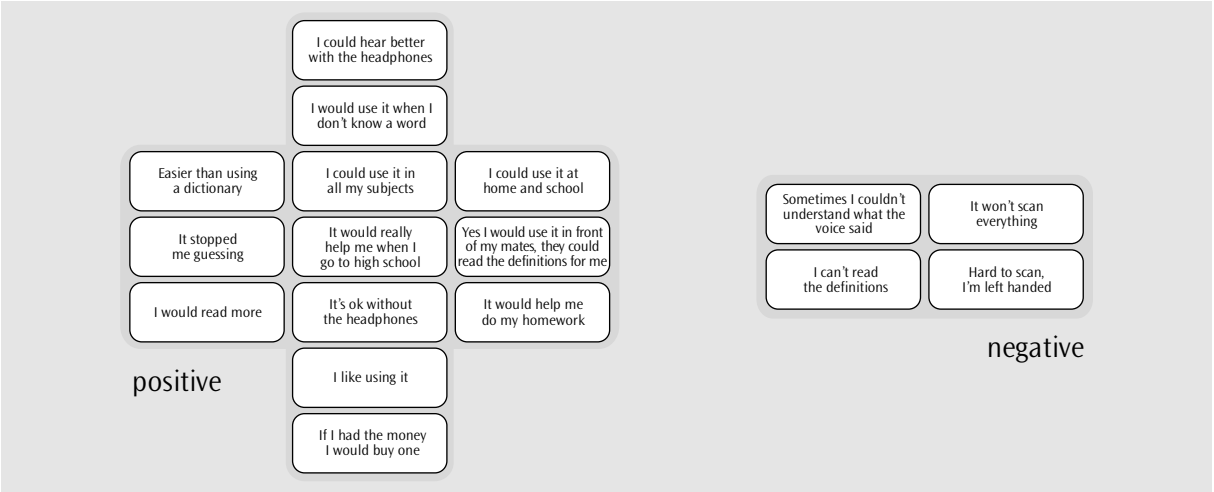


Figure 4. Summary of student comments following the use of ORP.

Negative comments included students indicating that the speech was difficult to understand at times and that they could not read the definitions. Other criticisms included difficulty with the scanning process and the fact that the ORP did not recognise all texts.

DISCUSSION

The ORP was successfully utilised within the regular classroom by all the students with a high degree of independence. Students indicated the perceived assistance they felt the ORP gave them was well-founded, as is supported by the PROBE results.

Although on trial the speech output appeared to be too quiet for the classroom even with the headphones, the results gained indicate that the students could hear and understand the pronunciation. Whilst headphones were offered for the PROBE test, none of the students used them. The speech output of the ORP was well-below the general noise level in the class. Initially, the students did comment that the pronunciation was difficult to understand at times but by the end of the practice they all reported that they could understand when they used the strategies they had been shown. These included replaying the speech, getting the ORP to say each letter in the word on its own and, as a last resort, asking a teacher or peer. This again highlights the importance of training users of ICTs to allow successful utilisation.

The results indicate that the mobility of the unit is also extremely beneficial to the students. Whilst they only used it independently for a day, their comments indicate that they believed they could utilise the ORP across the curriculum. They also indicated they would use it for homework and leisure reading and that they were excited about using it. Unlike the scanner and laptop combination mentioned earlier, and similar to the PDAs, the ORP lends itself to high mobility allowing easy use between home and school. A further benefit, as with the PDAs, is the relatively cheap price – making it accessible to more families and schools. A further highly beneficial feature is that the ORP can be carried in a pocket and is operated by batteries which means no larger desk or power points are required, minimising its impact on the classroom environment and enabling the user to settle to work quickly with no inconvenience to the teacher or peers.

All the students were able to increase their reading accuracy, being able to read text at their chronological age. Three of the four students also increased their reading comprehension at this level. However, Student 2's reading comprehension was significantly lower using the ORP. This result may have been influenced by Student 2's poorer fine motor skills. Student 2 took much longer to complete his PROBE test using the ORP. He appeared to concentrate more on the scanning process than the material he was reading which may be the cause of the poor comprehension score.

A further aspect which may have influenced Student 2's performance is that of excessive cognitive load. Miller (2007) defines cognitive load theory as the effect of overload on the working memory. Miller suggests that "overload" can occur when acquiring any new skill. In the case of this trial, the students had only a short training session on the ORP, meaning that the use of the tool required a high degree of conscious planning. The student was required to not only recall the contents of the article but to remember how to use a new piece of equipment. The load on the working memory was possibly too high for this particular student.

Further research is required but the results indicate that three of the four students were not affected by excessive cognitive load as their accuracy and comprehension scores improved. This again indicates the ease of the ORP's use and the effectiveness of a short, structured training plan. This has positive implications for the ORP's use within the school setting as many of the complications implementing new ICTs are removed by reducing training time such as staff training costs, withdrawal of students from class, frustration when learning how to use the equipment, and prerequisite ICT knowledge.

As identified earlier, technology must be closely matched to individuals for the best outcomes. The scanning position is supported by a plastic guide and the students certainly required assistance to begin scanning in the correct position. Following the training session all the students were able to scan effectively without the guide. A week later, following their refresher, three of the students scanned with no difficulty.

A further issue for Student 2 was that he was left-handed. A feature of the ORP is that the screen can be flipped, allowing left-handed people to scan with their left hand. This was found to be an important feature as some left-handed people are quite ambidextrous, as was Student 1. Student 2 found using his right hand very difficult so the ability to scan with the left hand was of great assistance, although it is apparent that he needs to further develop his fine motor skills to use the ORP more effectively.

CONCLUSION

Overall, analysis of the results highlight the many benefits of the ORP as identified by Becta (2004, 2007). The students' comments indicate that the ORP fosters independence, confidence and enthusiasm which all assist inclusion (Booth, Ainscow, Black-Hawkins, Vaughan & Shaw, 2000) enabling the student to read and understand at their chronological age. Students with reading difficulties commonly lack such traits (Dyslexia Foundation, 2007) which are inherently important for successful learning. From the evidence presented in this study it would seem the ORP not only enhances reading ability but also fosters the features commonly associated with successful independent learning, enabling the students to function effectively at school and in the wider community.

This trial has identified that the ORP is very effective after a short training time. Further studies comparing the results gained with the aforementioned ICTs may be conducted to clarify this viewpoint. From the writer's experience it does seem that the ORP is an economical and effective compensatory ICT. Hardy's (2004) comments outlined earlier seem unfounded by this trial aside from the difficulties of a user with limited fine motor skills (as Student 2). This trial found no issues with scanning effectively once the students

had been trained. In contrast to Hardy's (2004) findings, Student 3 scanned almost his whole PROBE assessment and increased both his comprehension and accuracy scores. This was achieved a line at a time as outlined by the ORP manual (Quick-Pen, 2007).

The independence the students demonstrated within such a short time using the ORP was astounding. To be able to read independently for meaning at their chronological age with a day's training on an ICT is indicative of its effectiveness. Three of the students required no further assistance prior to their second PROBE assessment when they used the ORP. They picked up where they left off. Student 2 required some coaching. The only general issue identified by the students in general which affected them using the ORP is that of reading the definitions provided on screen. Whilst this can be read aloud by the ORP, the students in general still found it challenging at times. When asked how they would get round it they commented they would ask a peer or adult.

The trial used a small sample size of students of four different ages. The results indicate that the ORP can be used effectively across a range of students ages (see Figure 2) between 10 and 15 years, supported Higgins' and Raskind's (2005) results. Although the students had varied levels of skills with ICTs, it would seem that there are very few prerequisite skills needed to ensure success with the ORP. One factor which appears to affect successful use is that of motor skill ability. With careful trialling and training the appropriateness of the ORP for individual students would be established (Balajthy, 2005).

This implementation trial has identified that the ORP does increase reading accuracy and comprehension for students with low reading ability. With its cheap price and simple operation, it lends itself to quick and easy implementation for a wide range of students who find reading a challenge. Such simplicity and ease of implementation negates many of the problems associated with more bulky, expensive and complex ICTs which require weeks of training and lots of preparation time. As one student commented, "I liked using it" and another added "I would read more", the ORP appears to be an appropriate and effective compensatory ICT which can be recommended for use in the writer's cluster schools. The trial indicates that the ORP is an ICT which can assist students to participate within school and society (Ministry of Education, 2003) and as such, its potential for assisting students with reading difficulties should be embraced.

POSSIBLE IMPLICATIONS FOR PRACTICE

The ORP may be used in a variety of ways. In examinations (with the dictionary secured) or silent reading there is no reason why headphones could not be insisted upon . The ORP could be easily switched between students if a teacher or teacher aide was working with a number of students as the history can be deleted in seconds along with altering the scanning mode for left/right handed students. The ORP is possibly an excellent "first" assistive ICT. If a student is introduced to the ORP and they progress well and are enthusiastic about its use, it may provide a springboard for them to use other more complex assistive ICTs later in their school lives.

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AUTHOR PROFILE

Ian Johnson

Ian Johnson

Ian Johnson is an RTLB working within the Westland cluster based in Hokitika. He migrated to New Zealand 7 years ago following 10 years teaching in English mainstream and special schools. Since arriving in New Zealand he worked for GSE as a Special Education Advisor with responsibility for ORRS students and Assistive Technology. He has recently completed his Masters of Education from Victoria University of Wellington, following his RTLB training.

Email

rtlb_ian@hokitika.school.nz

APPENDIX
Features of the ORP (Quick-Pen, 2007).

New Reading Pen *Oxford*

The Reading Pen *Oxford* was designed for people with reading or learning disabilities, such as dyslexia. It is also useful for people who are learning English, or want the ultimate convenience of having a dictionary at their fingertips.

The pen contains the 240,000 word Concise Oxford English Dictionary. It assists users by providing a definition of the scanned word or line of text, as well as reading both the words and definition aloud using its miniaturized text-to-speech technology. Individual words are enlarged on the display, and words may be spelled out, or broken into syllables. If a person is reading and comes to an unrecognized word, the user can simply scan it, and the word will be spoken in British Real Speak. Because of its complete portability, this pocket-sized reading technology can be used where and when needed.

FEATURES:

- Concise Oxford English Dictionary, over 240,000 words including countries, weights and measures
- SMS (Short Message Service – the shorthand used for sending text messages on cell phones)
- Speaks with Scansoft, British Real Speak
- Has special "Test Mode" that allows the dictionary definition lookup function to be switched off for use during tests
- New menu structure makes frequently used options easier to access
- Captures text within seconds (over three times faster than our original Reading Pen)
- Improved accuracy
- Displays and speaks dictionary definition
- Single word/Full line scanning
- Large character display
- Reads words aloud
- Recognizes 6-22 point size text, bold, italic, underlined, inverted text
- Scans left to right, and right to left
- Displays syllables
- Spells words out loud
- Keeps a history of scanned words
- Defines word within the definition (cross-reference)
- Adjustable for left and right handed users
- Ergonomic 6" x 1 1/2" x 1", lightweight - 3 oz.
- An Opticard lets you input text manually

Comes complete with:

- User Manual
- Quick Reference
- Card Carrying Case (plastic) with Opticard
- Earphone
- 2 "AAA" batteries

The Oxford Reading Pen is available in New Zealand for $NZ 489.00 (supplier: www.workandstudytech.co.nz).