EDUC 572

ICT in Schools and Centres: Theory, Practice and Implementation

Assignment 2 - Option A

An implementation trial:

Does the Oxford Reading Pen enhance reading accuracy and comprehension for students with reading difficulties in a classroom environment?

Presented by

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Introduction and scope of this trial

This implementation trial sets out to identify if the Oxford Reading Pen (ORP) is an appropriate and effective compensatory ICT to assist students with reading difficulties in their classrooms. The trial seeks to clarify if the ORP can satisfy four key questions:

Can the ORP,

- be used independently by a student within their classroom?
- enable reading comprehension to be enhanced?
- increase reading accuracy?
- enable students to read for meaning at their chronological age?

The writer approached the trial from the perspective of a practicing RTLB seeking to identify if the ORP is an appropriate compensatory ICT (*an ICT which assists a person to overcome a difficulty*) for students with reading difficulties. An experimental approach was used to test the effectiveness of the ORP during this small scale implementation trial.

This trial is relevant because many of the cases the writer receives are for students who require assistance and support with their reading. Whilst a variety of remediation programs are readily available within schools such as; Rainbow Reading (Pluck, 1996) and Reading Recovery (Reading Recovery NZ, 2006) this does not enable such students to readily engage in reading at their chronological age. Disengagement and disaffection are common results of students who are struggling to read (Dyslexia Foundation, 2007).

The ORP is claimed to assist people with reading difficulties (*see appendix one)* and as such links closely with the Ministry of Educations ICT policy which highlights the importance of people using ICT to participate fully in society including school (MOE, 2003). With the recent recognition of dyslexia within New Zealand (NZ)(MOE, 2007) and the governments pledge to assist students diagnosed with dyslexia ICTs such as the ORP may become more common within schools, this trial seeks to clarify the ORPs effectiveness in assisting New Zealand students to overcome reading difficulties.

Identification of theory which informs this implementation trial:

Whilst ICTs such as laptops combining text to speech software and scanners are common in many Western countries (*as is the ORP*) they are only now beginning to be used in NZ. The literature search conducted found that the research completed relating directly to this implementation trial originates only in the U.K (U.K. Parliament, 2007) and the U.S.A. (Slaughter, 2001), both countries which have historically recognised and provided specific screening and ongoing support for students with reading difficulties (dyslexia).

Appendix one informs the reader of the full features of the ORP. It is of similar size to a board marker and runs two triple A batteries. It combines Optical Character Recognition technology with an on board scanner, speaker and LCD window. It is able to scan printed text and read either individual words or sentences the user wishes to read. It is available in New Zealand for $489.00 (NZD) (supplier: www.workandstudytech.co.nz).

A study which tested the effectiveness of the ORP was completed by Higgins and Raskind (2005) which tested its effect upon 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 and trained 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. This study informed the framework of this trial and clarified the writer's ideas with regard to how the trial could be run.

Balajthy (2007) completed a study summarising the use of text to speech technology which is relevant to the ORP as it utilises scanning and speech technology. He identifies a range of literature which highlighting the success

of computers and text to speech software in enhancing reading and comprehension. He 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 users needs with the technology they are to use. As an example he identifies that text to speech software is more successful for students with low reading but that students with attention deficits do not generally do any better when using the ICTs. Students with only reading difficulties were selected for this trial due to this.

Within the reports presented above there was wide praise for the gains possible by utilising the various text to speech software and ORP where reading comprehension was concerned. The only issue identified related to a mismatch between equipment and the users needs which is not a criticism of the ICTs but more how they were implemented and should not be seen as a negative aspect of the ICTs concerned. Two further studies were located indicating some further concerns. Balajthy (2007) identifies a major problem when utilising laptops, text to speech software and scanners is that of preparation time for preparing the equipment and training as well as expensive purchase prices. Perhaps the ORP can circumvent these issues as it is readily portable and easy to use?

Further concerns are identified by Hardy (2004) who does not identify how she has obtained her viewpoints on the ORP but her comments do inform potential pitfalls for this trial. She writes of 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 is 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.

The use of the ORP may have other less measurable subjective benefits which the verbal questionnaire aims to identify. BECTA (2004; 2007) identify that ICT can motivate children with specific learning difficulties to acquire literacy skills and give support across the curriculum. They add that

it can also foster integration within the classroom and enhance student independence and self initiated learning. Items such as text to speech software, spellcheckers and wordlists are all identified as well as the ORP highlighting the hidden benefits of portable ICTs.

Perry's (2003) research supports the ideas mentioned above, he explores uses of PDA's (*handheld computers*) within schools. This is relevant as PDA's 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 a pedagogy must be developed around their use in schools as has been for graphical calculators. For instance could they be used instead of a human reader in examinations.

The ORP has the ability to only be used 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 they still could not be used in examinations as there is no guidelines for their use as they are new technology. 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 human readers are available and students with reading difficulties can use their complimentary ICTs at other times.

Perry (2003) indicates that many schools aim to have students accessing school websites for homework for instance and that PDA's could be used to achieve this. If ORPs are successful they will 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) indicate that a variety of factors must be considered when using portable ICTs such as; adequate training for staff and students, commitment from teacher, parents and student. This aspect along with

Higgins and Raskind's (2005) article helped shape the training aspect of this trial and the information sharing with the parents, teachers and students as will be described in the next two sections.

Description of activities during this implementation trial:

Following a conversation with a dyslexic colleague who recommended the reading pen the writer purchased one to trial within his RTLB cluster. The writer familiarised himself with the ORP. Following this four students who were already participating in reading remediation programs were selected as subjects for the study.

All of the students were open cases on the writers caseload and will be referred to as Students or 'S' 1-4 for the duration of this paper. Excellent relationships were already established with the students teachers and their parents. The writer approached the teachers and parents explaining 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 (*see log)*, all four students agreed to participate enabling informed consent to be obtained from the students, teachers and parents as well as written consent from the parents and teachers to be acquired.

The ethical dimension of testing the students reading accuracy and comprehension at their chronological age may be questioned as it was indeed challenging for them as all of them were reading more than 1.5 years below their chronological age. All students, parents and teachers were asked for their permission for the trial to take place and this issue was discussed with them. It was important to test at chronological age for a variety of reasons. Firstly, the students were presented with chronologically appropriate written material during their school day so it was an aim of the trial to identify if the ORP could help them overcome their difficulties. All parties agreed that no harm would occur from the students participation in testing at this level

following the writer's explanation of what was to occur and why it was important.

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 them agreeing to participate. It was important as the writer sought to identify if the ORP could be used effectively within a busy classroom environment.

The sample of four students is representative of the writers cluster and as the writer works with sixteen cases represents a quarter of current cases. This trial aimed to assess the potential benefits of using the ORP within the writers cluster to enable an informed decision about its utilization within cluster schools. Readers may relate this trials findings to their situation but should be aware that the sample size of this trial is limited and is relevant only to the writers cluster.

All of the students were selected because they were reading below their age. The students were of a different chronological age 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. Baseline data was collected on the students reading and comprehension levels using Prose Reading Observation, Behaviour and Evaluation of Comprehension (PROBE) (Pool, Parkin & Parkin, 1999) assessment and were used 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 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 days practice.

The following week the students were again visited by the writer 1-1 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 (*see log*) and thanked for their participation. The combination of both quantitative data (PROBE testing) and qualitative data (verbal questioning) aimed to provide a greater depth of information from the trial.

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

Log of activities:

Date	**Activity**	**Relevance**
20- 24.08.07	Writer received ORP and familiarised himself with its use Implementation trial plan was developed Writer selected trial subjects and contacted teachers, parents and students and explained trial plan and gained permissions	Enabled training plan to be developed Enabled information to be provided to students, parents and teachers facilitating permissions being granted
27-31.08.07	Existing data analysed and appropriate PROBE assessments prepared at students chronological age PROBE assessment for each student took place 1-1 within their classrooms followed by training on the use of ORP (*as detailed in training outline below*). Students left with ORP for the remainder of the school day to gain further familiarity	Preparation for the test phase of the implementation trial Enabled baseline data to be gathered and ensured students had ample training in the use of ORP. A further aim of locating the ORP training within the classroom was to insure the students could hear the speech function and experience using it in a real situation
03-07.09.07	Students received 5 minutes refresher on ORP and were then retested on second PROBE assessment at their chronological age using the ORP at their own discretion. No guidance was provided by the writer. Upon completion the students commented upon the questions presented below (*comments in summary of student comments*)	Ensured that students could recall how to use the ORP. The second PROBE assessment provided the quantitative data on the effects of the ORP upon reading accuracy and comprehension. The verbal questioning aimed to provide qualitative data about how the students felt about using the ORP and how their perception of the usefulness of the ORP matched

	Results were analysed and shared with parents, teachers and students	their actual scores on the PROBE Identified if the ORP had assisted the students and enabled parents and teachers to make informed decisions about the possibility of providing an ORP for their child/ student

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.

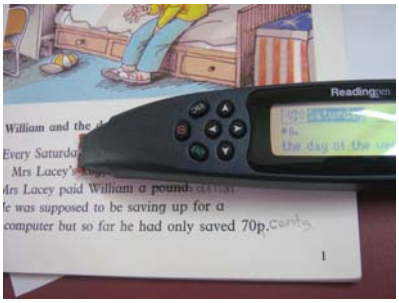
Items covered during the sessions were:

1. Demonstration of scanning and voice
2. Adjusting the ORP to scan with left or right hand to suit each student
3. Training student how to scan words and then sentences
4. How to playback individual words and whole sentences
5. How to access definition and history and examples of how these could assist
6. The option of headphone use and how to attach them
7. Students were left with the ORP to practice for the remainder of the day

Questions asked to each student following their second PROBE assessment:

1. What did you think of the ORP?
2. Tell me what you liked about it?
3. How do you think it could help you?
4. Would you use it in class with your mates?
5. Was there any problems when you used it?
6. If you had $500.00 of your own money would you buy one?

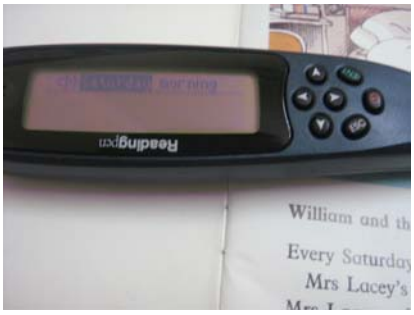
Pictures of the ORP in use:



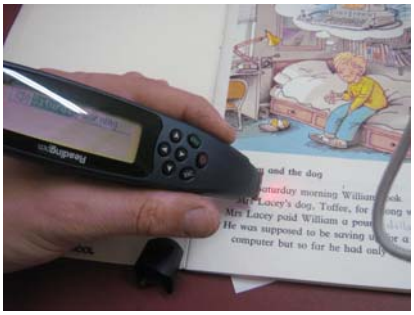
Saturday has been scanned and definition is displayed



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

Results:

The results were analysed and compiled by the writer and are shown in graphs and a summary with commentary during this section. The raw scores are available in appendix two.

Figure 1:

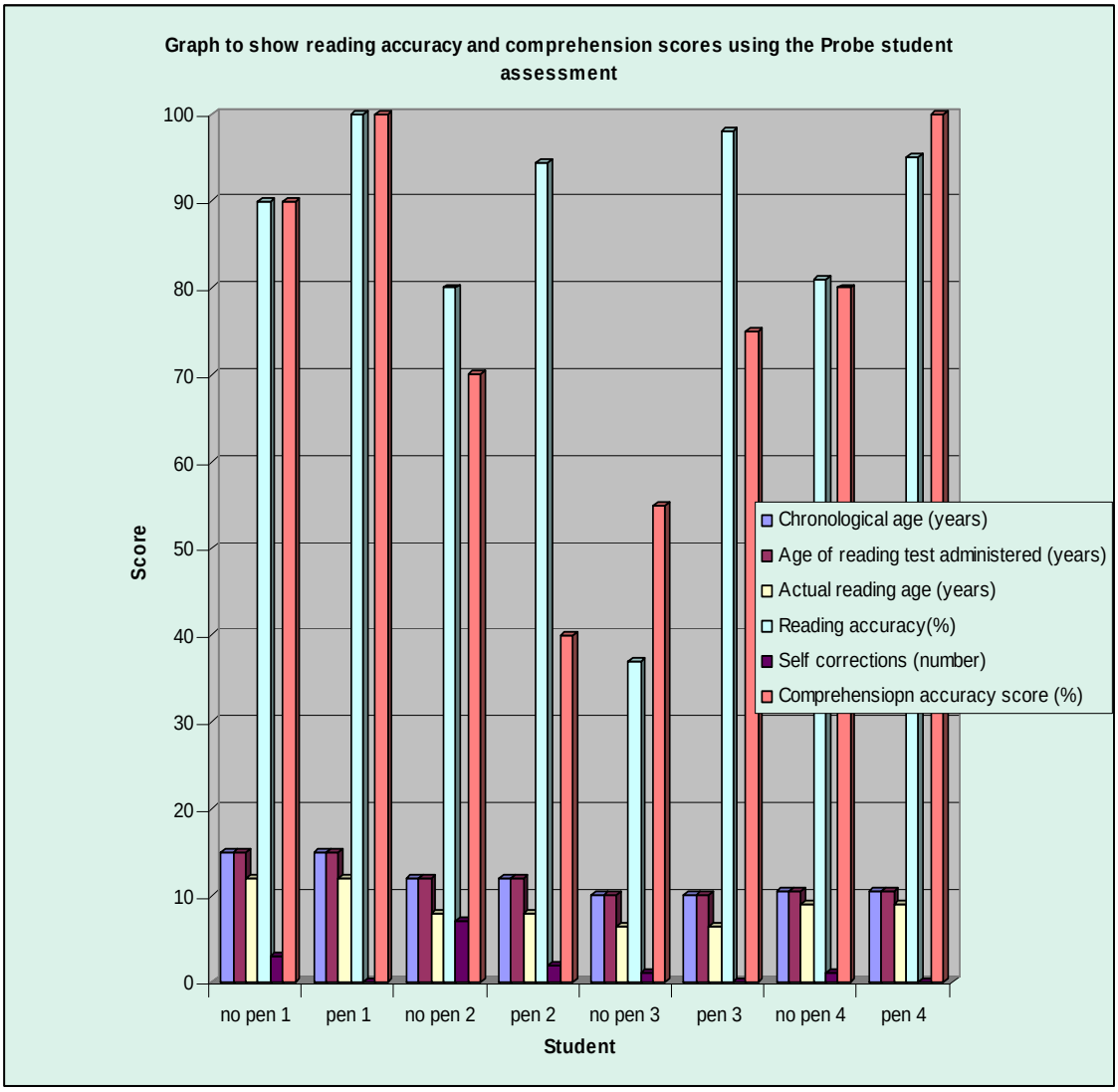


Figure 1 interpretation:

- Compares the chronological age, actual reading age and without and with ORP reading accuracy, self correction and comprehension scores for all four students
- all four students show increases in reading accuracy when using the ORP
- Students, 1, 3, and 4 show increased comprehension scores when using the ORP
- Student 2 shows a significant decline in comprehension when using the ORP

Figure 2:

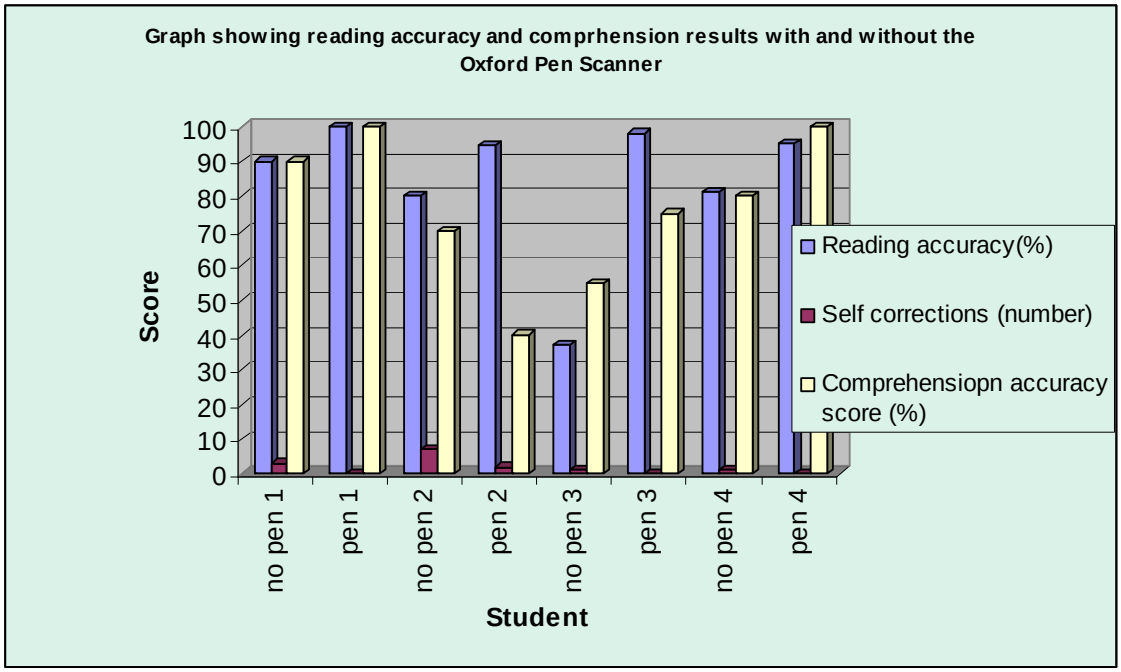
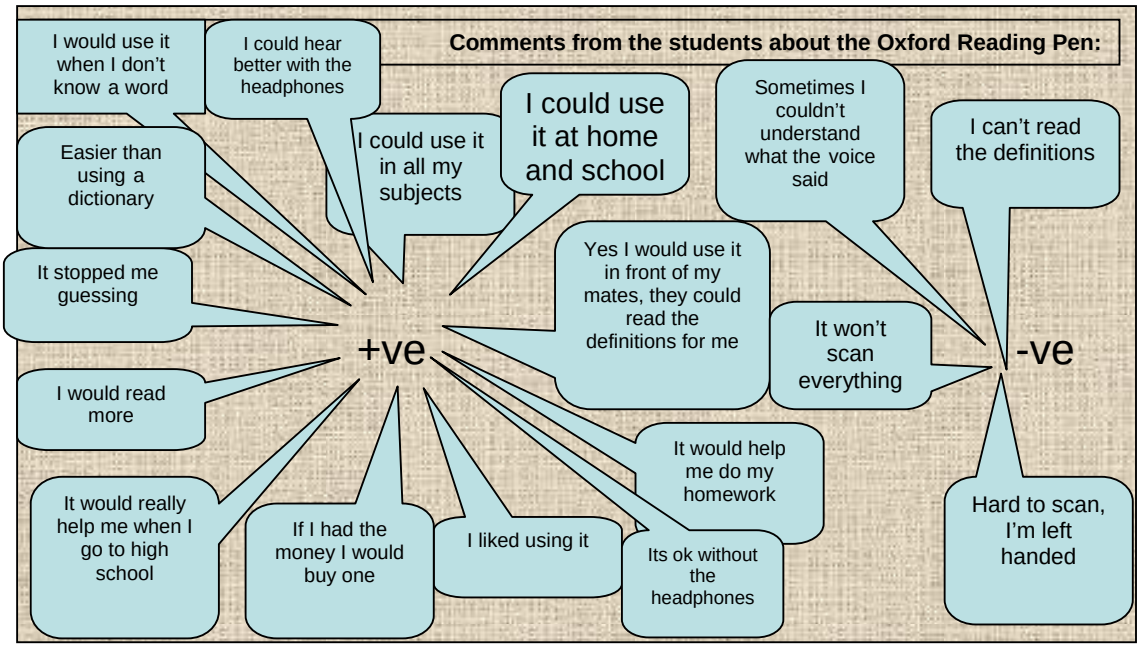


Figure 2 interpretation:

- Student 1 shows 100% reading accuracy and comprehension when using the ORP
- Student 2 shows a 15% increase in reading accuracy with the ORP but reading comprehension declined by 30% when using the ORP
- Student 3 shows a 60% increase in reading accuracy with the ORP and an increase of 20% in reading comprehension with the ORP
- Student 4 presents with a 12% increase in reading accuracy with the ORP and shows enhancement of reading comprehension of 20%

Summary of student comments following them using the reading pen:



Discussion

The results section shows that the ORP was able to satisfy the requirements of the four key questions identified earlier. All of the students were able to increase their reading accuracy using the ORP to read text at their chronological age. Three of the students also increased their reading comprehension at this level. Student two's reading comprehension was significantly lower using the ORP. Student two took much longer to complete his PROBE test with the ORP and I feel that his difficulty using the ORP due to motor skills caused him to concentrate more on the scanning process than the material he was reading resulting in poor comprehension.

A further aspect which may have influenced student twos performance is that of excessive cognitive load. Miller (2007) defines cognitive load theory as the effect of overload on the working memory. This can happen when acquiring a new skill such as using the ORP. In the case of this trial the students had only a short training session on the ORP possibly resulting in their working memory not only having to recall the article the read/ scanned with the ORP but also having to remember how to scan with and operate a new piece of equipment, its use was possibly not second nature by the time they completed their ORP trial (*a further possible explanation for student twos reduced ORP trial comprehension score).*

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 ORPs use and the effectiveness of a short structured training plan. This has extremely positive implications for the ORPs use within the school settings 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.

The ORP was also successfully utilized within the regular classroom by all of the students tested with a high degree of independence. Question answers from the students indicated the perceived assistance they felt the ORP gave them was well founded and is supported by the PROBE results.

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 of the students were able to scan effectively without the guide. A week later following their refresher three of the students scanned with no difficulty and student two just took a little longer.

A further issue for student two 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 a really important feature as some left handed people are quite ambidextrous as was student one. Student two 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 motor skills to use the ORP more effectively.

Prior to the trial the speech seemed too quiet for the classroom even with the headphones. The results 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 of the ORP was well below the general noise level in the class, in examinations or silent reading there is no reason why headphones could not be insisted on. Initially the students did comment that the pronunciation was difficult to understand sometimes but by the end of the practice they all reported that they could understand when they used the strategies they had been shown. These strategies included replaying the speech, getting the ORP to say each letter in the word on it's own and as a last result asking a teacher or peer. This again highlights the importance of training users of ICTs to allow successful utilization.

The results indicate that the mobility of unit is also extremely beneficial to the students. Whilst they only used it independently for a day due to time constraints their comments indicate that 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 PDA's the ORP lends itself to high mobility allowing easy use between home and school. A further benefit as with the PDA's 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.

The features outlined above highlight the hidden benefits of the ORP as identified by BECTA (2004, 2007) earlier. The students comments indicate that ORP fosters independence, confidence and enthusiasm which all assist inclusion (Booth, Ainscow, Black- Hawkins, Vaughan, & Shaw, 2000) as it enables them 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 paper it would seem the ORP not only enhances reading ability but also fosters the features commonly associated with successful independent learning, enabling them 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 compared to other ICTs and gains a very similar result. Further studies comparing the results gained with the afore mentioned ICTs may be conducted to clarify this viewpoint. From the writers experience it does seem that the ORP is a much more economical and effective complimentary ICT. Hardy's (2004) comments outlined earlier seem unfounded by this trials evidence aside from the difficulties if a user has limited 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 three 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.

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 days training on an ICT is indicative of it's effectiveness. Three of the students required no further assistance and prior to their second PROBE assessment when they used the ORP. They picked up where they left off. Student two required some coaching. The only issue identified by the students in general which would stop them using the ORP independently 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 four different ages. The results indicate that the ORP can be used effectively across a range of students ages (*see figure 1*) between 10 and 15 years this is supported by Higgins and Raskind's (2005) results. The students all had varied levels of skills with ICTs it would seem that there are very few pre requisite skills needed to ensure success with the ORP. One factor which appears to effect 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, 2007).

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 writers cluster schools. The trial indicates that the ORP is an ICT which can assist students to participate within school and society (MOE, 2003) and as such its potential for assisting students with reading difficulties should be embraced.

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Appendices

Appendix 1:
Features of the ORP (claimed) from: 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



Image retrieved from: www.jacksontechnology.com

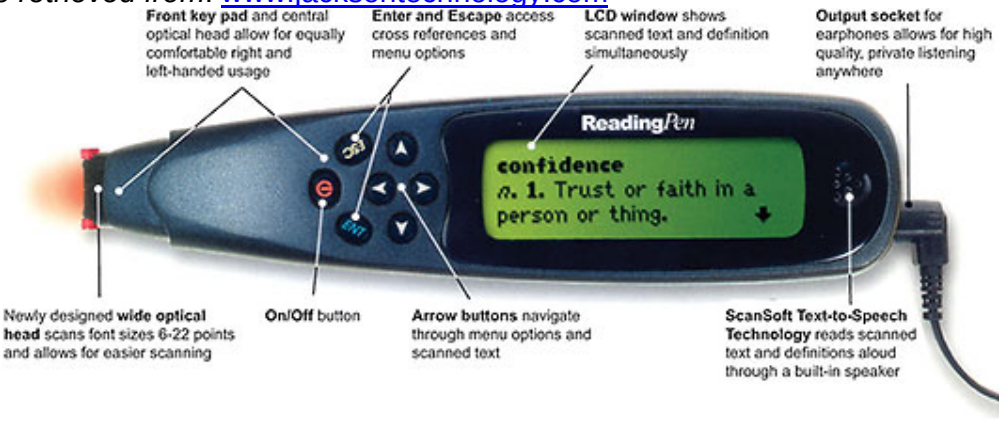


Image retrieved from: www.spectronicsinoz.com

Appendix 2: Source data for figures 1 and 2:

	no pen 1	pen 1	no pen 2	pen 2	no pen 3	pen 3	no pen 4	pen 4
Chronological age (years)	15	15	12	12	10	10	10.5	10.5
Age of reading test administered (years)	15	15	12	12	10	10	10.5	10.5
Actual reading age (years)	12	12	8	8	6.5	6.5	9	9
Reading accuracy(%)	90	100	80	94.5	37	98	81	95
Self corrections (number)	3	0	7	2	1	0	1	0
Comprehensiopn accuracy score (%)	90	100	70	40	55	75	80	100