IPAD ASSESSMENT FOR LOW VISION STUDENTS.

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CONTENTS

Introduction. .......................................................... 2
Rationale .......................................................... 3
Accessibility Features, positives and negatives ................................................. 4
The Students tested and their impressions ....................................................... 5
Assessment Breakdown .............................................................................. 11
The iPad as a drawing tool ................................................................. 11
Use as an eBook reader ........................................................................... 12
Use as a desktop publishing tool .............................................................. 13
Use as a multipurpose e-learning tool in the classroom ............................... 13
Use as a student organiser ........................................................................ 14
Conclusion ............................................................................................. 14
INTRODUCTION.

An assessment has been conducted to determine how useful the iPad is in the classroom context for low vision students who require a range of accessibility strategies to access the curriculum including screen reading, and screen magnification.

The purpose of this investigation was to assess how well the iPad serves five predetermined functions within a classroom environment with current applications available for testing as of July 2010.

The five nominated functions are as follows-

I.  Use as a drawing tool

II. Use as a combined EBOOK and audio book reader

III. Use as desktop publishing tool.

IV. Use as a multipurpose curriculum access tool using various apps.

V. Use as a Student Organizer.
RATIONALE

Currently many of our high school and older primary school students use laptops and computers as their primary means to access the curriculum, whilst these laptops are an invaluable tool, they are a cumbersome device for our students to use at all times for tasks they are expected to accomplish daily. Such tasks include;

- Note taking out of the classroom.
- Using an open and shut diary to record tasks and dates.
- Accessing diagrams and maps, labeling and drawing.
- Accessing the smart board.
- Reading a book or text.
- Engaging in multi-user accessible learning activities and games.

The iPad promises to address these issues as it is a multipurpose, compact device that promises to deliver universal accessibility out of the box.
The investigation did not seek to directly assess the accessibility of the iPad for Low vision users, the accessibility features of the iPad have been published many times including a Vision Australia Adaptive Technology Assessment, however very briefly the accessibility features and limitations of the iPad, noted in the investigation are

<table>
<thead>
<tr>
<th>Accessibility Features and limitations of the iPad for VIPS</th>
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<tbody>
<tr>
<td>+ Inbuilt shortcuts to activate zoom, voiceover and inverted colours</td>
</tr>
<tr>
<td>- zoom and voiceover will not work at the same time</td>
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<tr>
<td>+ Intuitive Zoom interface of up to 500%</td>
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<tr>
<td>+ Keyboard dock to allow keyboard shortcuts and ease of typing without touch screen</td>
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<tr>
<td>- use of the keyboard dock and camera plug-in take away from the portability and compact versatility of the device</td>
</tr>
<tr>
<td>+ Voice over allows readout of all buttons and has verbosity settings that can be tailored to the user proficiency</td>
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<tr>
<td>+ iPad menus are compact and easy to navigate for VI users and all core applications are immediately accessible.</td>
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<tr>
<td>- However many non-core applications are not properly scripted to allow voiceover to readout the content of buttons.</td>
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<tr>
<td>+ Lightweight item means it can be held in one hand at an optimum distance for a long time similar to a book, or placed sloped upright and towards the student on the desk.</td>
</tr>
<tr>
<td>- Somewhat delicate item that will require the purchase of a hard case and front cover to be issued to students.</td>
</tr>
<tr>
<td>+ Long battery life- 10 hours in use and up to a month on standby (in a state ready to be opened immediately)</td>
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THE STUDENTS TESTED AND THEIR IMPRESSIONS

Shaun.

Shaun is 10 years old and in year 4. Shaun is a Braille-using student who is severely visually impaired and is given a high allocation of support. Shaun’s visual acuity could not be accurately gauged by Vision Australia in his last vision assessment. Shaun’s primary mode of access to the curriculum has been using a combination of his Mountbatten brailer, and Braille documents, tactile objects and devices and more recently a laptop computer.

Current barriers to access for Shaun on a day to day basis include currently having no access to visual mediums such as diagrams or drawing tasks, a lack of accessible e-learning activities and games to play with other students that are accessible and a lack of access to a diary or calendar to record homework tasks and upcoming events.

It took around ten minutes to teach Shaun how to alternate between different accessibility modes, using the correct gestures and shortcuts. Shaun found that he could not gain easy visual access to the text using the zoom but could recognize symbols such as the iPod symbol and was conscious of the elements of the calendar app.

Shaun found that he could independently access all programs on the iPad using a combination of zoom and voiceover. He could navigate the song library on the IPOD using voiceover and find any song he was directed to.

Surprisingly, Shaun was able to use the onscreen keyboard and was not interested in using the keyboard dock. Shaun used voiceover to find keys but said that once he was ‘practiced enough’ he would be able to use the keyboard without voiceover.
Halfway through the assessment, Shaun discovered the ‘screen curtain’ mode and operated the device without the screen on.

Shaun’s favourite features of the iPad were his access to drawing and music and to play games with his friends, Shaun is very enthusiastic to continue exploring the iPad. The highlight of the afternoon for Shaun was when he wrote his name using the iPad.

Shaun was disappointed to find that he could not use both zoom and voiceover at the same time, particularly when accessing eBooks. Shaun did not find eBook reading very easy to accomplish using voiceover’s text to speech and found that the zoom was unsuitable for his vision.

**Carl**

Carl is aged 7 and in year 2. Carl is moderately vision impaired and his visual acuity as of his most recent ophthalmological report is 6/60. Carl's access to the curriculum is served primarily by enlarging material and the use of a school computer.

Current barriers for Carl include diagram and map access, his computer is a desktop computer that sits at the back of the class and there are commonly hardware and software issues as well as issues with his screenreaders software which make daily use too time consuming, Carl will receive a customised laptop to be integrated into his Individual Adjustment Program when his touch-typing skills are adequate which may be in one or two years.

Carl would benefit from a simple to use digital reading interface for books as well as a way to view maps and diagrams with ease, Carl would also benefit from inclusive e-learning applications with which he could engage with his peers.

Carl took some time getting to grips with the zoom interface but after some practice he could zoom and enhance text with ease. Carl took to exploring the iPad menus with ease, using zoom to read, “I’m starting to get the hang of zooming”.

When using the iBooks application Carl found he preferred to set the font size to his preferred font and could comfortably read without using the zoom at all. Carl’s favourite features of the iPad were the games and he enjoyed the phonics exercises and being able to zoom into various elements with ease.

Carl identified that there was a slight time lag between his physical drawing and the response of the iPad when using
Drawfree and expressed some irritation. After some tries he said he preferred the iPad for maps and would probably still like to draw freehand.

By the end of the session Carl was teaching his mother how to use the zoom feature, his mother expressed interest in purchasing an iPad for use as an e-learning tool at home.

**Rose**

Rose is 6 years old and has a visual acuity of 6/72 and is in year 1, making putting her into the moderate-significantly vision impaired. Rose currently benefits from magnified material and uses a CCTV device, and a sloping computer. Like Carl, Rose does not yet have the computing ability to be given a laptop computer and has limited use of her desktop computer.

Rose has access issues with print and diagram access, as well as board access and access to inclusive accessible learning activities. Rose has problems staying within the lines and constructing neat handwritten characters which interfere with her ability to complete tasks that meet her potential on a daily basis in a year 1 curriculum.

Rose enjoyed the drawing capabilities on the iPad and spent most of the afternoon drawing. When drawing she often made mistakes but was able to erase them easily with her finger. Rose expressed glee when realizing her ability to fix mistakes, and was very impressed by her ability to draw fine details and then enlarge them.

Rose, who has difficulty in class constructing letters enjoyed using the phonics program and exploring the interactive elements, using the zoom with precision on elements she was interested in. When using a Jigsaw application, Rose found it difficult to use the rotation gesture, but enjoyed piecing the puzzle together.

Rose also enjoyed reading with the “Alice in Wonderland application”. Although she experienced issues tracking the text she preferred to have the text read to her whilst she played with the visual elements.

There were some ergonomic issues with Rose when using the iPad. After she had spent the better part of the afternoon on the device she complained that her neck was stiff, this issue could be rectified by a keyboard dock but Rose liked to hold the device so she could rotate it and turn it as desired.
Grant

Grant is 8 years old and in year 3. Grant’s visual acuity is measured at .5/36 which puts Grant in the severely visually impaired spectrum; Grant is allocated a high level of in-class and itinerant support to effect access to the curriculum.

Grant primarily uses Braille and has very little visual access to curriculum material, Grant has a laptop and has been assessed for Screenreading software but will have to wait until next year before this assistive software can be bought for him and deployed. Grant is a special case in that he has been trialing the iPad for a term in-class and his iPad has already been integrated into the classroom.

Grant’s classroom teacher testifies that Grant uses his iPad daily. I observed Grant using both the zoom and the voiceover. Grant has a preference for the zoom and prefers to hold the iPad very close to his face to get visual access rather than relying on voice.

Grant uses the Google application to search for information and particularly enjoys e-learning games. Grant’s teacher stated that Grant uses his iPad with other students and they play games together, Grant is particularly good at math games such as mathemagic. Grant’s teacher also stated that it was very beneficial for Grant to have a device he can independently use.

It was fascinating to watch Grant play his favourite game which is a hangman application. Grant zoomed in and out to view the words and how many spaces there were and then began to play hangman with the zoom off, having memorized the location of all of the keys, Grant won the two games of hangman he played. Grant was also able to use zoom to play games with visual questions such as, “How many animals do you see?”.

Grant prefers his iPad for e-learning to his computer because it is instantly accessible and has games, whilst his options on a computer equipped with a demonstration version of a
screenreader are limited to word processing and is more complicated to use, as Grant said, “You can just play it.”

Grant’s teacher explained that the iPad at this stage is mainly used for e-learning apps. I observed that whilst Grant could use the iPad for audio books and had no problem using his keyboard dock and search with voiceover to navigate menus and find software, he found the eBook reader cumbersome when using voiceover.

**Peter**

Peter is a 16 year old year 10 student and has a visual acuity of 6/180 making his visual impairment significant. Whilst a student with Peter’s acuity would typically use Braille and audio devices, Peter has always preferred to use magnification to gain visual access and is a highly digitally literate student, comfortable with Mac and PC computers and can use a variety of devices to access a range of material.

Despite Peter’s superior technology skills, Peter has always found his access to diagrams insufficient and readings tasks are a struggle for Peter. Peter is usually given an audio book and eBook of texts to read but finds that he cannot conveniently read them. Peter can use his computer to see a diagram but labeling and drawing are difficult to achieve using the mouse. Peter currently uses a webcam to access to the smart board but admits that it is very difficult for him to track and see the board with this device.

Peter could immediately access the iPad and required no training as already uses his own iPhone at school (covertly) as a CCTV and OCR device, Peter immediately set the iPad to an inverted colours mode which reduced glare on text and deftly used the zoom and search feature to navigate around the device.

Peter was able to use the historical mapreader application to jump to coordinates on a map at my request, and he found the drawing application much better than his previous experience with mouse-driven applications which he professed he no longer tries to use. Upon asking Peter to draw angles on various geometric shapes, Peter was able to do so in a very quick manner using zoom.

Peter was able to find elements in the e-learning application quickly and could use the calendar and a French tuition app. eBook reading was simple and easy for Peter, he could enlarge the font to his preferred size and used a wipe technique on the iPad to keep the screen running across the letters at his desired reading speed, Peter explained that this technique is something he learned on his iPhone.

Peter also enjoyed using the iPad’s calculator, as the buttons are thematically grouped in colours and that makes it easy to use. But he admitted, “I’d prefer to use my iPhone calculator if I could have it at school”.

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**August 4, 2010**

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When asked what Peter would use his iPad for if he had one he said, “The drawing applications, I don’t draw on my Macbook- also I’d read with the iPad because it is faster, especially outside, nobody uses a laptop outside. I’d use the iPad for study when I don’t have a computer on me or when it’s inconvenient, like on the train.”
ASSESSMENT BREAKDOWN

Each student was assessed with an iPad with a view to incorporating the iPad for the following purposes, the students have been listed in order of their category of vision from most significantly vision impaired to the least based purely on their acuity and service provision, the order is not supposed to be a reliable indicator of the actual need of the students.

<table>
<thead>
<tr>
<th>Student</th>
<th>Drawing Tool</th>
<th>Book reader</th>
<th>Desktop Publishing</th>
<th>E-Learning App &amp; Toolkit</th>
<th>Student Organiser</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shawn</td>
<td>X</td>
<td>X</td>
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<td>Grant</td>
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<tr>
<td>Peter</td>
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<tr>
<td>Rose</td>
<td>X</td>
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<tr>
<td>Carl</td>
<td>?</td>
<td>X</td>
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</table>

Colour Breakdown; Green- Braille Using, Orange- Magnification Using.

THE IPAD AS A DRAWING TOOL.

Our vision impaired students who still use their vision to plan, draw and create currently have no ideal medium with which to create editable drawings. Pen and Paper drawing is limited by the inability to erase mistakes, to magnify fine elements and mechanical problems due to what are often poorly developed motor skills.

A digital drawing solution will allow a VI impaired student to more easily complete drawing tasks such as sketches, mind maps, mathematical drawings and more complicated mapping utilities.

Currently digital drawing solutions have been to use Windows based writing tablets (more than double the price of an iPad+apps+keyboard dock) and the smart board (hindered by low resolution, glare and the projection of a shadow in front of the student), The iPad could potentially provide a far superior solution with its high resolution LED touch screen and accessibility features.

Upon assessment, all students tested except Carl found the iPad medium more beneficial than drawing freehand because of the zoom interface and the ability to erase mistakes. It seemed to be our moderate-significantly impaired students who had the most substantial benefit, as they found the zoom easier to track then the more significantly vision impaired students and were not perturbed by the slight delay in drawing and erasing as the student tested with a more moderate vision impairment. One notable aspect that may affect
access for more users that rely on voiceover is the lack of zoom or drawing capability when voiceover is turned on.

The only two limitations on the iPad for drawing for low vision students are its relatively small screen size and the lack of combined voiceover/zoom functionality; however compared to current alternative solutions the iPad looks to be more affordable and efficacious than other digital drawing pads.

**USE AS AN EBOOK READER**

Because the iPad has both iPod and eBook reading functionality it has the potential to be an invaluable reading tool for VI students, providing it is accessible, easy to use and as powerful as current software eBook readers on the PC. As a reader it has advantages over an iPod because of the visual display and the ability to bookmark, as well as advantages over a PC as the iPad is a much lighter and more compact device.

Furthermore, the iPad’s eBook reader application, iBook contains an inbuilt dictionary, bookmarking, search and copy facility and upon assessing compared, based on an assessment of the reader apps available today, iBook seems most useful for the classroom compared to Kindle and free books.

Upon assessment it was found that students who relied on voiceover rather than enlargement did not find current eBook apps suitable for them to replace Braille or computer based text-to-speech. Whilst the use of the keyboard dock did serve to effect better access through the inclusion of keyboard shortcuts, it detracted from the portability of the device which is the primary advantage over the use of the laptop for eBook and audio book reading.

The device however was very accessible for magnification-using students, all but Peter were able to use the eBook reader without the zoom on as their required font was available from the application’s menu. All these students enjoyed using their iPad’s as reading devices and Peter demonstrated how a skilled student can make the most out of the eBook reader with the use of zoom using the wiping technique.

The use of an audio book played through the iPod application in conjunction with the use of an eBook would be very beneficial for these magnification using students, there are some applications such as Cat in the Hat which read the text of books along with the page but there are no eBook reading applications that integrate audio and visual material that I have discovered yet however this kind of application would be particularly beneficial.
USE AS A DESKTOP PUBLISHING TOOL.

The iPad could have benefits in the classroom to use with desktop publishing software. The only desktop publishing software available for testing was the Pages application.

Upon assessment, all students preferred to use the keyboard dock to type word processing documents, and as such it was hard to see the benefit of the iPad with the keyboard dock attached as opposed to a computer. The iPad may be of benefit to younger students who have not yet received a computer to assist with touch typing training or creating documents and familiarizing themselves with desktop publishing software concepts, but otherwise a personal computer affords superior file management and desktop publishing options.

USE AS A MULTIPURPOSE E-LEARNING TOOL IN THE CLASSROOM

The iPad has remarkable potential as both an electronic learning tool, the iPad’s touch screen and compact menus and programs make iPad applications much more accessible then flash-based or other computer based e-learning games for both magnification and screen-reading students. Because of the extreme diversity of applications it will be impossible to limit the versatility of the iPad as an e-learning and reference toolkit.

With current apps and software, some of the potential classroom uses of the iPad are;

- Even young students can access mail, pictures and audio files quickly using voiceover and zoom.
- Young low vision students will benefit from the use of visual apps that train their visual memory and cognitive skills.
- Applications such as Toy Story can be used for inclusive read-aloud activities.
- Students can read textbooks with Goodreader.
- Dragon dictation (not yet available at the Australian store) will be very useful for our students who are still uncomfortable with the keyboard and will be able to use Speech-to-text to create notes.
- Students without high computer literacy skills can use the iPad to search the internet.
- E-learning applications are all inclusive, a vision impaired student can have the same level of access to an activity as their peers.
- Vnc Software such as desktop connect or Itap can be used to effect a dynamic smart board access solution. (see http://www.youtube.com/watch?v=x58K4fA9wXI and http://www.youtube.com/watch?v=AnbT_YM3ZSU for video demonstrations).
- The iPad’s calculator is accessible for both voiceover and magnification using students and students with full colour fields find the keys thematic colouring easy to navigate.
‘Notes’ applications such as smartnote and awesomenote and voice recorder software is very easy to use and works well with voiceover, so students will be able to create effective classroom notes of text or speech should they choose.

Music composition apps give access to written music to low vision students in a way that the Braille medium currently does not suffice; furthermore it could allow our students to compose music much more easily.

The iPad has map applications that students can use to zoom into, bringing relatively easy map access to magnification using VIP students in an alternative to somewhat clumsy image navigation on a PC.

Dictionary applications and foreign language applications are easier and faster to use than currently deployed computer alternatives, making the iPad a useful tool for spelling and grammar, however the lack of multitasking means it’s less versatile for use for older students with their laptops handy.

The important limitation to any iPad applications accessibility is that the iPad application must be scripted to accommodate voiceover, sadly this is not the case for many available iPad applications, this means that before purchasing an application for a student who uses voiceover, the application will have to be tested for accessibility to ensure it is properly scripted.

**USE AS A STUDENT ORGANISER.**

Our VIP students daily come across the barrier of not being able to quickly open a diary and write down an assignment. There are computer applications but these require the presence of a laptop and laptops take time to load up when closed and are not as portable as the iPad.

Upon assessment the organization applications could be useful to both Screenreading and magnification using students, and the inclusion of an iPad as a diary device could potentially remedy this access issue for many of our VIP students, whilst Peter stated he would be more inclined to use the computer due to the keyboard, the iPad’s calendar and diary will sync to his macbook’s calendar and diary meaning both devices can be used at different times to contribute to one digital diary.

**CONCLUSION**

The iPad has a lot of potential as a piece of assistive technology and as a learning toolkit. With the limited selection of applications available for this test and the extreme diversity of applications available it is impossible to recommend a comprehensive software suite or to limit the uses of the iPad within the classroom context, the limitations to the use of this device lie in the limitations of the imagination of the application developers and the
teachers that incorporate their programs into their Individual Adjustment Plans, the iPad shines as a classroom resource for inclusive learning.

This being noted, the iPad is not a replacement for a personal computer for our students and it should be understood that there are limitations in the use of the device for voiceover using students, sadly the absence of a camera limits the functionality in regards to its potential for students to use it to create media, as a CCTV device to enhance or optically recognize text.

I would recommend the iPad for vision impaired students who experience barriers in the traditional classroom to their inclusion and whose learning environments would readily incorporate this technology into their schools.

**Recommendations for deployment.**

- Braille and speech using students should be assessed with an iPad and the required applications before purchase to ensure the required application is accessible for the student, a trial iPad could be kept for this purpose to ensure the student has access to the device for the required reason.

- The iPad has to be added to the school’s network to function effectively, the student’s email should also be set up to allow them to send and receive files to and from teachers.

- Apps need to be purchased and managed for each individual iPad which could mean they can be kept and managed at the library, the store needs to be available for classroom teacher and itinerant teacher to draw upon.

- Drawfree has an overlay mode to allow students to draw over maps and images in the photo library, but more investigation into drawing apps is needed.

- The iPad is a fragile and somewhat expensive device, as such it should not be deployed to students without a sturdy case and a front shield guard, a good policy may be to introduce it to younger students and kept in the classroom as purely a classroom tool for some time until the student demonstrates the maturity to take it home in preparation for the secondary school environment, as happens currently for students in our programs with laptops.

- A keyboard dock (pictured) should be bought for the iPad and can be incorporated into the primary school classroom, however secondary school students will likely leave it at home.