

iPad in Education: A case study of iPad adoption and use in a primary school

Sarah Henderson
The University of Auckland
s.henderson@auckland.ac.nz

Jeff Yeow
The University of Auckland
jyeo017@aucklanduni.ac.nz

Abstract

Apple's iPad has attracted a lot of attention since its release in 2010 and one area in which it has been adopted is the education sector. The iPad's large multi-touch screen, sleek profile and the ability to easily download and purchase a huge variety of educational applications make it attractive to educators.

This paper presents a case study of the iPad's adoption in a primary school, one of the first in the world to adopt it. From interviews with teachers and IT staff, we conclude that the iPad's main strengths are the way in which it provides quick and easy access to information for students and the support it provides for collaboration. However, staff need to carefully manage both the teaching and the administrative environment in which the iPad is used, and we provide some lessons learned that can help other schools considering adopting the iPad in the classroom.

1. Introduction

As technology becomes intertwined in our lives and with the birth of digital natives, schools are attempting to utilize technology to help provide the best learning experience for children [1]. Traditionally, the use of Information and Communications Technology (ICT) in education has been segregated from the normal teaching classroom: personal computers were relegated to a separate computer lab where students would go to study computer-related topics. A more technology-integrated classroom might have a PC or two down the back of the room that students could sometimes use during class time. More recently, smaller devices such as laptops, tablets and mobile devices have been tested and used within the classroom as a tool to help children supplement their lessons [2]. These changes mean there is need to investigate the impact these modern educational devices have in the classroom and on childhood education.

With the release of the Apple iPad, new and innovative ways of accessing and relating to information have emerged for both businesses and personal use. The iPad can be considered a pioneer, the

first of its kind. It is neither a smartphone, a netbook nor a tablet PC, but includes some elements of all of them. The features which make the iPad stand out amongst other mobile devices include the streamlined design, the lack of peripheral attachment, the connectivity, the large multi-touch screen and the variety of different applications available to the consumer.

On the first day of its release in April 2010 in the US, Apple sold over 300,000 iPads [3] and sold 3 million within the first 80 days after release [4]. Initial sales were largely to consumers who are fans of Apple and technology enthusiasts wanting to use the iPad as a personal device, but attention soon turned to how the device could be used in business and educational settings. Several schools announced they would be adopting the device. However further down the track, businesses and other sectors began looking at the iPad as a device to help assist in occupational activities. Some schools swiftly decided to adopt the technology, with one New Zealand school purchasing a set for classroom use as soon as they were available in that country [5].

This paper will explore the experience of that New Zealand primary school as they adopted the iPad for use in the classroom with students aged 5 – 12. We seek to understand the issues they faced and the benefits they perceived from both educational and IT management perspectives.

2. Literature Review

This section will briefly review some theories of education with a particular focus on understanding social learning, and learning with technology. We next review the different types of devices that have been used in education settings in order to provide a comparison with the iPad.

Theories of Education. Most educational practices are based on a constructivist approach, while a lot of educational technology is built from a behaviorist perspective. Behaviorism posits that learning is manifested by a change in behavior, and that the

environment determines these changes. Skinner had a notion of a “teaching machine” which presents students with material to learn and then tests them to ensure they have remembered the correct answer. On passing the test, they are taken to the next set of material to learn in a sequence he called “programmed instruction” [6].

Constructivism is based on the idea that knowledge is not a substance that is transferred from teachers to students, but that knowledge is constructed by students themselves when they interact with objects in their environment [7]. This view on constructivism is based on the principle that children learn by doing and that they construct their own knowledge through their surroundings, and in particular that the best way to ensure constructive learning is through actively performing a task.

Building on constructivism is the notion of social constructivism, whereby social participation is one of the main activities through which learning occurs in children [8]. Children construct knowledge through their interactions and engagements with others, creating shared meanings as they do so. This is true provided that instructors facilitate the proper environments to ensure engagement, which is often done through putting students into groups and creating situations where students need to interact with one another in order to solve a problem [8]. This kind of social collaboration can also boost achievement in that it helps to keep students engaged in their learning for longer periods of time.

It is only relatively recently that educational technology has been able to support a constructivist approach. Smaller devices are better able to facilitate social collaboration than PCs which users must use singly, and the rise of more social application software enables much better opportunities for collaboration than were possible in the past.

Mobility. Various mobile form factors have been deployed for technology used in educational settings. Small devices such as PDAs or smartphones have the advantage of becoming ubiquitous. While the small size provides mobility and a very personal user experience, it also makes it difficult to support interpersonal and collaborative learning [8]. Students may not achieve the same learning experience and amount of involvement as they would on a device with a larger display.

Netbooks are very similar to traditional laptops, but are smaller, weigh less and are usually cheaper in comparison to laptops. They typically don't have a touch screen, with primary interaction being using a keyboard and trackpad.

Tablet PCs combine the keyboard of a laptop with a touch screen and a stylus for navigating around the

desktop and programs. Typically the screen rotates so it can be used in a standard laptop format with the screen above the keyboard, or with the lid closed with the screen on the outside.

Some mobile devices, netbooks and tablet PCs support multi-touch screens and therefore have the ability to interpret multiple simultaneous pressure points on screen [9]. Fingers are the most common stimuli for multi-touch, which provides a natural means of input. As a result, students feel more motivated and interested to learn and are more engaged with content, therefore keeping students interested in learning for longer periods of time [1].

In single-touch devices, students have to take turns to use the device, which can disadvantage some students. Some students may dominate the technology while other more passive group members become marginalized, which results in a loss of learning benefits from group exercise for those students [10]. Multi-touch has the potential to reduce this inequality that as students are capable of interacting at the same time and with the same object, and has been shown to increase engagement with the mobile device [11].

Engagement is also influenced by the fact that the displays on modern mobile devices are similar in size to that of a story book, thus a student would engage with content on screen the same way they would when reading a book [12]. An important factor which influences engagement that is provided by mobile technology is that feedback is given in real time. Direct real-time feedback to a student's actions reduces the level of distraction, since it allows them to seamlessly flow on to the next task at hand, rather than idling in class, waiting for feedback before moving on [13].

Seamless learning is the notion that students can learn whenever and wherever they are curious and can easily switch learning contexts, for instance from formal to informal, or personal to social. A key component of this idea is each student having their own dedicated mobile device [14].

Using mobile devices allows students to physically move around various different locations with their device and communicate with others, and thus learn across space [13; 15]. Students and teachers will be able to use the device in the classroom, on field trips, at home, or wherever activities take place [16]. Having this portability enables students to further explore their interests in a subject at any given location [17]. Mobile devices can therefore help to augment the current environment children are in by providing access to information while on the move [18].

Another aspect to engagement is whether the engagement is sustained or is susceptible to the novelty effect. If the novelty effect applies, engagement would

be high early on while the student is unfamiliar with the device, but after gaining familiarity, the level of engagement would drop [12].

Collaboration is promoted by mobile technology, since it stimulates face-to-face social interaction between children [12; 13]. Having a mobile device right in front of students allows them to strongly engage with content, since mobile technology can be viewed as a portal which allows students to view content they are interested in at any given location [19]. This encourages and motivates children to read content, as they are able to easily access information which they enjoy in front of them [12]. It allows students to take control of their own learning and provides the ability for children to supplement what they are learning in class in real time as the educators speaks.

Social and emotional implications can also be an issue when using mobile technology in the classroom [20]. Mobile technology may not be for every student, as some may feel uncomfortable and have an aversion to using such technologies to learn [21]. Carr [22] discusses that using technology to learn can create a divide between students through the various “cultural baggage” students have.

Notwithstanding the benefits of using mobile technology, there will always be technical issues to resolve, such as connectivity, software, processing power, storage and design flaws. In addition, mobile technology may raise specific educational issues. One possible result of mobile learning is that teachers have less control over students. Children may use their mobile device for activities that are unproductive and unrelated to school [2]. Students may be able to use chat rooms, instant messaging, play inappropriate games, cheat in tests and visit inappropriate websites during class time if mobile technology is not appropriately controlled [2].

Technology may also be seen as an “intruder” by educators as it alters their traditional ways of teaching. Educators may resist the technology, or may need training on how to fully utilize and facilitate an environment for using mobile technology in the classroom [2].

3. iPad Features & Characteristics

This section briefly reviews the individual features and design aspects of the iPad. This will provide a good understanding as to why the iPad can be considered an educational tool to assist in learning for children within primary schools.

The height and the width of the iPad resembles the most popular size of a portrait children’s book. The iPad is also very thin, with a depth of 1.34 cm, which makes it a very easy device to transport and handle.

The iPad has a relatively large 9.7 inch diagonal multi-touch LED display with a 1024 x 768 pixel resolution, which provides viewing of bright, high-quality images. The iPad also has a wide viewing angle display (178°) which allows different people to view content on the iPad within the angle, hence the ability for children to collaboratively share viewing content with one another without distorting images [3].

The display has the ability to switch between different viewing positions from either portrait or landscape, depending on the way the iPad is held.

The standard iPad weighs 680 grams [3], making it a lot lighter than a traditional laptop or Tablet PC. The iPad also does not have any cables or peripherals attached to it, such as a keyboard or a mouse, and controls only consist of one single button. With the combination of the iPad’s size, light weight, lack of attachments and connectivity, it makes it a very portable device for children to hold, operate and use it where they choose, whether at their own desk, collectively around a table, on their lap or possibly out of class.

The iPad comes in both Wi-Fi and 3G models, both with Bluetooth, therefore allowing wireless connectivity to the internet at any given location which supports Wi-Fi or 3G. However, a monthly data usage plan from a telecommunications provider is required to support the 3G connection which can be quite costly.

The iPad has several thousand different educational applications available which must be downloaded via iTunes from Apple’s Application Store (either free of charge or paid), thus acting as a central hub for Apple applications [3]. Apple’s iTunes application store also acts like an integrated distribution network linking developers and end users together. Since external developers are able to submit their own applications to Apple, a large number of applications can continuously emerge from Apple’s application store.

The cheapest iPad (16GB Wi-Fi model) costs NZ\$799, which is expensive compared with other devices such as tablet PCs and netbooks typically purchased for a school. Because of the high cost it may be difficult to get an iPad for every student in a classroom due to budget constraints. Although due to the collaborative nature of the iPad, it is possible and that the iPad be shared among young students. The purchase cost is not the only cost, with software and maintenance also being a factor. If an iPad breaks it is not cheap to replace one or get it fixed [23]. The fact that the iPad will be used in a school setting means there will be a high probably that the iPad may be

broken or damaged. If schools do choose to pay for educational applications, the costs can mount up as applications must be purchased for each iPad.

To date, there is inability to control activities performed on the iPad. Schools that use laptops and personal computers to teach students are able to install monitoring software which allows teachers to keep track of what students are doing on their device [23]. This allows teachers to have more control over their students to ensure they are staying on task and also not viewing content which they should not be. Control is a very important part of education, especially for younger children. They can be easily distracted from their work and being that the iPad is a media device, there is a high chance children will be distracted without educators having appropriate controls to prevent or reduce distractions from occurring.

Ultimately, the iPad is a device which was created to consume content. The iPad was created for users to listen to media, view web content and access applications in a different ways, but doesn't allow easy creation of content [23]. The main iPad tool used to educate children will be through the use of the educational applications or web content. This is a disadvantage because children are merely using the applications on the iPad to answer questions, follow instructions, drag an object, and tap the screen at certain times etc. However, it doesn't allow children to become creative and develop their own content, such as recordings, videos and pictures, as there is no microphone and camera [23]. Nevertheless, word documents can be created on the iPad using the on screen keyboard, which may be tedious to use for long periods of time. While a physical keyboard can be attached onto the iPad this somewhat defeats the purpose using the iPad for its superior mobility.

There is an initial novelty effect for any new technology such as the iPad, but if teachers continue to use the same teaching techniques, the same applications, and use the iPad in the way for long periods of time, the effect or the appeal of the iPad will wear off eventually and so will the benefits [23].

Finally, one notable feature of the iPad is that it is not specifically built for childhood education. It is a device specifically made for consuming media and not to educate young children. It is designed to be sleek and streamlined, rather than rugged and protected

4. Research Method

As the purpose of the study is to understand and explore how iPads are being used in an educational setting, the research method selected for this paper will be a case study [24]. Specifically, this is an exploratory case study as it seeks to “discover relevant

features, factors or issues that might apply in similar situations” [25]. For example, rather than testing, explaining or comparing a phenomenon, like in explanatory case studies, the study will seek to explore why the iPad was selected, how it has been used in an educational context, and to discover if there are any issues involved in using the iPad, based from the responses given by participants.

Three semi-structured interviews were conducted with key school personnel. Semi-structured interviews allowed for flexibility when interviewing participants, since the technology was new and it wasn't possible to determine in advance all the issues that might arise [26]. The interviews were transcribed and analyzed using content analysis to extract the key themes [25].

The case site is Redoubt North Primary School – a primary and intermediate school located in Auckland, New Zealand which was one of the earliest adopters of the iPad as an educational tool in the classroom. Three participants were selected based on recommendations from the Principal of Redoubt North Primary School and from faculty members: the school's ICT manager, a senior teacher (lesson co-coordinator) and a teacher.

5. Results

This section will first present background information on the school regarding their selection of the iPad, followed by the management or administrative perspective on the iPad. This includes a discussion of how both the hardware and software (applications) were managed. Finally, we explore how the iPad is used in the classroom and the surrounding issues teachers have encountered.

5.1 Choosing the iPad

Prior to the iPad, Redoubt North had a total of 30 Aspire netbooks (five per class) and was looking at various devices to replace the netbooks. The ICT Manager states:

“We were actually looking at the time for a replacement for the netbooks. We were initially looking at newer laptops. We found the netbooks to be good but the screen size was a little bit small and the keyboard was quite small. A very usable machine but we were looking for something to replace those because they were three years old.”

However, rather than investing in newer laptops to replace the old netbooks, the school selected the iPad. The school considered the iPad as an option for the upgrade based on doing research from videos and articles which they had read over the internet. The ICT Manager also explains that Apple's iPhone (similar features to the iPad) had been used by staff members, thus having firsthand experience with the technology.

Before implementation, the school's senior managers trialed the iPad and purchased one from a New Zealand online auction site before the official NZ release. The iPad was demonstrated to the Principal of Redoubt North, and once approved; the school purchased another five for other senior members of the school to trial. After trialing the iPad, the school's senior members collectively decided that the iPad was suitable for the classroom, and purchased a further 10 iPads to be trialed in the classroom. The 10 iPads were trialed for four months throughout different age groups, as the ICT Manager explains:

"We also did trial work with the intermediate kids taking the iPads to the junior school's classes, and doing some work with the kids there and we found them really useful, a lot more useful than the current laptops that we had in the current classroom."

Once the iPads were deemed to be successful, they were given the green light to be used in the classroom on a permanent basis. More iPads were then purchased for the rest of the school to use after its official release in New Zealand.

5.2 Management of the iPads and Applications

At present the school has a total of around 48 iPads which are used on a daily basis. The iPads are mainly used in the senior classes of the school (ages 9 to 12). There are six senior classes (approx. 30 students), with each class usually using five to six iPads at a time. The school also has an additional two boxes of iPads, with six in each box, for the rest of the school to book and use. The ICT manager describes the process of how the junior school would go about gaining access to the iPad:

"We've got a booking system where they jump on the email, go to the calendar and say oh we want to book the iPads for this day, and then I'll hand them out. If no one books the iPads, then we will send them to class with the intermediates (seniors) so that one particular day, one class can have ten or fifteen iPads in a class."

One of the most compelling features of the iPad is the range of applications available. A number of applications are needed because student needs vary depending on the level and topic. Thus the ICT Manager states that applications are selected by the teachers. Teachers visit the iTunes application store and select applications which they believe can be used in the class. They notify the ICT Manager, who then downloads the applications. Downloaded applications are then trialed and evaluated by senior members. Once approved, the application will be added to the list of applications to be downloaded onto the other iPads. An issue pointed out by the ICT Manager in regards to

sourcing applications is that finding the right one can be hard:

"There's thousands upon thousands of apps out there so it's quite difficult finding one that's suitable for the right level and you may have to get five or six, trial them out, see whether they're gonna be any good before you find the right one...The trouble is new stuff comes out all the time it's quite hard to keep up with it."

Another issue brought up by the ICT Manager is that each iPad needs to be individually updated with the software/application. A brand new iPad can take around 30 minutes to install all current applications. An iPad currently at hand will take around 4 minutes. Seeing that the school has almost 50 iPads, it takes some time to update all iPads.

Redoubt North has a wireless network, with all devices having the same SID username and password. It allows every iPad in the classroom and throughout the school to be connected via the school's Wi-Fi network, thus making them internet enabled.

The ICT Manager noted that on top of the initial cost of purchasing the iPad, there is the additional cost of purchasing applications (where appropriate ones are not free). Applications need to be purchased per iPad, thus the cost can mount up quite dramatically. There is a system in the USA which makes this process easier and cost less, but there is unfortunately no such system available yet in New Zealand.

Another potential cost is data traffic costs. The school avoids this by not purchasing data plans for their iPads but simply connecting them through the school's Wi-Fi network. The cost involved with keeping the iPads connected is therefore part of the school's existing internet costs.

Additional costs are also incurred through the purchase of protective gear for the iPad, such as cases and screen protectors. Screen protectors for the iPad are also purchased by the school at \$10 each and needs to be replaced every so often.

"We also purchase screen protectors for them, which is an ongoing cost because the screen protectors only last about two or three months and then we're having to replace them... because they get grubby and they start peeling off"- ICT Manager

A case is purchased for each iPad, which costs the school around \$20 per case. Silicon cases were chosen for two reasons. The first reason is to protect the device from falls as it provides the iPad with a slip resistant surface and also to protect it from being damaged when dropped. The second reason is to use the different case colors to help distinguish individual iPads from one another in a classroom set.

Each classroom has a set of five to six iPads, and with each iPad color-coded, it makes it easier for

students within a class to remember which iPad they had worked on previously to retrieve their work.

“If a child is using a particular iPad they might be working on the pink one, they know next time if I want to keep going on my work, I go to the pink one.”- ICT Manager

Along with colored cases, each iPad is numbered, as there are only a limited number of colors available. A number is given to the iPad which corresponds to what class it belong to. Thus if a class requires additional iPads which are then borrowed from another class, the individual iPads can be easily identified and returned to their assigned class.

Rather than rely on students always being able to retrieve files they stored on a particular iPad, the school uses Apple’s file-hosting service, MobileMe iDisk. This acts as a virtual hard drive for storing files which can then be accessed remotely [3]. It allows students to e-mail/upload their work to Apple’s iDisk, which can then be retrieved by either the teacher or the student on a different device.

5.3 How the iPad is Used in the Classroom

How the iPad is used in the school depends not only on the subject being taught but also on the age group using the iPad. Both the teacher and the senior teacher say that the web browsing function is the most commonly used and important feature for senior students within the school. It allows students to research topics learnt in class online and is predominately used for subjects such as social studies, science and English. Once information is gathered online, students then use Apple’s Pages to type up what was learnt from their research. Students also sometimes use Apple’s KeyNote (similar to Microsoft PowerPoint) to present their findings to the rest of the class through attaching the iPad to a projector.

“The internet is used a lot in terms of the research... the internet is the main thing that the iPads used for...The safari browser is used a heck of a lot and then they can import some of those notes into ‘pages’...Sometimes either they present that on the projector for the rest of the class or then send it off to another computer” – Senior teacher

As stated earlier, e-books are also used in the classroom for teaching. Parts of a novel are read every day to students through the iPad’s iBook application. Students also use the iBook application to individually and peer read. Not only are e-books used for story time, but also as the teacher explains, their math textbook can be in PDF format, which allows it to be loaded onto the iPad for children to use, thus creating six extra math textbooks in the class.

In terms of the senior part of the school, mathematics is the only subject where application games are used by the senior students to help reinforce their learning. However, the senior teacher states that the use of gaming applications (or any application) within the senior school is still a relatively new part of the curriculum which they are still exploring.

“We’re still very much in the experimental phase to be honest...We’re getting more and more of them and finding more and more that are appropriate especially in the maths context, awesome little games and puzzles that you can do to reinforce learning” – Senior teacher

For the younger children in the school (junior school), gaming applications are used more frequently than the web browser. As the senior teacher describes, children at a younger age are still learning the basics of how to read and write properly, thus making the internet *“a bit too high for them”*. As a result, gaming applications such as simple math and spelling games are more widely used as part of the junior school’s learning curriculum. Also as part of the junior curriculum, children from the senior school help to teach others in the junior school through the gaming applications on the iPad and also through e-books.

The iPad has allowed learning to become more accessible and productive, as described by both the senior teacher and the teacher interviewed. They both found that it allows information to be easily searched and accessed quicker at any given location in the classroom. For example, as described by the teacher and senior teacher, students will not need to wait for the desktop computer or netbook to boot when they log in as they previously did, but simply press the iPad’s button and tap on the web browser. Accessibility has also empowered students through not only allowing them to view a wider variety of information to enhance their learning and productivity, but also provides students with a sense of pride in their work, as the teacher explains:

“The ease of access to information makes a huge difference...The standard of their presentation has hugely improved. They have a lot more pride in it so they’re putting a lot more time into it...The presentations most students created I was amazed, they just looked so impressive...and the information was of a higher level as well”

When asked how the iPad has improved students’ learning, it was made clear by the senior teacher that the iPad is not seen as a tool to improve learning in the context of test results or grades. It is seen as a tool to increase productivity in the classroom by making things easier and accessible, and to a certain extent, possibly enhancing learning through the use of applications.

“It’s a lot more productive, whether it’s enhanced learning, yes with the applications...It’s just another tool and probably an easier tool than some of the other tools that we’ve had so far...It’s just all in one, sort of simple sort of solution”

5.4 Collaboration

The iPad is used either individually or in groups, depending on what is being taught and the expected learning outcome. Given that there are usually five to six iPads in a classroom, iPads are usually shared, sometimes in pairs or sometimes among three to five students. When using the internet to do research, children normally work in groups. If using an educational application, students would usually work in pairs or individually. The teacher explains that the iPad is also used in group sessions with five to six students. For example, when a group-reading session is conducted via the iPad e-book, students with iPads gather around the teacher and follow what is being read while also given the ability to look up words on the iPad. As the teacher explains:

“They’ll be working individually with you on iPads being able to search things like definitions of words or things that extend their learning”

The group and individual use of the iPad is managed via roster system, where it is seen by both teacher and student. It allows students to identify what tasks they will be doing and at what time. Individual use of the iPad is usually rotated every 20 minutes, thus allowing each student to have a turn.

Having prior experience with netbooks and desktops in the class, the teacher states that using the iPad in groups becomes a lot more manageable. It allows for 360-degree viewing, whereas with the netbook, children previously had to crowd around each other to view content. In terms of the desktop computer, the senior teacher discusses the fact that using the iPad can promote a better collaborative learning environment compared with a desktop computer.

“You have to a) bring a group to the computer and b) have to kind of sit around it, whereas if you want to show somebody work on the iPad you can flip it over and the screen would flip...Once you’ve finished with it you can pass it to the class in seconds, whereas a desktop computer you have to shuffle everybody to the computer”

The portability and the ease of use of the iPad both contributed to its ability to support collaboration:

“They’ve been able to find information quickly and also move it quickly to the next person whereas...laptop, it does take quite a while to shuffle off the user and get it round.”-Senior teacher

Issues can arise when working with the iPad in groups, as the teacher explains. Every now and then a “strong one” emerges from the group and physically holds the iPad in front of him/her. This makes it difficult for other students to view content and interact with the iPad, as one person has it in very close proximity to themselves. In this situation, the teachers would give instructions telling students in a particular group they are unable to physically hold the iPad, but the iPad needs to be placed down on a desk in front of them, thus only using their fingers to navigate around the iPad’s interface.

“I prefer them to be working at tables so that then it’s sitting in between them because that tends to make it a more of a group thing rather than just individual within a group... that makes a big difference if you’re not actually touching (holding) it” - Teacher

In some cases it is necessary for the teacher to assign group roles, telling students, *“You’re the only person who’s allowed to actually touch the iPad”*. However, as the teacher explains, the issue of a dominant student with the iPad rarely occurs and the need to issue instructions is uncommon.

5.5 Engagement

“Doesn’t make any difference how intelligent they are... It’s just an easy tool; I think it’s just so accessible for them and at all levels.”- Teacher

The senior teacher and teacher were both asked about the issue regarding the novelty effect. The senior teacher replied that there was an initial novelty effect at the start but eventually students saw the iPad as a conventional piece of educational technology. Thus, the novelty effect did wear off but did not reduce the engagement students had with the iPad.

“They do get used to it pretty quickly...they’ve seen technology grow so fast already. The novelty wore off within days I would say, and it quickly became a learning tool. So I don’t think there’s been a decline in engagement because of it or anything like that.” – Senior Teacher

Both the senior teacher and the teacher said that the learning curve with the iPad is almost nonexistent due to its simplicity, and in some cases, students can help teachers and other students to solve problems.

“Kids nowadays are very intuitive when it comes to their technology. It’s a simple design it’s only got an exit button and all the rest is just push on the screen so they’ve picked it up extremely fast...with a five minute discussion and they’re away” – Senior teacher

“I was having real trouble doing something the other day in ‘Pages’. I couldn’t put a picture in the background. I had a student who’d finished early, I said “hey can you find out how to do this?” and within

5 minutes he solved the problem and then he taught the whole class how to do it so it was really good” – Teacher

The teacher describes an instance where a new student arrived in the country with little experience with technology and had to be taught how to use both the netbook and the iPad. The teacher found it was much more difficult to teach the student how to use the netbook when compared with the iPad, especially regarding opening files and transferring data from one place to another.

5.6 Distraction

Both the senior teacher and teacher recognize that distraction is an issue with the iPad, although they regard this as an inevitable part of using any technology. Expectations are clearly laid out in terms of behavior around the iPad and school work by the teacher at the beginning of the each class. It is part of the teacher’s role to ensure that these expectations are being enforced. An example given by the teacher is that when a student is caught on an application or web page they should not have been on, they lose iPad privileges for one week. They will still be allowed to work with the iPad in groups but will be unable to touch the device.

Distractions can also occur when students who are not meant to use the iPad come in contact with those who are meant to. However the teacher noted that due to the iPad’s portability, students with iPads can be easily separated from those doing paper-based work.

In terms of control, the teacher says that because the iPad is “*so open and visual*” (being placed on a desk), they are able to instantly see if children are off task. When the iPad is not used, students simply flip the iPad so that the screen is facing the desk, which prevents them from “*fiddling*” with the device throughout the lesson.

The iPad can sometimes be incorporated into a reward system that teachers have. For example, on rainy days during lunch breaks, if students are behaving well they will be allowed to play games on the iPad, which they really enjoy.

5.7 Other Issues

The responsiveness of the device was mentioned several times as a key benefit of the iPad, which is best explained by a quote from the teacher:

“It’s the instant factor...When we’re doing the laptops it takes you half an hour to get them out, plug them in...There’s not all the logon issues and other things that kind of get in their way...you press a button

at the bottom and you’re on the internet you know. So it’s a lot quicker.”

One issue brought up by the senior teacher is that they are aware that the iPad is a difficult tool to be used for creating content but easy to consume, due to the nature of it. However, it was made apparent by the senior teacher that the iPad should not be used as an exclusive tool in education but to be used alongside others:

“It’s difficult to create content, it’s easy to consume...I’m not convinced yet that typing out a big document is easy on the iPad as it is on a computer... I don’t think, it couldn’t replace everything we certainly wouldn’t ditch everything in place of the iPads.”

Not all students readily adopt the iPad. In the interview it was discussed by the teacher that there was a case where a student chose to use the school’s netbooks rather than the iPad:

“I’ve only got one student in my class who if there is a choice will go for the laptop...its new technology, she’s a bit scared”

6. Discussion

The **mobility** of the iPad was one of the most significant features. The portability was enabled by the small size, the lack of peripherals, and the presence of a Wi-Fi data connection. These features allowed students to gather around the teacher and use the iPad to follow what was being read to them whilst also looking up definitions of words; it also allowed them to easily work in groups and move from one location to the next when needed. The ease with which it could be passed around meant that students could easily work on it along with other kinds of learning resources, or during presentations by the teachers. This was consistent with Rogers & Price [18], where devices are used to help students in their immediate foreground for short periods of time.

However, in this case study, the iPad doesn’t really demonstrate its true potential as a mobile device, nor is it really used to support the ability to learn across space and time as suggested in [13; 15]. The iPad is capable of being a truly mobile device, and with a data plan, it can be used to its fullest extent anywhere and anytime. However, the school only allows students to use their iPads inside the classroom, and usually only during class time. While students are occasionally able to use the iPad during a rainy lunchtime, normally they are not available during recess or lunch, and cannot be taken outside.

Seamless mobile learning (as described in [14]) is also hindered in this particular context since students

do not have their own dedicated device. While either the color-coding or the MobileMe data service may allow them to resume a previous task, the fact that there are generally only 5 or 6 iPads shared amongst 30 students means that they don't really have the option to do so whenever they choose

The mobility is perhaps a mixed blessing when it comes to **collaboration**. The collaboration benefits of the iPad do not seem to be as strong as might initially be suspected and this is partly because of the mobility and partly because of the multi-touch. The promise of multi-touch to allow multiple students to work together on the same screen at the same time [1] doesn't seem to be realized in a device of this size. The experience reported by the teachers is that while multiple students can view the device together, only one can realistically operate it at a time, and thus there is the potential for some students to monopolize the device. The ability for multi-touch to support multiple users seems to be valid for interfaces with larger surfaces (such as [10]), but not for devices with a form factor as small as the iPad's. This potential for monopolization is aided by the devices mobility, since it is easy for one student to move the device closer to them to have better control of it, or to pick it up and hold it, thus preventing others from seeing it.

On the other hand, the portability of the device can clearly enhance collaboration in other ways. For instance, one person can do a search and find some information and then easily pass the iPad over to another student to share that information. The screen is big enough that more than one person can read it at a time, thus making it possible for people to collaborate on a task. And the networked nature of the iPads means that it is possible for students to individually use an iPad but collaborate (or compete) through particular applications.

The mobility of the iPad is also clearly a benefit when it comes to the management of the devices, since it allows the moving of iPads around the school to maximize the use of scarce resources. It also allows the devices to be easily managed from the perspective of gathering them together to charge batteries and perform updates.

The findings from this case study regarding student attitudes are consistent with the literature of Hourcade, et al., [12] and Li, et al., [27], where students felt **engagement** and felt empowered by their work, creating and sharing richer content with their peers, parents and teachers confidently through a digital medium. Use of the iPad often resulted in students spending more time and effort on their work, thus creating high level presentations as the teacher

describes. Older students were also given the ability to read and teach younger students, which, as the teacher explained, they enjoyed very much.

When the issue of the novelty effect [23] was posed to the teacher and the senior teacher, they stated that there was an initial novelty factor at the start, but interestingly, the senior teacher explains that once students understand that the iPad is a tool to help them learn and not to be played with, they come to understand what is expected of them. The students see the iPad as any other tool in the classroom, such as a desktop PC or laptop, thus having the same novelty effect a desktop PC or a laptop would. However, it was noted that students were still excited when using the iPad as a means of reward when behaving well. Nevertheless, the iPad has only been used in the classroom for a few months and therefore the degree to which the novelty effect is still in play is unknown.

Having teachers **manage** and facilitate a learning environment around the iPad emerged as an essential part of using the iPad successfully in an educational setting. The most effective use of the iPad varies depending on age, subject area and learning outcome. For example, gaming applications are heavily used in the junior school, whereas gaming applications in the senior school are only used in the subject of mathematics. However, in the senior school, the use of the iPad is mainly focused on software applications such as word processing, publishing and web-browsing.

Setting guidelines around the use of the iPad also overcomes some issues identified by the literature and in this case study. For example, the issue of students dominating the device was managed by not allowing students to physically pick up and hold the iPad but to place it on the desk in front of them, thus allowing other students to share and view content. Distractions were also managed by teachers through conveying expectations and taking appropriate actions, which prevent or mitigate students from being distracted.

The way the iPad is managed out of the classroom is essential in order to get the best out of the device. Out of the classroom refers to the more 'administrative' side of the iPad. For example, as seen in the case study, colored cases and numbers are placed on the iPad to help students and teachers distinguish iPads from one another, applications are selected by teachers to meet the needs of their the classroom and virtual hard drives were set up, giving students and teachers the ability to easily retrieve and store work.

It is important to note that many of these issues are likely to be common to other technologies, and thus the iPad shouldn't be expected to replace all other devices.

7. Conclusion

This paper has provided a case study of the use of Apple's iPad in a primary school setting. The teachers interviewed found that the iPad has features and a design to make it a very useful tool for education. The size, portability and lack of peripherals allow it to be easily moved around the school and the classroom, although in this case the device wasn't used in a truly mobile fashion.

Students were generally very eager to use the device, and able to pick it up and use it intuitively with little instruction. It was so readily adopted that it was successfully used as a reward. The device can be used to support engagement and collaboration amongst groups of students working on a project although careful attention needs to be paid to ensuring that students don't dominate the device in a group situation, and to ensure they stay on task and don't get distracted.

However, without a proper learning environment, management and facilitation, the device's potential may not be realized. It is important to have a good management framework in place, both in the classroom and behind the scenes. There needs to be a plan for managing things like recharging batteries, application deployment, backups, and protecting, repairing and replacing iPads as needed. In addition, choosing appropriate applications from the large range available can be difficult and thus schools will need to have a process in place to manage this.

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