

**iPad iPedagogy: A study of teacher perceptions on the impact of
the iPad on teaching and assessment practices at a third level
college in the United Arab Emirates**

التعليم الآيبيادي : دراسة لمفهوم المعلمين عن الأثر الذي أحدثه جهاز الآيباد على التعليم
وممارسات التقييم في كلية من المستوى الثالث في دولة الإمارات العربية المتحدة

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Abstract

This investigative study explores teachers' perceptions of the opportunities and challenges associated with adopting the iPad as the primary learning resource and considers if the adoption of the device has facilitated innovative learning opportunities. It also discusses how the iPad has impacted assessment practices. The findings report both opportunities and limitations associated with the device and identify a core list of applications (apps) which teachers reported as effective in the classroom. It further identifies factors which discouraged teachers from experimenting with the device in the classroom. A pedagogical framework is outlined which could help teachers evaluate their use of the tablet. The paper concludes with recommendations to help alleviate factors which teachers identified as challenges and discusses approaches which could be adopted by policy makers and administrators which could help teachers maximize the potential of the iPad to help launch a new era of innovative, learner-centred education.

Keywords: iPad, opportunities, challenges, innovative, teaching & learning, assessment, SAMR model of technology adoption.

ملخص

هذه الدراسة الإستقصائية تبحث في مفهوم المعلمين عن التحديات والفرص المصاحبة لتبني جهاز الآيباد كوسيلة تعلم رئيسية، ويبحث فيما إذا كان هذا التبني للجهاز سهل عملية الإبداع والتجديد في الفرص التعليمية. وأيضاً يناقش هذا البحث كيف أثر الآيباد على ممارسة التقييم. الإستنتاجات المستقاة تذكر الفرص ومحدوديات الإستعمال المصاحبة للجهاز وتحدد مجموعة رئيسية وقائمة تطبيقات قام المعلمون بإدراك والإعتراف بفعاليتها في الصف. وقد قامت الدراسة بتحديد إطار تعليمي تثقيفي لكي يساعد المعلمين على تقييم نجاعة إستعمال هذا الجهاز. ويختم البحث بوضع توصيات للمساعدة في التخفيف من العوامل التي حددها المعلمون كتحديات، ويناقش المقاربات والطرق التي يمكن أن يتم تبنيها من قبل صناع القرار والإداريين التي من شأنها مساعدة المعلمين لزيادة الإستفادة من الآيباد للحد الأقصى ولإطلاق عهد جديد من التعلم الإبتكاري المتمحور حول المتعلم.

كلمات مهمة: آيباد ، فرص، تحديات، إبتكاري، تعليم وتدریس، تقييم، نموذج SMAR في تبني التكنولوجيا.

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Chapter 1 Introduction

1.1 Overview

Since its release in 2010, the iPad has been adopted as a learning resource by many educational institutions worldwide. Although the tablet was originally designed as a media-consumption device for individual users, the iPad has been extensively adopted for a range of innovative purposes in corporate, retail, medical and education environments (Murphy, 2012). In the past two years the use of the iPad has become much more prevalent at all levels of education. Already, many research papers have investigated its impact on teaching and learning and initial results are encouraging (Banister, 2010; Clark & Luckin 2013; Crichton, Peglar & White, 2012; Goodwin, 2012; Murphy, 2011; Rossing et al., 2012). However, research also recognises that new technologies create new challenges for pedagogy (Garaj, 2010; Murphy, 2011; Rossing et al., 2012) and that there are a myriad of factors which contribute to the successful integration of new technologies in the classroom (Anderson, 2011; Hew & Brush, 2007; Mumtaz, 2000). This investigative study reports on teacher perceptions of the opportunities and challenges associated with using the iPad as the primary learning resource and explores how teachers feel it has affected teaching and assessment practices. It further discusses factors which discouraged teachers from experimenting with the device to create innovative learning opportunities.

1.2 Statement of the Problem

Many educators believe that technology can be a catalyst for a paradigm shift in education from a teacher-centred behaviourist approach to a student-centred constructivist approach (Crichton, Peglar & White, 2012). Despite the perceived potential of technology to support constructivist pedagogical approaches, this transformative potential has frequently been underutilized, resulting in technology being employed primarily to repackage traditional content and replicate existing learning approaches (Kirkup, & Kirkwood, 2005; Pegrum, Howitt & Striepe, 2013; Rajasingham, 2011; Tangney & Bray, 2013). The launch of the iPad gave new hope that this device could provide the impetus for the afore-mentioned paradigm shift (Crichton, Peglar & White, 2012; Clark & Luckin 2013; Murphy, 2011). Research has indicated that to maximize the potential of mobile devices, a fundamental change in teaching

methods is necessary (Cavanaugh et al.; Garaj, 2010; Murphy, 2011). Other research indicates that a fundamental change in assessment practices is required to precipitate a fundamental change in teaching methods (Birenbaum et al., 2004; CHE, 2004; Lincoln, 2009; Ridgway, McCusker and Paed, 2004). This research study investigates teacher perceptions of the impact of the iPad on both teaching and assessment practices at a third level college in the UAE. The study was conducted at the conclusion of the academic year in which the iPad was introduced as the primary learning resource. It attempts to explore if the adoption of the iPad impacted teaching and assessment practices to facilitate a more constructivist learner centred approach which could help students develop the skills necessary to successfully contribute to a 21st century knowledge-centric society.

1.3 Background of the Research

In September 2012, the UAE iPad initiative mandated the simultaneous adoption of the iPad as the primary learning resource at the three main public third level institutions in the UAE. The three institutions have an enrolment of 41,000 students attending twenty campuses spread throughout the UAE. In the first year, the initiative was targeted at the thirteen thousand foundation entry-level students. The foundation course is an academic bridge programme intended to develop students' English skills before they commence their bachelor degree. Students also study math, Arabic and information technology. Students spend between one and four semesters in the foundation programme until they meet degree-admission standards (Al Hamelli & Underwood, 2014). This iPad project represented the largest deployment of a mobile device for educational purposes anywhere in the world (Hamdan, 2012). The primary objective driving the iPad adoption was improved student learning (Cavanaugh et al., 2012). At the Higher Colleges of Technology (HCT) annual conference, 2012, HE Sheikh Nahayan, the then Minister for Higher Education and Scientific Research, and Chancellor of the three public institutions encouraged teachers to use the new technology "to develop innovative ways of teaching and learning". Research claimed that the device could help "transform the higher education student learning experience and post-graduate results in the UAE" (Cavanaugh et al., 2012, p. 2). In addition, it was envisaged that the use of the iPad could increase student engagement (Hamdan, 2012) and provide a more sustainable alternative to paper. The management also recognised that the tablet was a more economical and a more portable alternative to the laptop (Elwasazer, 2012).

1.4 Research Questions

In an effort to evaluate the impact of the iPad on teaching and assessment practices, the present study will attempt to answer the following questions:

1. What are teacher perceptions of the opportunities and challenges associated with using the iPad as a pedagogical tool?
2. What are teacher perceptions of the impact of the iPad on teaching practice?
3. What are teacher perceptions of the impact of the iPad on assessment practices?

The purpose of the research was to assess if the adoption of the device had resulted in more innovative learning and assessment opportunities and ultimately facilitated a more progressive constructivist approach in the classroom. This study has developed from a research proposal that was previously submitted to the British University in Dubai (Mullen, 2013).

1.5 The Significance of the Research

Although many studies have explored the potential of the iPad as a supplementary learning tool there has been little research conducted regarding the adoption of the tablet as the primary learning resource. This study aims to investigate the opportunities and challenges associated with using the device as the main learning platform. In addition, this investigative study explores the impact of the device on assessment practices and considers if the new technology, pedagogy and assessment practices were aligned to effectively support a constructivist learner-centred approach in the classroom.

The findings should prove interesting to any educational institutions seeking to adopt the iPad either as a primary or supplementary learning tool. They can learn from the experiences of the participants in this study as to what features of the iPad actually enhanced learning and assessment opportunities and also help them avoid using it in situations where teachers felt it constrained teaching and learning. The study also explores which applications (apps) teachers found most useful. This can help other institutions plan which apps they would like to initially focus on and help them tailor professional development (PD) towards more effective apps. It further considers some of the factors which teachers perceived as barriers to effective pedagogical use of the iPad. Understanding the factors which discourage teachers from using the device is an important first step in the removal of those barriers.

The study recognises that teachers are not free agents in the classroom. Their practices are influenced by policy, administration, curriculum and assessment requirements. All of these factors influence how new technology is integrated in the classroom and are discussed in this investigative report. The Substitution Augmentation Modification Redefinition (SAMR) Model of technology adoption is one method by which level of technology integration can be evaluated and this model is discussed in Chapter 2 to outline how technology can be incorporated into the classroom to facilitate more participatory and innovative learning experiences.

1.6 The Structure of this Paper

This chapter has introduced the research topic and outlined the purpose, background and significance of the study. The next chapter reviews the literature which discusses the implementation of new technological devices in educational environments. It summarises the opportunities and challenges associated with using the iPad as a pedagogical tool as described by other research studies. It presents the SAMR model of technology adoption and considers the level of technology integration necessary to trigger a more constructivist learner-centred approach in the classroom. It discusses the pivotal role teachers play in the successful integration of new technology in the classroom. Finally, it considers the critical influence of assessment on the teaching and learning process and discusses the potential of technology to encourage more progressive assessment paradigms which in turn will stimulate more enlightened pedagogical practices. Chapter 3 describes the methodology adopted in this study. It explains the research design and describes the methods of data collection and analysis. The findings of the study are presented in Chapter 4 and a comparison is drawn between these results and those of similar research studies. Chapter 5 reflects on measures that can be taken to integrate the iPad in the classroom in innovative ways to support a more constructivist learner centred approach. It concludes with a series of recommendations which if adopted, could eliminate or at least alleviate many of the challenges identified by this study.

Chapter 2: Literature Review

2.1 Technology and the Predicted Educational Revolution

The transition from an industrial production-based economy to a knowledge-based digital economy has had profound implications for the skill set required in current work places. This generation of students require critical thinking and problem solving skills and must engage in lifelong learning to help them meet the demands of an increasingly technological and rapidly changing work environment (Birenbaum et al., 2006; Boud, 2000; Salama, 2013). The education sector has been challenged to equip students with the 21st century skills demanded by this dynamic, evolving workplace (Drabinski, Clark & Roberts, 2011). Studies have pointed to the manner in which technology has transformed other aspects of our lives and many educators believe it can act as a catalyst to bring about the necessary changes to reform education to meet the needs of 21st century learners (Birenbaum et al., 2006; Crichton, Peglar & White, 2012; Rajasingham, 2011). For the past half century, each new technological innovation has been welcomed by educational technology advocates as the device which would revolutionize the teaching and learning process and prepare students for the challenges posed by an ever changing world (Buckingham, 2007; Hew & Brush, 2007; Tangney & Bray, 2013). Perrotta (2013, p.1) offers a definition of technological innovation as applied in an educational setting:

In the context of education, the word innovation is generally understood as referring to the uptake of technology-enhanced practices, underpinned by pedagogic models that favour learner-centred, 'constructivist' approaches that shift the focus from traditional instruction to more participatory and personalised types of learning.

Certainly the role of technology in education has become increasingly important in the last two decades (Drabinski, Clark & Roberts, 2011; Hu, Clark & Ma, 2003; Rajasingham, 2011) and many studies report that its integration can positively impact student learning (Hew & Brush, 2007; Mumtaz, 2000; Stepp-Greany, 2002; Wu et al., 2013). However, the actual use of information and communications technology (ICT) in education typically falls well short of the innovative uptake described by Perrotta (2013) and many studies indicate that ICT has not transformed the educational landscape (Birenbaum et al., 2006; Buckingham, 2007; Kirkup, & Kirkwood, 2005; Mumtaz, 2000; Murray & Olcese, 2011; Rajasingham, 2011; Tangney & Bray, 2013). Rather, it has merely resulted in a repackaging of traditional pedagogy and most educational institutes continue to give priority to knowledge acquisition

and transmission of content rather than to knowledge creation and critical thinking (Birenbaum et al., 2006; Johnson, Means & Graff, 2012; Kim & Bonk, 2006; Pegrum, Howitt & Striepe, 2013; Rajasingham, 2011; Tangney & Bray, 2013).

2.2 Is the iPad the Innovation that will Finally Deliver the Predicted Revolution?

The launch of the iPad in 2010 gave renewed hope that this was the device that would finally transform education (Crichton, Peglar & White, 2012; Clark & Luckin 2013; Murphy, 2011). “Ultimately, the iPad and student-centred tool-based learning can transform the higher education student learning experience, and post-graduate results in the UAE” (Cavanaugh et al., 2012, p. 2). Early studies report positive perceptions regarding the potential of the iPad as a learning resource (Banister, 2010; Clark & Luckin 2013; Crichton, Peglar & White, 2012; Goodwin, 2012; Murphy, 2011; Rossing et al., 2012). Much of the optimism regarding the transformative potential of this versatile device stems from its particular features including its portability, relatively large screen size, instant internet access, multimedia capabilities and the availability of a vast array of engaging interactive apps. These attributes have the potential to create a variety of teaching and learning opportunities in the classroom (Banister, 2010; Clark & Luckin 2013; Pegrum, Howitt & Striepe, 2013). Additionally, the intuitive design of the iPad makes “the actual process of using the technology easy” (Clark & Luckin 2013; Crichton, Peglar & White, 2012, p. 24; Goodwin, 2012; Manuguerra & Petocz , 2011; Melhuish & Falloon, 2010). Cavanaugh et al. (2012, p.2) contend that “being able to quickly move past the technology and onto the pedagogy are an essential game-changer unseen in prior emerging technology”.

However, the literature also recognises that there are many pedagogical iPad related issues which have yet to be resolved. Possibly the greatest barrier to the transformative potential of the iPad, is that akin to previous technological initiatives, the device is only been employed to deliver content (Murphy, 2011; Tangney & Bray, 2013). The literature suggests that teaching methods need to change significantly if the iPad is to be employed effectively in pedagogically innovative ways (Murphy, 2011; Rajasingham, 2011; Rossing et al., 2012). A more thorough exploration of the literature is required to understand the opportunities and challenges associated with using the device in an educational setting to determine whether the iPad will transform education or prove to be an educational short-lived fad similar to many of its antecedents.

2.3 Opportunities and Challenges related to using the iPad as a Pedagogical Tool

2.3.1 Mobility and Portability

iPads afford learners the opportunity to participate in anytime, anyplace learning (Bansiter, 2010; Goodwin, 2012; Kinash, Brand & Mathew, 2012, Murphy, 2011; Rossing et al., 2012). The device extends learning beyond the walls of the lecture hall and facilitates self-directed learning opportunities (Harmon, 2012; Kinash, Brand & Mathew, 2012; Naismith et al., 2004; Pegrum, Howitt & Striepe, 2013; Rajasingham, 2011). The tablet also facilitates teacher mobility within the classroom. Barbour (2012, p. 26) claims the iPad allows teachers to interact more freely with individual and groups of students:

Essentially, it is as if the teacher is able to tuck that electronic whiteboard underneath their arm and use it with the same mobility as a teacher would use a textbook in years past.

2.3.2 Collaborative Learning Experiences

In recent years, most educators have indicated a preference for constructivist learning approaches over more traditional behaviourist approaches because they are student-centred and are more likely to engage learners in critical thinking and knowledge creation (Murphy, 2011; Stepp-Greany, 2002; Rajasingham, 2011; Tangney & Bray 2013). Collaboration is perceived to be a critical component of the constructivist learning approach. There is considerable research evidence to suggest that the iPad has the potential to foster collaborative learning opportunities in several ways (Clark & Luckin 2013; Diemer, Fernandez & Streepey, 2012; Goodwin, 2012; Kinash, Brand & Mathew, 2012; Manuguerra & Petocz, 2011; Melhuish & Falloon 2010; Murphy, 2011; Pegrum, Howitt & Striepe, 2013; Rajasingham, 2011; Rossing et al., 2012). In class, the device is less intrusive than a laptop and becomes a central focal point generating interaction between learners (Clark & Luckin 2013; Murphy, 2011; Rossing et al., 2012). Students can easily access social media apps on the device, enabling users to collaborate with a much wider audience (Pegrum, Howitt & Striepe, 2013). Rossing et al. (2012) maintain that the iPad also promotes collaborative learning because of the selection of applications specifically designed to encourage teamwork. However, other studies report that there are complications related to using the iPad as a collaborative tool because the tablet was designed as a media-consumption tool intended for individual use (Crichton, Peglar & White, 2012; Goodwin, 2012).

2.3.3 Spontaneous Access to Internet

There is a general consensus among researchers that the spontaneous access the device affords to the extensive educational resources on the internet can result in a range of ‘just-in-time’, authentic, situated and personalised learning opportunities (Banister, 2010; Clark & Luckin 2013; Crichton, Peglar & White, 2012; Gawelek, Spataro, & Komarny, 2011; Pegrum, Howitt & Striepe, 2013; Rossing et al., 2012). There is an abundance of information on every conceivable topic available on the internet. However, Rossing et al. (2012, p. 14) caution “that information differs significantly from knowledge”. It is essential that teachers prepare students to critically evaluate the available information. Another barrier to learning posed by the spontaneous access is the distraction factor. Students get frequent pop-ups informing them of updates on social media sites and similar platforms. The ease with which students can switch from educational apps to social media apps has proved very distracting during class time (Banister, 2010; Kinash, Brand & Mathew, 2012; Rossing et al., 2012). Banister (2010) also cautions that students frequently copy material from sources on the internet and paste it directly into their assignments. Several studies recommend that institutions consider how digital citizenship may be cultivated to adequately prepare students for the new challenges presented by learning in a mobile environment (Crichton, Peglar & White, 2012; Parsons, 2013; Rajasingham, 2011). Melhuish & Falloon (2010, p. 10) expound this notion as they believe that:

The challenge for educators will be to open security doors sufficiently to allow access to the full resources of the web, while at the same time, guiding, teaching and managing the challenges that more open and unfettered connection can bring.

2.3.4 Multi-media features

Multimedia resources engage students and enhance conceptual understanding (Banister, 2010). The iPad, with its ultra-high screen resolution, integrates a variety of multimedia tools such as still and video camera and audio recorder (Goodwin, 2010), and facilitates the creation of lively, spontaneous and high-quality presentations which can be easily annotated in real-time thereby customizing learning content to particular classroom needs (Banister, 2010; Manuguerra & Petocz, 2011; Murphy, 2011). Creating video lectures using earlier technologies required considerable technical expertise but the iPad simplifies the process significantly (Manuguerra & Petocz, 2011). The multimedia capabilities together with the touchscreen interface appeal to a wide range of learning styles, including audio, visual and

kinaesthetic learners (Murphy, 2011). However, other studies consider the incompatibility with Flash a limitation as many on-line multimedia resources have been created using Flash (Clark & Luckin 2013; Parsons, 2013; Rajasingham, 2011).

2.3.5 “App”olutely or “App”olutely not

The availability of more than 20,000 vibrant educational apps which readily engage students is another compelling reason to adopt the iPad (Bannister, 2010; Murphy 2011; Waters, 2010). Harmon (2010 p. 30) claims that these media rich apps captivate learners “in a way that traditional classroom activities could not.” A review of the literature also suggests that individual learning preferences can be accommodated through the addition of carefully selected apps (Bannister, 2010; Clark & Luckin 2013; Goodwin, 2012; Murphy 2011; Waters, 2010).

Apps may be divided into three categories; instructive game-based apps, content delivery apps and content creation apps (Goodwin, 2012). Instructive game-based apps are of the ‘drill and practice’ variety and are designed to improve the user’s proficiency in a specific skill. These apps usually provide instant feedback, include a competitive element and offer graduated levels of difficulty (Goodwin, 2012). Content delivery apps replace the textbook but also exploit the multimedia capabilities of the device and include links to relevant online resources. Both of these categories of apps facilitate personalised learning opportunities and the multimedia dimension enhances conceptual understanding (Banister, 2010; Murray & Olcese, 2011). However, they merely replicate experiences which were already available with earlier technologies (Murphy, 2011; Murray & Olcese, 2011; Waters, 2010). Learners must employ the content creation apps to acquire creative thinking and problem solving skills, the skills necessary for the 21st century if the device is truly to transform education (Goodwin, 2012; Murray & Olcese, 2011). Studies have reported examples of elementary pupils using content creation apps to produce professional digital artefacts that demonstrated their learning across disciplines (Crichton, Peglar & White, 2012; Goodwin, 2012; Marks et al., 2013). However, despite extensive searches some high school students and teachers struggled to find apps relevant to their area of study (Clark & Luckin, 2013; Crichton, Peglar & White, 2012). Murray and Olcese (2011, p 48) posit that the majority of apps are targeted at the consumption rather than the creation or collaboration of content, mimic behaviourist learning approaches and consequently, they conclude that the device “will not revolutionize teaching and learning”. Other educators also believe that the iPad is more useful as a consumption

device rather than as a production tool (Pegrum, Howitt & Striepe, 2013; Waters, 2010). Additionally, there are attendant difficulties in using the iPad for text input because the on-screen keyboard and the screen size are impediments when composing extended texts (Pegrum, Howitt & Striepe, 2013; Gawelek, Spataro, & Komarny, 2011; Rossing et al., 2012).

The time-consuming process of evaluating, selecting and managing apps is a further area of concern addressed by research papers (Goodwin, 2012; Harmon, 2010; Parsons, 2013). Other studies questioned the stability and reliability of apps and reported that heavy usage resulted in apps crashing, causing considerable disruption to the learning process (Rossing et al., 2012). Finally, the research recommends that institutions must carefully consider “the benefits (and ethics) of requiring students to purchase applications that may not prove valuable beyond the scope of a given assignment or class activity” (Rossing et al., 2012 p.18). While the ‘lite’ version of many apps is free, there are many attending restrictions, such as length of audio recording permitted, restrictions on number of projects, or accessibility to content (Clark & Luckin, 2013; Pegrum, Howitt & Striepe, 2013).

2.3.6 Student Engagement

There is a general consensus in the literature that the use of the iPad contributes to increased levels of student engagement in the classroom (Diemer, Fernandez & Streepey, 2012; Gawelek, Spataro & Komarny, 2011; Harmon, 2010; Manuguerra & Petocz, 2011; Marks et al., 2013; Pegrum, Howitt & Striepe, 2013). Marks et al. (2013) claim that the iPad raised student engagement levels for all students but that this improvement was more evident in boys than in girls. However, the literature also expresses some evidence to the contrary. A study investigating student perceptions of classroom engagement and learning using iPads, concluded that gender did not affect student engagement but that student proficiency with e-learning and mobile technology was a key factor in determining student engagement (Diemer, Fernandez & Streepey, 2013). Naismith et al. (2004) claim that ownership of mobile devices is necessary to create the optimum circumstances for engagement as students then have the time to explore and exploit the features and functionalities of the device which offer the best learning opportunities for them.

2.3.7 Technical Issues

Studies have expressed concerns regarding technical difficulties related to internet connectivity, speed and coverage which resulted in frustration and classroom disruption (Crichton, Peglar & White, 2012; McKenna, 2012; Parsons, 2013; Rossing et al., 2012). In particular, Rossing et al. (2012, p. 18) argue that “the largest impediments to learning and strongest challenge to the convenience of the device appeared to be wireless connectivity and the stability and reliability of applications”.

2.3.8 Distribution Storage and Submission

Some research studies indicate that the iPad allows teachers to easily share materials with students (Clark & Luckin, 2013). The devices can function as “highly efficient repositories and delivery mechanisms for course materials” (Murphy, 2011) through applications similar to Blackboard. In addition, there is evidence in the literature to indicate that the capability of the tablet to connect to “cloud” document repositories for example “Dropbox” and “Google Docs” enables students to access, share and collaborate on projects (Clark & Luckin, 2013; Murphy, 2011; Parsons, 2013).

Other studies indicate that the distribution, storage and submission of work are a continuing challenge with the iPad (Crichton, Peglar & White, 2012; Parsons, 2013). Additionally, data retrieval is a challenge because when content is lost on an iPad, it is virtually impossible to recover (Crichton, Peglar & White, 2012). Parsons (2013) also reports that students also lost work because they misunderstood the role of iCloud.

2.3.9 Summary

Although the literature recognises that there are issues yet to be resolved in employing the iPad as a pedagogical tool, overall there is a recognition that the device has the potential to provide a wealth of learning opportunities, increase student engagement and help teachers implement a constructivist learning approach which encourages the development of creative thinking and problem solving skills. However, teachers must employ the device to engage students in content creation and collaborative activities if the iPad is to be the catalyst for a paradigm shift in education. In order to integrate technology in an effective and innovative manner, teachers need to develop technology-supported pedagogy, knowledge and skills.

The following section discusses the SAMR model, a pedagogic model of technology integration which describes possible levels of integration.

2.4 SAMR Technology Pedagogic Model

Figure 1 below presents Puentedura’s (2006) SAMR model of technology adoption which explains that educators progress through a series of stages before achieving the optimum levels of technology integration that facilitate the “more participatory and personalised types of learning” described by Perrotta (2013) on page 5 of the present study.

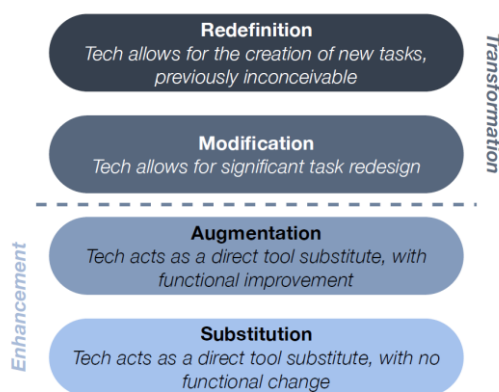


Figure 1: The SAMR Model of Technology Adoption (Puentedura, 2006)

It is relatively easy to implement the first two stages of the model. Initially, users seek to employ new technology to perform the same function as the tool it is replacing. This is the substitution stage and can be as straight forward as transferring the learning resources to the new device, in this instance, the iPad. Often the second stage, augmentation, follows as a direct consequence of the substitution because ideally the new device affords some functional improvement over the tool it is replacing. For example, the dictionary feature on the iPad affords learners an opportunity to quickly check the meaning of unfamiliar vocabulary. The instructive game-based and content delivery apps, described in Section 2.3.5, are also at the substitution and augmentation stages of the model. The substitution and augmentation phases are classified as aspects of enhancement but do not constitute a fundamental change in teaching delivery methods which research has indicated is necessary if the device is to transform the education process. Teachers must embrace the modification and redefinition stages of the model if the technology is to be employed in optimal pedagogical ways. Employing the iPad to develop learners’ higher cognitive thought processes through

participation in collaborative projects in social environments, simulations and games align with the higher levels of use (Cavanaugh et al., 2012). It can take teachers a considerable length of time to employ new devices effectively to adapt learning activities to the point that the educational experience is actually transformed (Cavanaugh et al., 2012).

However, there is significant research evidence to demonstrate that previous technological innovations were seldom employed at the transformation levels described by the SAMR model and that their use was largely restricted to content consumption (Kirkup & Kirkwood, 2005; Pegrum, Howitt & Striepe, 2013; Rajasingham, 2011; Tangney & Bray, 2013).

Tangney & Bray (2013, p. 1) caution that

... if past experience is a valid predictor of future behaviour then, they [iPads] too will at best be assimilated into existing practices and their prime function is likely to be as content delivery devices.

The following section describes the critical role teachers play in the successful introduction of technological devices in the classroom and underlines the importance of supporting them to employ new technology in pedagogically innovative ways.

2.5 Why are Teacher Perceptions towards Technology Important?

A search of the relevant literature reveals that integrating new technologies successfully in educational environments is primarily dependent on the teacher (Armstrong, 2011; Barnea & Dori, 1997; Cavanaugh et al., 2012; Judson, 2006; Keengwe, Onchwari & Wachira, 2008; Mumtaz, 2000; Rossing et al., 2012; Stepp-Greany, 2002). Teachers' educational philosophies and their views regarding the importance of technology in education greatly influence how they integrate digital devices into their classroom and it can be a challenge to persuade reluctant users of the benefits of incorporating new technology (Keengwe, Onchwari & Wachira, 2008). Other studies highlight how teachers' attitudes towards technology have a significant effect on student attitudes towards technology (Hu, Clark & Ma, 2003). Negative teacher perceptions regarding technology can be a significant factor inhibiting students from exploiting the educational potential of these devices (Anderson, 2011; Nasser, Cherif, & Romanowski, 2011). Similarly, positive teacher attitudes towards technology are associated with correspondingly positive student attitudes and contribute to a more extensive and effective use of the technology (Hu, Clark, & Ma, 2003; Johnson, Means & Graff, 2012).

Therefore, teachers require intensive professional development (PD) to persuade them of the value of the new technology (Hew & Brush, 2000). They need sufficient time to become familiar with the device and learn how to use it as a pedagogical tool. Teachers require ongoing support throughout the implementation phase to enable them to adapt resources and instructional design (Rajasingham, 2011) if they are to employ the device effectively at the transformation level of the SAMR model (Cavanuagh et al., 2012; Hu, Clark & Ma, 2003; Rossing et al., 2012; Tangney & Bray, 2013).

2.6 Technology and Assessment

Even if teachers have the technological pedagogical knowledge to integrate technology at the transformational level of the SAMR model, their use of technology may be constrained by other factors including curriculum, time and assessment. Research has indicated that pressures associated with summative assessment can be a major factor discouraging teachers from experimenting with innovative technologies in the classroom (Hew & Brush, 2007). There is a general consensus in the literature that current assessment practices, with their overreliance on summative pen and paper assessments do not meet the requirements of the today's knowledge economy and fail learners by not preparing them to become creative thinkers, problem solvers and lifelong learners (Birenbaum et al., 2006; Boud, 2000; Pellegrino & Quellmalz, 2010; Perrotta, 2013; Ridgway, McCusker & Paed, 2004; Sealey, 2013). In addition, summative, high-stake assessments encourage restrictive teaching practices with teachers devoting considerable class time to practice tests (Broadfoot & Black, 2004, Sanders & Horn, 1995, Smyth & Banks, 2012). Boud (2000, p. 155) claims that "Existing assessment practices are perhaps the greatest influence inhibiting moves towards a learning society".

During the past three decades, the use of more progressive formative assessment practices has become more prevalent. Good formative practices, which provide clear, timely feedback to learners have been shown to result in increased student motivation and improved student performances (Black & William, 1998, Brookhart, 2001, Ridgway, McCusker & Paed, 2004, Stiggins, 2000). Formative assessment or assessment for learning fits well with the constructivist approach to learning because it empowers learners, helps them develop confidence and metacognition, and fosters an ethos of lifelong learning (Boud, 2000).

Furthermore, these practices can record student progress on a much greater range of skills including higher order thinking skills (Lincoln, 2009; Ridgway, McCusker & Paed, 2004). Numerous studies have reported how technology can assist a more seamless integration of innovative formative assessment techniques into the teaching and learning process through the use of dynamic e-portfolios, simulations, electronic voting systems (EVS), diagnostic, adaptive and on-demand testing (Buzzetto-More and Alade, 2006; Owen, 2009; Pellegrino & Quellmalz, 2010; Ridgway, McCusker & Paed, 2004; Simpson & Oliver, 2007).

Because the iPad is a relatively new device, there has been little research into its effectiveness as an assessment tool (Clark & Luckin 2013; Rajasingham, 2011). However, several studies refer to its potential to enhance formative assessment practices because it facilitates timely and personalised feedback to learners (Clark & Luckin 2013; Gawelek, Spataro, & Komarny, 2011; Manuguerra & Petocz, 2011). Goodwin (2012, p. 7) is convinced that the device presents “opportunities for the teacher to provide on-going, just-in-time feedback and also collect cumulative assessment data”. The device’s capability to provide authentic learning opportunities and its potential to offer rich multimedia experiences facilitate the design of dynamic e-portfolios (Clark & Luckin 2013). Also, there are a range of apps which include polling tools to enable teachers to promptly collect student responses and thereby assess whole class level of understanding (Clark & Luckin 2013; Gawelek, Spataro, & Komarny, 2011; Murphy, 2011). Manuguerra and Petocz (2011) also claim that the device facilitates the grading of assessments.

The literature indicates that technology can facilitate assessment for learning opportunities in the classroom. However, overlooking the need to reform assessment and continuing to rely on antiquated summative assessments will greatly hamper the potential of any technological innovation to transform education to meet 21st century requirements (Hew & Brush, 2007).

This chapter discussed how the emergence of the knowledge-based, digital economy has changed significantly the skills students need to develop to participate successfully in a rapidly changing 21st century work environment. Educational institutions need to adopt a more social constructivist approach emphasising collaborative, communicative, and problem solving skills to enable students to meet the fluid demands of a technologically driven society (Drabinski, Clark & Roberts, 2011; Tangney & Bray, 2013). The iPad can facilitate the implementation of a social constructivist approach if its use in the classroom is implemented at the transformation level of the SAMR model. Possibly the greatest barrier to the

transformative potential of the device, as Hanley (2011, p. 11) noted is that, "new technologies often heralded and sold as 'revolutionary', are deployed to do the same old things". Teachers need considerable support and on-going in-service to help them to integrate technology at the transformation level of the SAMR model. Existing summative assessment practices are a key factor inhibiting teachers from experimenting with innovative technologies in the classroom. (Hew & Brush, 2007; Perrotta, 2013; Tangney & Bray, 2013). Therefore, a desire to employ any technological innovation to reform the education system needs to be preceded by a willingness to embrace a more progressive assessment paradigm.

Chapter 3 The Present Study

The purpose of this study was to investigate teacher perceptions of the effect of the iPad on both teaching and assessment practices at a tertiary institute in the UAE. In April 2012, it was decided that the foundations department would adopt the iPad as the primary learning resource for the following academic year. Consequently, teachers had just 4 months (2 of which were summer vacation) to become proficient iPad users and to learn how to use the device in an educational setting. iPads were issued to the foundation teachers in May, to enable them to get familiar with the device. Two teachers who were already competent iPad users were nominated to attend a centralized training course and to subsequently facilitate PD sessions for the remaining foundation teachers. Additional teachers were encouraged to investigate educational apps and to share their findings with colleagues. All foundation teachers were required to attend a two week PD training session to learn how to use the device in an educational setting. The PD sessions concentrated on technical competencies and how to use particular apps in an educational setting. It also prepared teachers to facilitate iPad orientation sessions with the students. The students had recently graduated from high school and had little previous experience of online learning. They were required to come to college, in the week prior to the start of classes, to purchase the iPad and have preselected educational applications loaded on the device. On 9th September, 2012, the foundations department started their academic year with iPads replacing the previously used laptops and the more traditional textbooks. Teachers were encouraged to use the device exclusively and to limit the use of paper whenever possible.

3.1 Methodology

This investigative study used a concurrent mixed-method survey to collect information from the participants. Creswell (2008, p. 388) claims that surveys provide useful information to evaluate the success of programmes in education. Additionally, the choice of a survey enabled the researcher to canvass a much wider range of views than if the researcher had chosen to interview participants, which because of time-constraints, would have necessarily restricted the sample size (Drever, 2003). Furthermore, a survey facilitates efficient and economical data collection and eliminates bias because all participants are presented with the

same questions in the same order (Creswell, 2008; Kelley et al., 2003; Pring, 2000). Finally, questionnaires offer participants a degree of anonymity which few other research techniques permit and this factor can encourage greater participation and are more likely to result in forthright responses (Munn & Drever, 2004).

A mixed method survey design was selected because the resultant quantitative and qualitative data can provide a thorough understanding of the research problem (Creswell, 2008). In addition, collecting both kinds of data can overcome the weaknesses associated with solely relying on information gathered from either source. Quantitative data can yield results which describe trends in the behaviour of a population and the qualitative data can uncover the complex causes underlying these trends (Creswell, 2008). In the present study, the researcher hoped that the quantitative data would highlight both the successful and the challenging aspects of the adoption of the iPad. It was anticipated that the qualitative data could explain teacher perceptions of the reasons underlying the successes and challenges. The quantitative questions were located at the beginning of the survey to focus the respondents' attention on the aspects which the researcher wanted to collect information. The discussion in Chapter 4 focuses primarily on the wealth of rich descriptive data obtained in response to the qualitative open-ended questions. Rossing et al. (2012) and Awan (2013) also used a questionnaire to successfully investigate perceptions regarding the integration of technology.

3.2 Research Instrument: The Survey

The survey was paper based (See Appendix A) and followed the mixed method design. The researcher designed a detailed questionnaire specifically for this study. The questionnaire included both 5-point Likert-scale questions with responses ranging from strongly agree to strongly disagree and open-ended questions. Priority was given to the open-ended questions because the purpose of the survey was to explore teachers' perceptions and open-ended questions give participants more opportunity to describe their experiences by not limiting the possible responses (Creswell, 2008).

Kelley et al. (2003) recommend that surveys should be reviewed to help ensure the credibility of the findings. This questionnaire was reviewed by four colleagues who have expertise in mixed method survey design. During the review process the editors checked and validated the content of the survey and evaluated all questions to make sure they were unambiguous, clearly categorized and followed in a logical sequence (Creswell, 2008; Kelley et al., 2003;

Munn & Drever, 2004). The questionnaire was subsequently piloted with 3 teachers and revisions made accordingly. Two questions were deleted as the pilot participants felt other questions were eliciting the same information. The revised survey was then piloted again with an additional 2 teachers (Munn & Drever, 2004). The teachers who piloted the survey were not part of the study. They were adjunct teachers who had joined the foundations team at various times throughout the year. The study itself was limited to teachers who had attended initial PD sessions and had taught in the foundations program for the full academic year.

The final draft of the questionnaire took approximately 25-30 minutes to complete and was divided into five sections.

Section A collected demographic information about the participants. It was composed of five quantitative questions and aimed to establish the gender, age, experience, subject area and computer literacy level of the participants.

Section B explored how teachers perceived the iPad had impacted on classroom practices. The main aims of the UAE iPad initiative were to develop innovative ways of teaching and learning, increase student engagement and improve the overall student learning experience. Therefore, Section B included eight Likert scale questions to explore how teachers felt the introduction of the device had affected these key aspects. The first two questions investigated teacher perceptions of the suitability and effectiveness of the iPad as a pedagogical tool. The intention of question 3 and 4 was to explore if teachers perceived the device facilitated the creation of innovative and personalised learning opportunities. Questions 5, 6 and 7 explored how teachers felt the tablet influenced student engagement and learning. The last question in this section asked participants to reflect if their classroom practices had changed with the introduction of the device. Participants, who indicated that their classroom practices had changed, were also invited to add comments to explain the manner of this change. Teachers were also requested to include any other relevant remarks to give participants an opportunity to qualify their responses and to express any issues which may not have been anticipated by the questions in the survey.

Section C comprised three Likert scale questions to gauge how the iPad had affected assessment practices. The first two questions asked teachers to consider if the iPad had facilitated with the administration and grading of assessments. The final question probed if

the device had contributed to the creation of innovative assessment opportunities. Participants were again invited to add additional comments to clarify their responses.

Section D investigated which apps teachers found most beneficial to learning as the effectiveness of the iPad as a pedagogical tool is largely dependent on the usefulness of the available educational apps. Research has indicated that teachers can be overwhelmed by the variety and immense selection of more than 20,000 educational apps (Goodwin, 2012; Harmon, 2010; Parsons, 2013). The purpose of this section was to identify a preliminary, select suite of apps which could enable teachers to effectively carry out their classroom responsibilities as they make the initial transition to teaching with the iPad. Participants were presented with a list of 22 apps which had been introduced in initial PD sessions. The teachers were requested to specify how often they had subsequently used the apps as it seemed reasonable to assume that teachers would use the most effective apps more frequently. Teachers were also asked to identify the three apps they perceived as most effective to ascertain which of the initial 22 apps and other apps subsequently introduced, were most useful.

The final section of the survey included open-ended questions which asked participants to describe two attributes of the iPad which both enhanced and limited learning opportunities in their particular educational setting. The section asked teachers to reflect on both opportunities and challenges associated with using the device in an attempt to get a more balanced view of the device's potential as a pedagogical tool from participants who were iPad enthusiasts and those who were more sceptical about the educational potential of the device. The study further recognises that teachers are not free agents in the classroom and consequently the last question asked participants to consider factors which may have discouraged them from experimenting with iPads to create innovative learning opportunities.

3.3 Sample

In this study the choice of a survey enabled the researcher to include the whole population of foundations teachers who were present at initial PD sessions and who afterwards used the device as the primary learning resource for a full academic year. The foundations teachers were targeted because this was the first programme where iPads were introduced. Munn & Drever (2004) recommend targeting the entire population if possible. The sample included males and females, teachers from different disciplines, with varying degrees of teaching

experience and levels of computer literacy. It also meant that data could be collected from the full range of users from the most reluctant to enthusiastic iPad adopters. Therefore, the findings may prove significant for a wider population than if the sample had been limited to a smaller more exclusive group.

3.4 Ethics

Creswell (2008) emphasises the importance of ethical considerations in the collection, analysis and reporting of research data. He stresses the need to obtain permission from the research site management team and to acquire the informed consent of individual participants (Creswell, 2008, 179). The author submitted a written application to the institution's Scholarly Activities Committee to conduct this research study. The committee approved the research request and the author agreed to abide by the conditions, policies and procedures of the participating college. Individual participation in the study was both voluntary and anonymous. The author included an explanation with the survey to provide participants with adequate details to allow them to make an informed decision to take part or to decline (Hammersley & Traianou, 2012). The findings will be shared with interested participants.

3.5 Data Collection

The final survey was distributed by email to all 45 foundations teachers who had taught using the iPad for a full academic year. Participants were requested to return the completed questionnaire in a sealed envelope to protect their anonymity. The survey was distributed in the final two weeks of the academic year when classes had finished and teachers had only invigilation and marking duties. It was anticipated that distributing the survey during this less frenetic period could help maximize return rates. Hard copies of the survey and envelopes were provided in the faculty lounge to serve as a reminder to participants, to save them the trouble of printing and ultimately to encourage additional responses. After one week, a follow-up email was sent to thank those who had already responded and to remind others who wished to participate of the impending deadline. In total, 32 out of 45 respondents returned the survey giving a response rate of 71%.

3.6 Data Analysis

3.6.1 Quantitative Data

The quantitative data was manually scored (Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2, Strongly Disagree = 1). The scores were recorded in an Excel spreadsheet and the means and standard deviation calculated.

3.6.2 Qualitative Data

The open-ended questions in Sections B, C and E generated a wealth of descriptive and explanatory information. The responses to each section were collated and entered into an Excel spreadsheet. The researcher categorized the information from each section into themes. A colleague with experience in mixed-method independently coded the information. Subsequently, the two investigators met to compare the categories and the allocation of comments to each category to clarify any researcher bias and to modify the themes. Next, the number of responses which subscribed to each theme was counted and converted into percentages. Finally, the data was presented in tables to show the most significant, frequently cited, commonly cited and rarely cited comments for each section. A final table was prepared which summarised the main themes emanating from all sections. The quantitative and qualitative databases were compared to determine the degree of similarity between the results.

3.6.3 Section D

Question 1 in Section D asked respondents to indicate how frequently they had used the apps introduced during college based PD sessions to discover which apps had subsequently proved useful in a classroom setting. The participants had 3 categories to choose from: “Not at all-Once”, “2-5 times” and “More than six times”. The results were sorted in descending order by the apps used “More than six times”. This method does not necessarily reflect the educational value of all apps. The fact that a teacher used an app 2-5 times and then discarded it may be more of an indictment against an app than one that they have never used. In addition, when a teacher found an app that accomplished a particular task they may not have felt the need to explore other apps which could fulfil a similar purpose. Additionally, apps which were intended for exclusive use by math teachers would obviously score lowly because less than one fifth of the foundation teachers are math teachers. However, most of

the apps listed are presentation apps, production apps or apps designed to facilitate file storage and distribution. These apps have a general cross-discipline application. The apps which score highly in the “frequency of use table” should provide some indication of apps that have proved useful in the educational setting described in this study.

Question 2 in Section D asked participants to identify the three apps they perceived as most effective and to briefly explain why. The percentage of respondents, who included specific apps in their top three, was calculated and a table showing the list of effective apps ranked in descending order was constructed.

Then the two lists were compared and a single list of apps which scored highly on both criteria was compiled.

3.7 Limitations in Using a Questionnaire

Munn & Drever (2004) identify three main disadvantages in using a questionnaire; the time taken to draft the questionnaire is frequently underestimated by researchers, the resultant information can be descriptive rather than explanatory in nature and the information can be superficial. To overcome these limitations, the researcher must be very clear of the purpose of the questionnaire and the nature of the information he wishes to collect (Munn & Drever, 2004). In the present study, each question was carefully drafted and then the draft questionnaire was subjected to a rigorous review and pilot process as described earlier in this chapter. The answers submitted to the open-ended questions by the pilot participants were evaluated for relevance and to ensure they were delivering the depth of explanatory information required for the study. The researcher was aware that the resultant range of responses was likely to require complex, labour-intensive data analysis and engaged the help of a colleague to independently verify the coding (Creswell, 2008; Munn & Drever, 2004). The length of the questionnaire has been identified as another critical factor which can greatly influence response rates (Munn & Drever, 2004). Survey questionnaires should not take longer than 30 minutes to complete (Punch, 2003) and the questionnaire used in this study was designed as such.

The following chapter presents the results of this mixed-methods study and demonstrates the significance of the results in relation to literature reviewed earlier.

Chapter 4 Findings and Discussion

The present study generated a wealth of findings regarding teachers' perceptions of the opportunities and challenges associated with using the iPad as a pedagogical and assessment tool. This chapter initially presents the figures from the quantitative data and this is followed by a discussion of the qualitative data in conjunction with the quantitative figures. Both sets of findings are compared to determine the degree of similarity between the results as recommended by Creswell (2008). The discussion also compares the findings with the results of other relevant studies in the literature. It further considers how these studies overcame some of the challenges associated with using the iPad in an educational setting.

4.1 Quantitative Findings

4.1.1 Section A Findings

Table 1: Section A Demographic Findings

Gender		Age		Years of Teaching Experience		Subject Area		IT Skills	
Male	15 (46.9%)	20-30	0 (0%)	6-10	2 (6.3%)	English	24 (75%)	Novice	1 (3.1%)
Female	17 (53.1%)	31-40	3 (9.4%)	11-15	6 (18.8%)	Math	6 (18.8%)	Intermediate	20 (62.5%)
		41-50	14 (43.8%)	16-20	9 (28.1%)	Other	2 (6.3%)	Expert	11 (34.4%)
		51-65	15 (46.9%)	> 20	15 (46.9%)				

The findings indicate that the participants are a very experienced group of teachers with 75% having more than 16 years teaching experience. The table also illustrates that 75% of respondents were English teachers. This is not an unusual result as English is the predominant teaching area in the foundations programme. Furthermore, the findings reflect that participants consider themselves to be computer literate with all but one respondent rating their IT skills as intermediate or expert.

4.1.2 Section B Findings

Table 2 shows the means and standard deviations for the responses to Section B.

Table 2: How did the iPad affect actual teaching practices in the classroom?

The different values for “*n*” are because of an incomplete survey where a respondent skipped an answer.

	After two semesters of using the iPad	<i>n</i> =	<i>m</i> =	<i>sd</i> =
1.	I find the iPad useful for teaching.	32	3.563	0.998
2.	I feel the iPad has enhanced my effectiveness as a teacher.	32	2.813	1.044
3.	The iPad helps me to create and facilitate innovative learning opportunities.	32	3.250	1.090
4.	The iPad helps me to create and facilitate personalized learning opportunities.	32	3.438	0.864
5.	The iPad has increased student engagement.	31	3.032	0.967
6.	The students are often distracted by other applications.	32	4.531	0.706
7.	The iPad has enhanced student learning.	32	2.938	0.827
8.	My classroom practices have changed with the introduction of iPads.	32	3.719	1.038

The table illustrates that the item which scored the highest mean and lowest standard deviation was that “The students are often distracted by other applications” indicating that this is an area of prime concern for teachers. The item which scored the second highest mean was that teachers believed their classroom practices had changed with the introduction of the iPad. The perception that the iPad had enhanced student learning and teacher effectiveness were the two items awarded the lowest means indicating that teachers had significant concerns about the adoption of the iPad as a pedagogical tool. All of these issues will be discussed later in this chapter.

4.2.2 Section C Findings

Table 3 shows the means and standard deviations for the responses to section C.

Table 3: How did the iPad affect assessment?

	After two semesters of using the iPad	<i>n</i> =	<i>m</i> =	<i>sd</i> =
1.	The iPad facilitates efficient administration of assessments.	32	2.375	0.960
2.	The iPad facilitates the grading of assessments.	32	2.656	1.290
3.	The iPad has helped me assess students in new ways.	32	2.719	1.068

The respondents gave a relatively low rating to the device's impact on assessment for all three items. When the quantitative results are compared for section B and C it is clear that teachers scored the iPad's effect on assessment much lower than they had rated its impact on classroom practices. The highest mean awarded for the devices impact on assessment (2.719) is less than the lowest mean awarded in Part B (2.813) suggesting teachers had significant reservations employing the device as an assessment tool. The problems surrounding assessment practices will be explored later in this chapter.

4.2 Qualitative Findings

The open-ended questions in this survey generated a wealth of qualitative data which was analysed according to the method described in Chapter 3. The remainder of this chapter discusses the opportunities and challenges, most frequently identified by teacher responses to the open-ended questions, associated with using the device as a pedagogical tool. The discussion then explores teacher perceptions of the device's impact on assessment. The final section considers the key factors which teachers indicated hindered them from experimenting with the device to create innovative learning opportunities.

Table 4 below summarises the most frequently cited themes which emerged from each section. The individual table of findings for each section can be found in Appendix C. Some of the themes which surfaced in Section B and C also reappeared in Section E indicating how strongly teachers felt about these issues. Teachers were much more prolific in submitting comments regarding the challenges presented by using the iPad than they were in writing about the opportunities the device afforded as evidenced by the percentage of respondents who offered comments for each section. This further supports the observation, that teachers had significant concerns regarding the device's effectiveness as a pedagogical tool, detected from the quantitative data. The qualitative data also explained the reasons for the participants' concerns.

Table 4: Summary of Qualitative Findings

	Section B Impact on Classroom Practices	Section C Impact on Assessment Practices	Section E
Opportunities	Teacher Mobility (22%)	Grading of Assessments (21%) Formative Assessment (15%)	Mobility & Portability (40%) Variety of Apps (37%) Enhanced Creativity (33%) Student Engagement (27%) Instant Internet Access (20%) Personalized Learning Opportunities (17%) File Storage & Distribution (13%)
Challenges	Distraction Factor (41%) Technical Difficulties (19%) Exclusive use of iPad (26%) No Change in Teaching Practices (19%)	Unsuitable Summative Assessment Tool (53%) due to <ul style="list-style-type: none"> • Complex set-up procedure (58%) • Security issues (42%) • Lost submissions (32%) Limits Assessment Opportunities (21%)	Distraction Factor (57%) Technical Difficulties (53%) Exclusive use of iPad (53%) Written Assignments (43%) Variety of Apps (23%) File storage & Distribution (23%)
Inhibiting Factors			Technical Difficulties (25%) Lack of Time (37.5%) Insufficient PD (22%) Pressure of Summative Assessment (12.5%)

4.3 Opportunities related to using the iPad as a Pedagogical Tool

The findings from this study support the literature that suggests the iPad can facilitate a range of learning opportunities. The participants identified the opportunities outlined below most frequently.

4.3.1 Mobility and Portability

40% of respondents commented on the opportunities associated with mobility and portability. Participants particularly appreciated the teacher mobility the tablet afforded, “not being tethered to the teacher computer”. Respondents perceived that this feature enabled them to give individual attention to students, “It is great being able to walk around the classroom with an iPad and sit down next to students with it. In many ways it’s easier than a book.” Teachers also perceived that the device, being portable, benefited the students in many ways. A respondent explained, “They are light and portable, so it is more likely students will have them with them through the day.” Another commented, “The iPad is easier to carry around instead of carrying many files and books. It was more efficient for students to study wherever they were.” These findings are consistent with other research which concluded that “an iPad allows teachers to integrate technology on an individual student basis”, (Barbour, 2012, p. 26) facilitates anytime, anywhere learning, (Bansiter, 2010; Goodwin, 2012; Kinash, Brand & Mathew, 2012, Murphy, 2011; Rossing et al., 2012) and reduces of the weight of school bags (Clark & Luckin 2013; Tangney & Bray, 2013).

4.3.2 Variety of Apps

The vast array of more than 20,000 educational apps has been cited as a prime motive for adopting the iPad as a learning resource (Bannister, 2010; Clark & Luckin 2013; Goodwin, 2012; Murphy 2011; Waters, 2010). In this study 37% of respondents commented favourably on the variety of interactive apps which created new learning opportunities in the classroom. Many teachers felt these apps readily engaged students and offered “new opportunities to experiment”. Others comments indicated that particular apps enabled personalised learning and formative assessment opportunities. These comments are explored in greater depth in later sections.

4.3.3 Enhanced Creativity

A third of respondents recognised that the iPad enhanced creativity among both teachers and students. One respondent noted that “Visually, it is very colourful and interesting; with a good screen resolution and so pictures, images and videos look great.” Another teacher applauded the ease with which you could get pictures from the internet, “a real gem of a resource for English”. Others commented that it enabled both teachers and students to “produce professional learning materials”. Teachers were particularly enthusiastic about the multimedia features as “It [the iPad] also enhanced the students’ ability to produce audio-visual content with ease”. Another respondent enthused, “Making an iMovie engaged students-We studied prepositions of place and movement and I asked them to make a video of a ball under the table /flying through the window, rolling down the stairs etc. They also had to write the preposition or record a running commentary.” These findings echo the literature that suggests that the iPad presented new opportunities for teachers and students to easily produce professional, engaging presentations by using the range of multi-media features (Banister, 2010; Goodwin, 2012, Manuguerra & Petocz, 2011).

4.3.4 Student Engagement

A review of the literature suggests a positive correlation between the use of the iPad and student engagement (Clark & Luckin, 2013; Diemer, Fernandez & Streepey, 2012; Gawelek, Spataro & Komarny, 2011; Harmon, 2010; Manuguerra & Petocz, 2011; Marks et al., 2013; Pegrum, Howitt & Striepe, 2013). 27% of participants in this study also described examples of increased levels of student engagement. One participant explained, “Interactivity motivated the students and increased their participation in the classroom.” A second respondent attributed the increased student engagement levels to the device’s enhanced visual features, “Nice visual for projecting and presenting, engaging for students.”

4.3.5 Spontaneous Access to Internet

One fifth of respondents also commented favourably on the immediacy of communication the device provided and the spontaneous access to the vast educational resources on the internet. One respondent valued the speed with which he could communicate with students and colleagues, “The iPad enhanced communication with the students and other teachers because email opened more quickly”. Other participants noted that the device saved time by not requiring as many logins from users, “quicker access to BB9 than on laptop-(students don’t

have to log in as often)”. Many teachers also valued the “Instant access to real, authentic materials through the internet”. These findings are supported by research findings from other studies which reported that the device provides ready access to the internet (Clark & Luckin 2013; Crichton, Peglar & White, 2012; Rossing et al., 2012), has a positive effect on communication (Clark & Luckin 2013; Gawelek, Spataro, & Komarny, 2011) and the rapid one-touch access saves time compared with time consuming logins (Clark & Luckin 2013).

4.3.6 Facilitates Independent Study and Personalised Learning Opportunities

Many studies also suggest that the iPad can facilitate independent study and personalised learning opportunities through the addition of carefully selected apps (Bannister, 2010; Clark & Luckin, 2013; Goodwin, 2012; Murphy 2011; Waters, 2010). This view was corroborated by 13% of the participants in this study, “Quizlet allowed totally independent vocab study, wordlists/definition/pronunciation/games/quizzes”. Another respondent reported that “Students were able to study at their own pace.” However, one participant felt that these benefits only applied to motivated students “More student independent learning (for motivated students only)”.

4.3.7 File Storage and Distribution

13% of respondents perceived that the iPad facilitated file storage and distribution, “Saving everything in one place made it easier for students to study at any time and at any place.” Another commented, “Having all the files in one place meant students couldn’t lose bits of paper”. A colleague echoed these sentiments noting that “Misplaced memory sticks were no longer a concern”. “I like how easy it is to share/upload and annotate things” was an observation from another advocate of the iPad as a storage and distribution tool. Evidence of effective use of the device as a centralised repository is demonstrated in the literature too (Murphy, 2011).

4.4 Challenges related to using the iPad as a Pedagogical Tool

In this study the findings show that teachers perceived that there were many challenges to be overcome before the iPad could be more effectively integrated into classroom practice and their concerns were echoed in other research studies. These challenges are discussed below.

4.4.1 Distraction Factor/ Technical Difficulties

The quantitative data obtained from Section B indicated that the distraction factor was a major area of concern for teachers. The qualitative data corroborates and clarifies the quantitative findings with 57% of participants commenting on the “Absolute distraction of other apps.” Spontaneous access to the internet had the unfortunate consequence of providing easy access to a range of absorbing distractions. “A lot of class time and focus was reduced by the students wanting to use game apps or chat apps” reported one frustrated teacher. Accounts of “Students’ tendency to drift away and get busy with games and other apps” were repeatedly reported in the findings and this problem was exacerbated by the idle time created when teachers encountered technical difficulties. More than half of the participants complained of technical problems. One respondent commented, “Occurrence of technical problems impedes learning and creates more opportunities for students to download free games or become engaged in social media applications like Instagram and Facebook.” There were other frequent complaints regarding time delays created by mirroring, “Wasting at least 10-15 min of class time between opening the iPad, mirroring...etc...” As a result of the distractions and the idle time created by technical issues, teachers reported that they had to switch their focus from student learning to classroom management, “the students get too distracted resulting in the major focus being classroom management rather than language acquisition.”

These comments concur with concerns expressed in the research about the possible barriers to learning posed by the spontaneous internet access (Banister, 2010; Kinash, Brand & Mathew, 2012; Rossing et al., 2012). One possible solution suggested in the literature is that institutions need to conduct digital citizenship awareness classes to help students acquire responsible learning habits in the new environment (Crichton, Peglar & White, 2012; Melhuish & Falloon, 2010; Parsons, 2013; Rajasingham, 2011).

Research indicates that effective classroom management enhances student learning. The integration of new technology requires new classroom guidelines to effectively manage the

changed learning environment (Hew & Brush, 2007). Hew & Brush (2007) cite the lack of technology-related-classroom management skills as a factor inhibiting the effective integration of new devices in education.

There is some advice in the literature to help teachers limit student use of the device to educational purposes. iPad activities must be carefully structured with clear instructions, clearly defined student roles and very specific deadlines (Hew & Brush, 2007; Rossing et al., 2012). There must be contingency plans in place so students know what to do if technical difficulties are encountered (Hew & Brush, 2007). Teachers should circulate in the room and carefully monitor student use of the device and insist that the iPad remains closed when it is not required for class work (Rossing et al., 2012).

4.4.2 Exclusive use of iPad

The findings indicate that exclusive use of the device presented a major challenge for teachers. The quantitative data from Section B highlighted that many teachers believed their classroom practices had changed with the introduction of the iPad but the qualitative data shows that the change was frequently regarded unfavourably. One respondent noted, “Classroom practices have been forced to change but not necessarily for the better”. An overwhelming 53% of respondents included comments to report that the exclusive use of the device had constrained the teaching and learning process. A teacher commented that “It is one tool and having to use this tool exclusively meant other opportunities were lost” (See Appendix B: Sample of completed survey). One teacher commented that “the educational opportunities available on the iPad were more limiting than those available on the laptop”. In general, teachers perceived that several learning outcomes could have been more easily achieved with the use of a laptop, “For teaching academic English they [iPads] are in no way an improvement over the laptop”. Another teacher explained, “Reading is another skill where the use of the iPad diminishes the learning potential to develop this skill. The size of the screen is an issue and swiping between the reading and question page every few seconds doesn’t help develop reading skills, it prevents them”. The math teachers also observed that the device hindered learning, “In math students need paper to work out solutions to complex problems. They tried to use Neu Annotate but it slows down the pace of the lesson. Swiping between the formula page, Neu Annotate and the word problem was cumbersome.”

In addition, 43% of respondents complained specifically about difficulties associated with writing on the iPad. One respondent reported that “It is almost impossible to conduct effective writing practice for IELTS (International English Language Testing System) using the iPad. The screen is too small and the keyboard is not an effective writing tool.” Several other teachers expressed similar views and were concerned about “paper restrictions”, claiming many students preferred pen and paper. “Students feel that they still need to write notes as this helps them develop conceptual understanding but they complained that their handwriting is terrible on the iPad.” In addition, other respondents reported that students experienced problems annotating text on PDF files, “They couldn’t write on PDFs they opened. The textboxes provided were too small.” A further comment was, “The Microsoft-like apps were limited in production & editing tools compared to software on a laptop.” There is wide recognition in the literature regarding the difficulties associated with writing on the iPad (Clark & Luckin 2013; Gawelek, Spataro & Komarny, 2011; Rossing et al., 2012; Waters, 2010) and many studies recommend that the iPad be reserved for tasks that require limited text-input (Gawelek, Spataro & Komarny, 2011; Rossing et al., 2012; Waters, 2010).

Another respondent commented, “Materials are less interactive and iPads resulted in a step back from using laptops.” Other teachers felt that the exclusive use of the device stifled their creativity and constrained the teaching and learning process. One teacher reported, “Cannot create any of your own worksheets-constrained by apps” and another commented, “Learning now somewhat driven by capacity of iPad for question types.”

There is a consensus in the literature that the tablet has most potential when used to complement rather than replace existing digital devices. (Banister, 2010; Clark & Luckin 2013; Crichton, Peglar and White, 2012; Pegrum, Howitt & Striepe, 2013; Rossing et al., 2012; Waters, 2010).

Crichton, Peglar & White (2012, p. 29) recommend:

In terms of specific recommendations from our study, we are further convinced that educators have to consider a menu of devices and applications for their teachers and students – no single device is the answer to every teaching and learning situation.

While 53% reported that the exclusive use of the device had inhibited the teaching and learning process, a further 19% stated that there had been no change in teaching practices. One teacher wrote, “I think the iPad is little more than an alternative delivery system.” These statistics are alarming because the literature suggests that perhaps the greatest barrier to the

realisation of the transformative potential of device is that it would just be employed to do the same old thing (Hanley, 2011).

4.4.3 Variety of Apps

In this study, 37% of respondents commented favourably on the variety of interactive apps which created new learning opportunities in the classroom. However, 23% of teachers' responses submitted comments indicating that they felt overwhelmed by the variety and sheer volume of apps. One teacher felt the choice should be limited, "There are too many apps which people talk about. I find it confusing. I feel we should restrict ourselves to some tried and trusted ones". Also, teachers complained that the free "lite" version of apps had reduced functionality, "Free apps are too limiting in their scope. You always have to pay extra for the features which you want to use." Another respondent felt that "the functionality of apps is severely limited when compared to their websites".

These views echo the concerns expressed in the literature which recognises that selecting appropriate apps can be a time-consuming and sometimes fruitless process (Clark & Luckin, 2013; Crichton, Peglar & White, 2012). The findings in this study generated a list of frequently used apps and also identified a list of apps which teachers had perceived as effective in the classroom (See appendix D). There was a strong correlation between the apps which were rated highly by participants using both criteria and a single list of apps which teachers used frequently and rated highly as effective teaching applications was compiled.

The author wishes to reiterate that while this list recognises apps that have proved effective for the participants in this study, it does not draw any conclusions about apps which were awarded less favourable rankings. As discussed in Chapter 3, there are a variety of extraneous factors which could account for a low ranking. Table 5 shows the list of apps which had been ranked highly by teachers according to both criteria.

Table 5: Apps ranked highly for “Frequency of Use” and “Effective Teaching” Criteria

Rank Frequency of Use	Rank Effective teaching App	App	Purpose
1.	2.	Adobe Reader	PDF Reader
3.	3.	Keynote	Presentation Tool
2.	4.	BB Learn	Repository/ Assessment/Discussion tools/Blogs/ Track Student use
4.	1.	Quizlet	Range of interactive activities, including vocabulary presentation, games & quizzes.
5.	6.	Neu Annotate	PDF Reader
9.	5.	Socrative	Interactive surveys
7.	7.	iFiles	Facilitates file storage and distribution
6.	11.	Notes	Productivity
12.	8.	Popplet	Productivity Concept maps
13.	8.	Pages	Productivity Word Processing
11.	10.	iBook	Productivity Facilitates creation of interactive learning materials

This list is not overwhelming and addresses most teaching requirements. It could serve as a preliminary list when the device is first used as a learning resource. As teachers become more proficient and confident in using the tablet they will undoubtedly discover more apps and these could be gradually introduced in the ongoing PD sessions necessary to support the transition to teaching with iPads.

The list included PDF reader apps, which judging from the teachers’ ratings proved indispensable. Keynote was the presentation app of choice. Quizlet received very favourable reviews because it was perceived to be “easy to use, included a range of fun, interactive activities, including vocabulary presentation, games & quizzes”. Furthermore, teachers reported that students liked the Quizlet app because it facilitated personalised learning opportunities. Blackboard was also considered an indispensable application by many teachers because it acted as a centralized repository and it was easy for students to use.

Additionally, teachers were able to track students learning and participation and the quizzes provided immediate feedback. Socrative proved popular with teachers because it facilitated formative assessment through interactive surveys.

4.4.4 File Storage and Distribution

Although 13% of teachers perceived that the iPad facilitated file storage and distribution, a greater percentage of respondents (23%) commented that sharing and accessing student work was problematic for them. Several participants reported difficulties resulting from a “lack of cohesive and coherent system for materials delivery and work collection”. A review of the literature suggests that there are workable solutions. The use of Learning Management Systems (LMS), such as Blackboard, enables the device to function as an efficient content repository (Murphy, 2011). The ability of the tablet to connect to “cloud” document repositories such as “Edmodo”, “Dropbox”, “iCloud” and “Google Docs” also facilitate the sharing and collaboration of work (Murphy, 2011; Parsons, 2013). However, the many applications for sharing materials can result in confusion for both teachers and students. Although studies have claimed the intuitive design of the iPad as a compelling reason to adopt the device (Cavanaugh et al., 2012; Crichton, Peglar and White, 2012), the use and subsequent management of cloud document repositories is certainly not as intuitive (Parsons, 2013).

4.5 iPad as Assessment Tool

The literature indicates that the iPad has the potential to facilitate formative assessment practices (Clark & Luckin 2013; Gawelek, Spataro, & Komarny, 2011; Manuguerra & Petocz, 2011). The participants in this study also recognised this potential as is indicated by the following comments, “Socrative, Nearpod, and BB9 quizzes enable more immediate feedback” and “Using applications like Nearpod helped me assess students understanding directly after submitting their answers, because it automatically generates stats for the students’ answers. I can easily tell who couldn’t solve the question to provide direct help”.

The quantitative data from Section C illustrated that participants had significant concerns regarding the use of the iPad as an assessment tool. The qualitative data substantiated these findings and unilaterally reflected that the teachers perceived that the iPad was not suitable as

a summative assessment tool. Respondents repeatedly referred to security concerns regarding the completion of assessments on the device. One respondent remarked that “The security of the exam is not guaranteed. It is possible to copy a model essay before the exam and paste it as an answer during the exam.” Another teacher was worried because “we cannot be sure that all students are taking the test from the same starting point since some may have spellcheck turned off and others don’t – which in English can make a big difference”. To address these concerns, each student’s iPad had to be checked to ensure the auto correct buttons were switched off. Teachers also had to activate a “Guided Access” software on each iPad to prevent students from accessing other applications. However, this was a time-consuming process which delayed the start of exams, “The countless number of steps involved just to begin a test is unbelievable. By the time all such steps are done and students are ready to begin the test, 30-40 minutes have already elapsed.” It proved an anxious time for students and teachers, because set-up errors could result in the student either losing their work or having access to all applications on their iPad, “The procedure for setting up iPads is complex and time consuming. However, getting every step correct is critically important. The omission of one step could result in a student losing all their work.” Many teachers described an assessment experience where many students’ final submissions were lost. “Just been a major problem with assessments on iPads-25% of students have to re-sit an exam as their work was lost-this is unacceptable/unreliable. Paper based assessments!!”

The literature indicates that there has been very little research conducted into the effectiveness of the iPad as a summative assessment tool (Clark & Luckin, 2013; Rajasingham, 2011). The University of Ottawa explored the potential of the device with a timed, online multiple-choice questions (MCQ) examination (Jalali et al., 2011). They concluded that the digital exam improved the efficiency of the administration process, facilitated quicker feedback to students and significantly reduced paper use. On the negative side, they reported increased student stress levels which resulted from students not having a paper exam in hand and unstable internet connections. The students were worried that their answers would not be saved (Jalali et al., 2011).

The summative assessment experience described by participants in the present study differed from the Ottawa experience as in addition to the MCQ element, students had to submit an essay style question. The main fear contributing to the anxiety expressed by the students in the Ottawa study was realised in the assessment experience described in the present study. The volume of students accessing the assessment software put enormous pressure on the

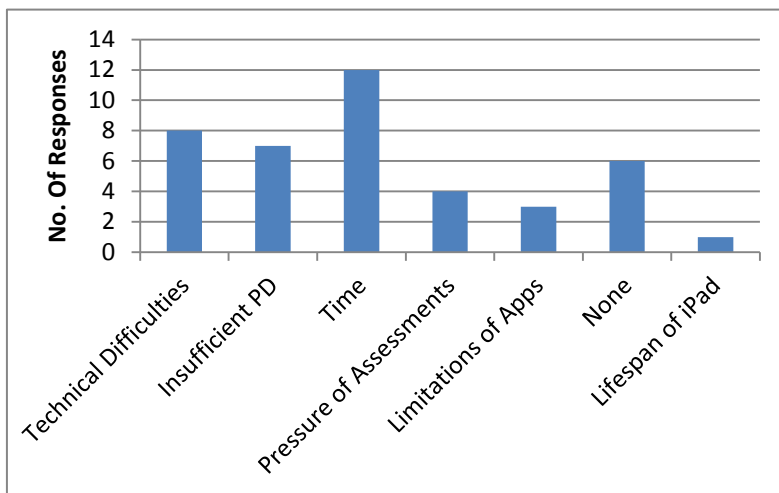
servers resulting in slow downloads and unstable connections and student submissions were lost.

Teachers also complained that the use of the iPad restricted the assessment choices to Multiple Choice Questions (MCQ). They reported this impacted negatively on students' grades as students could not be awarded partial marks for demonstration of working processes. Like the Ottawa study, some teachers perceived that the iPad facilitated the grading of exams. However, another teacher noted that "the grading of assessments is done by programmes/software such as BBV and BB9, the iPad is useless in this regard." Overall, the participants were unimpressed with the device as a summative assessment tool due to the complex set-up procedure, security issues and lost submissions.

4.6 Factors Inhibiting the Use of the Device

Figure 2 shows the key factors which teachers identified as inhibiting them from experimenting with the device to create innovative learning opportunities.

Figure 2: Factors which discourage experimentation with iPad



The problems, associated with technical difficulties and the app-based approach, have already been discussed earlier in this chapter. This section will confine the discussion to the remaining four factors. The literature also recognises that these six factors are barriers to the transformative potential of technology being fully realised in the classroom.

4.6.1 Lack of Time

Respondents cited “lack of time” most frequently as an obstacle to adopting the device to generate more innovative learning opportunities. Many participants just included “TIME” as a response. Others elaborated: “Teaching loads & preparing students for exams make it difficult to find time to experiment with new iPad apps.” Several other teachers indicated that there was insufficient time to develop iPad compatible resources, “No time to develop materials.” The time taken to select and evaluate apps has already been identified as another demand on teachers’ limited time resources.

The literature recognises that time constraints are a key barrier to the effective integration of technology in schools (Afshari et al., 2009; Buckingham, 2007; Clark & Luckin, 2013; Hew & Brush, 2007; Mumtaz, 2000). These constraints are manifested in two ways, time taken for teachers to prepare materials suitable for use on the device and the limited class time available with students (Hew & Brush, 2007; Mumtaz, 2000). Studies recommend teachers be given release time to preview resources, develop materials and observe colleagues who have integrated the device in innovative ways (Afshari et al., 2009; Hew & Brush, 2007; Mumtaz, 2000). Many secondary schools and third level institutes schedule class periods which are less than one hour in duration and this short time-frame is a challenge to employing the device to engage the students in authentic, problem-solving, collaborative activities particularly when activities are interrupted with unreliable connections (Tangney & Bray, 2013). Several solutions are proposed in the literature, ranging from scheduling double classes, clearing timetables for an entire morning to carry out problem solving activities or devoting successive classes to completing different aspects of the activity (Hew & Brush, 2007; Mumtaz, 2000; Tangney & Bray, 2013).

4.6.2 Insufficient PD

Lack of PD was another factor frequently cited by respondents as a barrier to integrating the device in meaningful ways in their teaching. “I would love to use more apps on the iPad and then use the apps to create innovative learning opportunities in the classroom. I need more PD sessions to help me accomplish this goal.” A further comment was, “We need more efficient Professional Development classes from a really expert iPad user.” Another participant perceived that he felt constrained by “Lack of knowledge of effective utilization of iPads in the teaching/learning process.” Yet another respondent commented “More training

would be useful: best practice etc., There were a lot of limitations –that much is clear- but we are only a year in, so things may improve.”

The need for PD to support teachers integrating new technology in the classroom is a recurring theme in the literature (Cavanaugh et al., 2012; Hew & Brush, 2007; Mumtaz, 2000). The literature claims that in the past PD related to integration of new educational technologies has concentrated on how to operate the technology and has not focused on transformative technology-supported- pedagogy (Hew & Brush, 2007). Many studies claim that the iPad is an intuitive device and consequently, the focus of the PD can quickly target pedagogy (Cavaunagh et al., 2012). However, this study revealed that many teachers experienced difficulties with sharing and accessing student work so this is definitely an area that would need to be addressed in a comprehensive, systematic PD programme. Also, teachers require concrete subject specific sessions on how to integrate the device at the transformation level of the SAMR technology pedagogic model. There is overwhelming support in the literature for the need to integrate technology at the transformative level to cultivate the development of generic 21st century skills but authors rarely discuss the specifics of how can this can be achieved in practice (Clark & Luckin, 2013).

4.6.3 Pressures of Summative Assessment

The pressures faculty face in preparing students for final assessments is another factor which inhibited teachers from trialling innovative learning approaches. One teacher reported “I am under pressure to improve the students’ English. I don’t have time to experiment, especially when I know that 98% of the apps are not of direct value.” Another teacher cited “Lack of time for experimental activities within the busy curriculum as we prepare students for exams”.

These views are consistent with a theme prevalent in the literature, that existing high-stakes summative assessments pose a major impediment to the integration of technology to develop innovative constructivist approaches in the classroom (Hew & Brush, 2007; Perrotta, 2013; Sealey, 2013). The literature recommends the use of alternative assessment approaches technologies and more research to investigate how ICT can be integrated to fulfil the demands of standards-based accountability (Hew & Brush, 2007).

4.6.4 Lifespan of iPad

There are concerns raised in the literature regarding the accelerating rate of technological development. Buckingham (2007) predicts the likelihood of “technological fatigue” because teachers have to transfer content from one learning platform to another as innovative technical devices are introduced with greater frequency. One respondent alluded to this issue, “I’m not sure how long the iPads will be around for so I don’t want to put my energies into learning about and developing things for a platform which could be gone in a semester or two.”

This chapter presented and discussed the findings of the present study. It explored the opportunities and challenges the participants identified with using the iPad as their primary learning resource for a full academic year. The chapter also reported how the device had affected assessment practices. The teachers perceived that the tablet facilitated formative assessment practices and the grading of assessments but they unanimously agreed that it was an unsuitable device with which to conduct summative assessments. Finally, six factors which inhibited teachers experimenting with the device to create innovative learning opportunities were identified.

Chapter 5 Conclusion and Recommendations

The adoption of the iPad as the primary learning resource for all foundation students studying in third level institutions was a very brave and ambitious initiative which reflects the commitment of the UAE government to education and to integrating technology to provide citizens with the skills necessary to be successful in the 21st century work environment. However, the adoption of any single device will not by itself induce an optimal learning environment where 21st century skills can flourish. Such a transformation requires a combined and concerted effort from researchers, policymakers, administrators and teachers. This chapter considers how each of the above communities can contribute to eliminate or at least alleviate some of the challenges identified by this study.

5.1 Recommendations

5.1.1 Research

Research has indicated that technology needs to be integrated at the transformative level of the SAMR model of technology adoption if it is to meet the needs of 21st century learners (Parsons, 2013; Tangney & Bray, 2013). However, most research studies do not include specific examples of how educators can achieve this in practice (Clark & Luckin, 2013). This study calls for the publication of more research papers that describe detailed examples of how technology in general and the iPad in particular can be employed effectively in the classroom to cultivate the development of higher order thinking skills and prepare students for the challenges of the 21st century workplace. Further research could be conducted with the participants in this study who indicated that the device had helped them create innovative learning opportunities. The study could include interviews and classroom observations to obtain a comprehensive understanding of how the teachers are integrating the device to facilitate a more progressive constructivist approach in the classroom.

5.1.2 Assessment

One of the purposes of introducing the iPad into higher education in the UAE was to develop innovative ways of teaching and learning and cultivate progressive classroom pedagogy (Cavaunagh et al., 2012). However, the participating educational institution continued to evaluate student performance on summative assessments which focused mainly on knowledge recall. There is an inherent incompatibility between the desire to employ

technology to create innovative learning opportunities and the seemingly intractable insistence on evaluating student performance against outdated criteria. The potential of the iPad or any other technological device to facilitate progressive pedagogies is greatly compromised if teachers have to prepare students for high stakes assessments. Judging from the limited transformational effects of previous technological innovations on education, it seems reasonable to hypothesise that the potential of the iPad to transform teaching and learning will be greatly compromised if teachers have to prepare students to sit a final high stakes exam which emphasise factual recall. The assessment criteria and the learning outcomes have to be more strategically aligned to cultivate a climate where the potential of the device can be exploited to promote more progressive learner centred classroom practices. There needs to be more research to investigate how the iPad can encourage alternative assessment approaches and how these approaches can meet the requirements of standards-based accountability. Finally, teachers unanimously agreed that the iPad is not suitable as a summative assessment device. Therefore, this study strongly recommends that the iPad should not be used to conduct such assessments until such time as the limitations associated with using the device in such a capacity are eliminated.

5.1.3 Professional Development

Providing PD opportunities to teachers to support the integration of new technological devices is a recurring theme in the literature and is a key factor determining the success of any such integration (Anderson, 2011; Hew & Brush, 2007). More than a fifth of participants in this study identified lack of PD opportunities as a barrier to using the device to create innovative learning opportunities. This study recommends the development of a comprehensive, systematic PD programme which addresses the needs identified by teachers in this study. Such a programme could be implemented in two stages, a series of introductory workshops before the device is introduced in the classroom, followed by a series of ongoing workshops to support teachers throughout the first year of use.

The introductory sessions could initially focus on six key areas, five of which were recognized as problem areas by the participants in this study: Familiarization with the device; File sharing and distribution; Essential Apps; Classroom Management; SAMR model of technology adoption; Trouble shooting.

Obviously, initial PD sessions need to ensure teachers are familiar with the device but research studies claim that the iPad is an intuitive device and thus the focus of the PD can

quickly target pedagogy (Cavaunagh et al., 2012; Crichton, Peglar & White, 2012). However, in this study, even after using the device for a full academic year, 23% of respondents still reported difficulties associated with file sharing and distribution so this is definitely an area that would need to be addressed in initial PD sessions. The findings indicated that teachers were using a variety of apps for file sharing, including iFiles, Dropbox, iCloud, BBV and PDF readers. To avoid overwhelming less experienced users, administration should decide in advance on one or two ways of file sharing and distribution and present these solutions with clear guidelines during the initial PD sessions. Many teachers will likely explore alternative methods during the course of the implementation phase and if these methods are evaluated as being more effective they could be shared with teachers in the ongoing PD sessions.

Introductory workshops would also have to focus on essential apps. Again in this study, 23% of respondents admitted to feeling overwhelmed by the variety of available apps and were discouraged by apps, presented in introductory PD, which they subsequently perceived as ineffective in the classroom. This study identified a select list of 11 effective teaching apps which address most learning requirements in the classroom. Initial PD sessions should focus on these apps which have been piloted and proved effective in a learning environment. As teachers discover other useful apps they can be introduced gradually in the ongoing PD sessions.

The issue of classroom management should also be addressed because the integration of new technology requires additional rules and procedures to successfully manage the change in classroom dynamics (Hew & Brush, 2007). 57% of the teachers in this study acknowledged that they had to increase their vigilance in the classroom with the introduction of the iPad because of students being distracted by other applications. In Chapter 4, the author described a number of strategies which could be shared with teachers during iPad classroom management PD sessions.

In addition, teachers should be introduced to the SAMR model of technology adoption. While it is expected that many teachers will initially integrate the device at the enhancement level, it is important that they have a pedagogical framework against which to evaluate their teaching and a goal towards which to aspire. As more experienced users discover ways to integrate the device at the transformative level they can share their experiences with colleagues at the ongoing PD sessions to encourage all teachers to adopt such approaches.

As about half of respondents cited technical difficulties as a factor which discouraged them from using the device to create innovative learning opportunities, initial PD sessions need to focus on basic trouble shooting. In addition, institutions need to install robust Wi-Fi connections and have technical support on hand for the technical issues that teachers cannot resolve.

If these six areas are covered comprehensively in initial PD sessions, teachers would likely display greater comfort levels with the device and have a clearer idea of the potential of the iPad to facilitate innovative classroom practices. It is anticipated that the ongoing workshops could address teachers' emerging concerns as they use the device as a pedagogical tool, facilitate a sharing of best practice and help teachers develop a more comprehensive understanding of an 'iPedagogical' framework. The development and implementation of such a rigorous, structured and systematic PD programme could eliminate many of the challenges identified in this study.

5.1.4 Digital Citizenship

In addition to preparing teachers to meet the challenges posed by new digital devices, this study recommends that students are also presented with opportunities to learn about the challenges they will face in an increasingly digital environment. Research indicates that students would also benefit from an induction course in the use of the iPad (Crichton, Peglar & White, 2012; Parsons, 2013; Rajasingham, 2011). For students, this course does not need to focus as much on technical competencies because, as participants noted in this study, many of the students adapt to the new technology with ease. The student induction course needs to focus on digital citizenship and responsible use of the iPad. Because of the speed with which the device connects to the internet and the ease with which users can switch between apps it is virtually impossible to prevent adult learners from accessing social media apps if they are intent on doing so. The students need to be encouraged to take responsibility for their own learning. They need to have the temptations and the consequences of acceding to those temptations outlined to them and to understand that as adult learners they must ultimately choose. The students also need to be cautioned about plagiarism and avoid the temptation to copy and paste information from the internet into assignments and to learn how to correctly reference and cite sources. The students will likely require ongoing support to develop digital literacy skills to evaluate and select relevant information from the vast resources available on the internet.

5.1.5 Exclusive Use of the Device

The findings from this study revealed that the exclusive use of the device constrained the teaching and learning process. Obviously learner needs should always drive the use of technology and consequently the iPad should be reserved for purposes where teachers indicated it could effectively meet or enhance learning opportunities for their students. Teachers should have access to a range of digital devices and other resources and select the most appropriate tool to maximize the learning potential of every situation for their particular learning community.

5.1.6 Lack of Time

Most teachers identified a lack of time as a factor which prevented them from employing the iPad to develop innovative learning situations. Studies suggest teachers be given release time to evaluate existing resources, create new resources and observe colleagues who have integrated the tablet at the transformative level of the SAMR model of technology adoption (Afshari et al., 2009; Hew & Brush, 2007; Mumtaz, 2000). This study agrees with those recommendations. However, this study also recognizes that with ever increasing demands on educational budgets that this is not always a feasible solution. An alternative solution is for teachers to collaborate in teams teaching the same year group or subject and to share the development of materials. Management could also help by organizing efficient strategies for identifying appropriate online resources. They could also arrange video recordings, of experienced users who are adopting the device to create innovative opportunities, to share at the ongoing PD sessions.

5.2 Limitations

This study was conducted with a relatively small sample size of 32 teachers who work with students in quite a unique environment so this may limit the degree to which the results can be generalized to other populations. Also, teachers had only four months to become competent iPad users and to learn how to employ the iPad as a learning resource. Studies which investigate iPad initiatives with a less ambitious lead-in timeframe and invite teacher volunteers as pilot iPad users may reveal different results. The fact that all foundations teachers were mandated to use the iPad as their primary learning resource may have generated more negative comments than if the pilot had been restricted to volunteers. Nevertheless, the study illustrates that the iPad can be adopted as a pedagogical tool by users

with various IT competency levels and from different discipline areas. It is significant that the findings from this study are consistent with those of other studies.

5.3 Conclusion

This study has reported both opportunities and limitations associated with using the iPad as a pedagogical and assessment tool. It also recognizes that the adoption of any technological device will not by itself result in the manifestation of innovative learning opportunities. There needs to be a number of fundamental changes at policy and administration level to create the environment in which innovative learning can flourish. Institutions need to adopt more progressive assessment paradigms that align assessment criteria with learning outcomes associated with more progressive learner centred classroom practices. Both teachers and students require intensive introductory PD, as described earlier in this chapter, to prepare them to meet the challenges of a fundamental change in the teaching and learning process. Teachers and students should have a range of digital devices and other resources at their disposal and freely choose from the most suitable device to accomplish particular tasks. Teachers should be given release time or at least be helped to manage their time more effectively to accommodate the increased workload a successful transition demands. Institutions need to ensure they have installed robust Wi-Fi and have sufficient technical help on hand to assist with the inevitable technical glitches. This study strongly recommends that the iPad should not be used to conduct summative assessments until such time as the limitations associated with using the device in such a capacity are eliminated.

Clearly, there are many challenges to be overcome if the iPad is to be used in innovative ways to support a more constructivist learner centred approach and to cultivate the skills students need to successfully contribute to a 21st century knowledge-centric society. Considering the increasingly important role technology and in particular mobile devices play in all of our lives there is an obligation on researchers, policy makers and educators to continue to explore the potential of new technology to precipitate “more participatory and personalized types of learning” that will propel students in the direction of lifelong learning. The iPad may help promote the development of generic 21st century skills such as collaboration, communication, creativity and problem-solving but the relevance to student learning should always drive its use.

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APPENDICES

Appendix A Questionnaire

Questionnaire: iPad Classroom Implementation

As part of my Master’s Degree, I am carrying out research into the implementation of iPads in the foundations programme. My research looks at the opportunities and challenges teachers face in adopting the iPad for teaching, learning and assessment. Your participation is voluntary. Your candid answers are very important and all remarks are completely confidential. Please return the completed forms via internal mail by Monday 24th June.

Many thanks, Carrie Mullen

Part A: Demographic/Personal Information

1.	Are you male/female? Please select one box.[X]	Male	Female				
		<input type="checkbox"/>	<input type="checkbox"/>				
2.	How old are you? Please select one box.[X]	20-30	31-40	41-50	51-65		
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
3.	How many years of teaching experience do you have? Please select one box.[X]	1-5	6-10	11-15	16-20	20 and above	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	What subject do you teach? Please select one box.[X]	English	Math	Other			
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
5.	How would you rate your IT skills? Please select one box.[X]	Novice	Intermediate	Expert			
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			

Part B: How did the iPad affect actual teaching practices in the classroom?

		Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
After two semesters of using the iPad						
1.	I find the iPad useful for teaching.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	I feel the iPad has enhanced my effectiveness as a teacher.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	The iPad helps me to create and facilitate innovative learning opportunities.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	The iPad helps me to create and facilitate personalized learning opportunities.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	The iPad has increased student engagement.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.	The students are often distracted by other applications.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.	The iPad has enhanced student learning.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.	My classroom practices have changed with the introduction of iPads.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments						
If you agreed with question 8, could you please explain how your practices have changed?						

Part C: How did the iPad affect assessment practices?

		Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
After two semesters of using the iPad						
1.	The iPad facilitates efficient administration of assessments.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	The iPad facilitates the grading of assessments.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	The iPad has helped me assess students in new ways.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments						

Part D: Apps

Look at the following list of apps. Please select one box[X] for each app to indicate how often you have used this app.

Frequency of use of apps		Not at all/ Once	2-5 times	More than 6 times
1.	BB Learn	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	Keynote	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	Pages	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	iTunes U	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	ifiles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.	EverNote	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.	Neu.Annotate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.	Notes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.	SoundNote	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.	Adobe Reader	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.	Dropbox	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12.	iBooks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13.	Socrative	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14.	Nearpod	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.	Quizlet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16.	iMovie	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17.	Flashcardlet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18.	Popplet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19.	Creative Book Builder (CBB)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20.	Geometry Pad	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21.	ChartmakePro	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22.	Numbers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please list the three apps you found most effective for teaching apps and briefly explain why?

1.		
2.		
3.		

Part E : iPad Opportunities and Challenges in the Classroom

1. Describe two things about the iPads which you feel enhanced learning opportunities in the classroom?

2. Describe two things about the iPad which you feel restricted learning opportunities in the classroom?

3. Are there any factors, which have discouraged you from experimenting with iPads and creating innovative learning opportunities?

Appendix B Example of Completed Questionnaire

Questionnaire: iPad Classroom Implementation

As part of my Masters Degree, I am carrying out research into the implementation of iPads in the foundations programme. My research looks at the opportunities and challenges teachers face in adopting the iPad for teaching, learning and assessment. Your participation is voluntary. Your candid answers are very important and all remarks are completely confidential. Please return the completed forms in a sealed envelope via internal mail by Monday 24th June.

Many thanks, Carrie Mullen

Part A: Demographic/Personal Information

1.	Are you male/female? Please select one box.[X]	Male	Female				
		<input type="checkbox"/>	<input checked="" type="checkbox"/>				
2.	How old are you? Please select one box.[X]	20-30	31-40	41-50	51-65		
					X		
3.	How many years of teaching experience do you have? Please select one box.[X]	1-5	6-10	11-15	16-20	20 and above	
						X	
4.	What subject do you teach? Please select one box.[X]	English	Math	Other			
		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
5.	How would you rate your IT skills? Please select one box.[X]	Novice	Intermediate	Expert			
		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>			

Part B: How did the iPad affect actual teaching practices in the classroom?

		Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
After two semesters of using the iPad						
1.	I find the iPad useful for teaching.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	I feel the iPad has enhanced my effectiveness as a teacher.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3.	The iPad helps me to create and facilitate innovative learning opportunities.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	The iPad helps me to create and facilitate personalized learning opportunities.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	The iPad has increased student engagement.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.	The students are often distracted by other applications.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.	The iPad has enhanced student learning.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
8.	My classroom practices have changed with the introduction of iPads.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments						
<p>If the students were more motivated to learn, we could really unleash the full potential of the Ipad and the associated technology. Students are very easily distracted.</p>						
If you agreed with question 8, could you please explain how your practices have changed?						
<p>I no longer use books. I have had to change the way I introduce and present material and I have to use Airplay to project my lessons. I have to closely monitor my students who are distracted by other apps and I have to work extra hard to keep them focused.</p>						

Part C: How did the iPad affect assessment practices?

		Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
After two semesters of using the iPad						
1.	The iPad facilitates efficient administration of assessments.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	The iPad facilitates the grading of assessments.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	The iPad has helped me assess students in new ways.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Comments						
<p>My assessment is broken down into skills. The Ipad facilitates the grading of reading and listening assessments but not writing.</p>						

Part D: Apps

Look at the following list of apps. Please select one box[X] for each app to indicate how often you have used this app.

Frequency of use of apps		Not at all/ Once	2-5 times	More than 6 times
1.	BB Learn	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2.	Keynote	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3.	Pages	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.	iTunes U	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	ifiles	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6.	EverNote	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
7.	Neu.Annotate	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8.	Notes	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9.	SoundNote	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
10.	Adobe Reader	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
11.	Dropbox	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
12.	iBooks	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
13.	Socrative	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
14.	Nearpod	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.	Quizlet	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
16.	iMovie	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
17.	Flashcardlet	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
18.	Popplet	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
19.	Creative Book Builder (CBB)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
20.	Geometry Pad	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21.	ChartmakePro	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22.	Numbers	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Please list the three apps you found most effective for teaching apps and briefly explain why?		
1.	Adobe reader	Very easy to use and I needed to present documents in PDF form. Can be easily edited with good tools.
2.	Quizlet	Fantastic range of vocabulary activities for students and easy to use
3.	Educreations	Easy to use for students, can record voice and use pictures

Part E : iPad Opportunities and Challenges in the Classroom

<p>1. Describe two things about the iPads which you feel enhanced learning opportunities in the classroom?</p>
<p>Visually, it is very colourful and interesting; with a good screen resolution and so pictures, images and videos look great.</p> <p>Instant access to real, authentic materials through the internet</p>

2. Describe two things about the iPad which you feel restricted learning opportunities in the classroom?

Dependent on Airplay to function and if this drops out you can't use it.

It is one tool and having to use this tool exclusively meant other opportunities were lost.

3. Are there any factors, which have discouraged you from experimenting with iPads and creating innovative learning opportunities?

No, I loved experimenting.

Appendix C Qualitative Data Findings

Section B Complete Table of Findings

Table 6: Teachers Views on how teaching practices have changed

Part B: If you agreed with question 8 (My classroom practices have changed with the introduction of iPads), could you please explain how your practices have changed?			
Most significant	Frequently Cited	Commonly Cited	Rarely Cited
Distraction Factor (41%)	Exclusive Use of iPad constrained T&L (26%) Facilitated Teacher Mobility (22%) Technical Difficulties (19%) No Change (19%)	Reduced paper usage (15%)	Increased student engagement (7%) Facilitated group work (4%) Facilitated a student centered approach (4%)

Section C Complete Table of Findings

Table 7: Teachers' views on how assessment practices have changed

Part C: How did the iPad affect assessment practices?			
Most significant	Frequently Cited	Commonly Cited	Rarely Cited
Complex set up procedure (58%) Not suitable as a summative assessment tool (53%) Security Concerns (42%)	Lost submissions (32%)	Facilitates Grading (21%) Limits assessment opportunities (21%) Enhanced formative assessment practices (15%)	Unsuitable for visually impaired students (11%)

Section E Complete Tables of Findings

Table 8: iPad Opportunities in the Classroom

Part E: Describe two things about the iPads which you feel enhanced learning opportunities in the classroom.				
	Most significant	Frequently Cited	Commonly Cited	Rarely Cited
New Themes	Variety of Apps (37%) Enhanced Creativity (33%)	Instant access to internet (20%)	File-storage and distribution (13%)	Nothing (7%) New Opportunities for Teaching & Learning (3%)
Themes identified in Section B & C	Mobility & Portability (40%)	Student engagement (27%) Personalized Learning Opportunities (17%)	Reduced paper usage (13%) Facilitated Formative Assessment (10%)	

Table 9: iPad Challenges in the Classroom

Part E: Describe two things about the iPad which you feel restricted learning opportunities in the classroom.				
	Most significant	Frequently Cited	Commonly Cited	Rarely Cited
New Themes	Exclusive use limited teaching & learning opportunities (53%)	Difficulties associated with writing (43%)	File Storage & distribution (23%) Variety of apps (23%)	Lack of established software compatibility (13%)
Themes identified in Section B & C	Distraction Factor (57%) Technical difficulties (53%)		Unsuitable summative assessment device (17%)	

Appendix D: Section D Quantitative Findings

Table 10: Frequency of Use of Apps

Rank	App	Not at all/Once	2-5 times	More than 6 times
1	Adobe Reader	16%	10%	74%
2	BB Learn	22%	6%	72%
3	Keynote	6%	31%	63%
4	Quizlet	25%	16%	59%
5	Neu.Annotate	16%	28%	56%
6	Notes	19%	31%	50%
7	ifiles	22%	31%	47%
8	Pages	28%	28%	44%
9	Dropbox	23%	39%	39%
9	Socrative	35%	26%	39%
11	iBooks	31%	31%	38%
12	Popplet	45%	23%	32%
13	SoundNote	59%	13%	28%
13	iMovie	41%	31%	28%
15	iTunes U	66%	22%	13%
15	Numbers	66%	22%	13%
17	Nearpod	81%	9%	9%
17	Flashcardlet	75%	16%	9%
19	Creative Book Builder (CBB)	75%	19%	6%
20	EverNote	88%	9%	3%
20	Geometry Pad	94%	3%	3%
20	ChartmakePro	97%	0%	3%

Section D Qualitative Findings

Complete list of ranked “Most Effective Teaching” apps

In this part of the survey teachers were asked to list the three apps they found most effective for teaching and to briefly explain why. The table below shows the complete list of apps ranked by percentage of respondents who included app in top 3.

Table 11: Most effective teaching app ranked by percentage of respondents who selected app in top 3

Rank	Most Effective teaching App	% of Respondents who included in top 3	Summary of Teacher Comments
1.	Quizlet	45%	Easy to use and included a good range of fun and interactive activities, including vocabulary presentation, games & quizzes. Students liked it.
2.	Adobe Reader	41%	Every class we use material on PDF- easy to use. You can open, annotate, save and organise files in folders.
3.	Keynote	28%	Teachers can easily convert their PowerPoint presentations to Keynotes. Creates professional visual learning materials. Easy to use. Creative way for teachers and students to share information.
4.	BB Learn	25%	It is easy to organise materials on BB9 and easy for students to use. Acts as centralized repository Track students learning and participation and give immediate feedback
5.	Socrative	22%	It facilitated formative assessment practices through interactive surveys and so increased student engagement. You can easily record for speaking practice.
6.	Neu Annotate	16%	You can open, annotate, save and organise files in folders.
7.	iFiles	13%	Makes the iPad more like a laptop and allows students access to shared drives. It made saving and organizing files easy.
7.	Popplet	13%	Permitted a fun way to brainstorm and keep a record. Good for introducing and summarizing lessons. Easy and fun for students to use to create their own summaries.
7.	Educreations	13%	It acts like a whiteboard that students can add anything to. Students can quickly use it to send some short notes with recording and pictures to teacher. Increased student engagement.
7.	iBook	13%	Helps to create organized visual and interactive learning materials.

11.	Notes	9%	For all my notes/planning The best way for students to write at length and they can paste their writing to other apps when they are ready, few technical issues with this app. Students can make quick notes
11.	English Practice Grammar	9%	Independent learning reinforcing lesson objectives Supplementary Grammar practice
13.	iMovie	6%	Creative helped engage students creating engaging presentations
13.	Pages	6%	Suitable for writing/typing. Creative way for teachers and students to share information but less visual generally.
13.	NearPod	6%	Nice presentation, interactive, locks students (= minimizes distractions)
13.	Recorder Plus	6%	Very effective for speaking/recording practice
17.	SBS spelling	5%	Creates a variety of html activities such as MCQ, Short Answer, Crosswords and word jumbles that students can do on the iPad
18.	Ask3	3%	As above. I am able to present video. S's able to respond with their own videos.
18.	Babble	3%	Typing Practice
18.	Chartmaker Pro	3%	I can make any type of chart using real life data and it is excellent for student learning.
18.	Hot Potatoes(not an app)	3%	Creates a variety of html activities such as MCQ, Short Answer, Crosswords and word jumbles that students can do on the iPad
18.	CBB	3%	Creating Interactive textbooks
18.	Phrasal Verbs Machine	3%	Appropriate for courses and provides fun learning