A STUDY ON HOW AND IN WHAT WAYS HAS THE USE OF TABLET TECHNOLOGIES (SPECIFICALLY iPADS) ENHANCED LEARNING AND TEACHING ACROSS CURRICULUM AREAS.

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Notice 1

Notice 2

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Signed: ………………………………….. Date: …………………………………..

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Abstract

The use of technology in education is not a new phenomenon; however, schools in Australia and around the globe are searching for the best ways to integrate existing and emerging technologies in the curriculum. Their goals are to engage students, to raise academic achievement and to prepare them for a technology rich world. The introduction of tablets and for the purposes of this study, iPads and iPad technology in education, has renewed hopes for individualising and personalising the educational experience of students anywhere, anytime and at any pace.

The aim of this study is to examine the ways in which the iPad, a tablet technology device, enhances learning and teaching across the curriculum. Four teachers volunteered to be a part of this study and as such, focus group interviews and qualitative analysis, presented data linked to the research question – "How and in what ways has the use of tablet technologies (specifically iPads) enhanced learning and teaching across curriculum areas?"

The context where the research takes place in, is a large independent school in the south-east corridor of Melbourne, Victoria, Australia. This school has currently mandated the purchase and use of iPads for students and subsequently has purchased this device for each teacher together with providing ongoing training and professional development. The focus of the literature review investigates a number of past and current research studies in order to identify any 'gaps' related to the use of tablet technologies in education. Due to a paucity of literature in the use of tablet devices such as the iPad, the literature review also includes a review of the use of other types of technologies in education including desktop computers and online resources that support learning and teaching.

This study adopted a qualitative case-study, phenomenological approach as the chosen methodology. This offered the researcher the opportunity to work with participants in a natural professional setting and observe them interacting with each other while exchanging ideas and strategies related to the ways in which iPad technologies were being employed with a view to enhance the learning and teaching across their chosen curriculum areas.

Four case studies form the basis for data analysis as a result of the contributions made by the teacher participants during focus group sessions. These case studies highlight the specific strategies, apps (applications – used as an acronym in iPad technology) and other digital resources each of the teachers employed to enhance teaching and learning through the use of tablet technology.

The findings of this research paper confirmed similar findings to those of previous studies; that the effective use of tablet technologies such as the iPad, can definitely engage students and cater for their individual needs and learning styles. However, what emerged was the additional finding that there are specific strategies that must be implemented in order for these devices to assist educators realise their educational goals. Hence, any one-to-one implementation needs to take into account when and how iPad or tablet technologies can make a difference to existing practices. The summative findings of this research show that the use of the iPad created a supportive learning environment through the use of apps (applications), e-Books, games, simulations and online resources, which were available to students 24 hours seven days a week.

Glossary and Acronyms

24/7	Twenty-four hours, seven days
Apps	An abbreviation for applications
DEECD	Department of Education and Early Childhood Development
DER	Digital Education Revolution
e-Journal	Electronic journal
ICT	Information and Communications Technology
iTunes U	Apple's online platform that allows Educational Institutions and individuals to create multimodal courses and make them available for subscription and download
LMS	Learning Management System
MCEETYA	Ministerial Council for Education, Early Childhood Development and Youth Affairs
NAPLAN	National Assessment Program for Literacy and Numeracy
VLE	Virtual Learning Environment
WWW	World Wide Web

Chapter 1: Background: Nature and Scope of the Study

1.1. Overview

Educators around the globe are constantly searching for new ideas, strategies and resources that can be used to create flexible and effective educational environments in order to engage students, raise academic achievement and prepare them for the future. A solution to this complex issue is seen by some educators as the effective integration of tablet technologies such as the iPad, to support the learning needs of individual students at any time, pace, and place. The term 'effective', in this context, refers to student achievement in relation to the specific goals of the curriculum. Hence, for the purpose of this report, the use of tablet technology in education is classified as effective when it assists students to meet the specific outcomes of the curriculum.

This research is positioned against the backdrop of the Australian Federal Government's agenda for improving learning outcomes for *all* students, as outlined in the 2008 Melbourne Declaration on Educational Goals for Young Australians (http://www.mceecdya.edu.au/). One of the goals of this declaration defines successful learners as students who "have the essential skills in literacy and numeracy and are creative and productive users of technology, especially ICT, as a foundation for success in all learning areas" (2008, p. 8)

The use of Information and Communications Technology (ICT) in education is not a new phenomenon. However, the use of one tablet computer to one student in learning and teaching is a relatively novel strategy for addressing individual needs and for preparing students for the future. It has been more than a decade that State Government reports have promoted the systematic use of learning technologies to increase student outcomes in all areas of the curriculum, including the acquisition of foundation skills in literacy. An overview of the last

ten years highlights the emergence of the use of the iPad as it relates to governmental policies and goals for raising standards in learning and teaching.

In 2001-2002, the then Victorian Department of Education set new targets in order to further improve standards in primary schooling. It was in this year the Victorian Schools Innovation Commission was established in order to advise the Minister for Education and Training on innovations in public schools. A recommendation of the commission included the use of Information and Communications Technology (ICT), to improve student learning in literacy (DET, 2002). In 2002-2003, the focus of education in Victoria was on "developing in each child the essential skills necessary for ongoing progress in education" (DET, 2003, p.23). In addition, during this period Victoria begins to play a leading role in the development of flexible online learning strategies.

A key element in the Education Department's policies, from 2003 to 2004, was a "five-year strategic view of the kind of ICT investment needed to make the biggest difference to learning outcomes" (DET, 2003, p.11). From this time forward, the focus shifts from integrating technology into curriculum to improving student outcomes through Information and Communications Technology (DET, 2003, p.11).

In November 2006, the Government announced its commitment to create the Ultranet, an online learning and teaching platform for all Victorian state schools. The Ultranet was conceptualised as a statewide, secure website that students, parents and teachers could access. It was to provide a new learning space and more opportunities for information sharing across the Victorian government school system. The Ultranet was to give students access to the latest online tools and personalised learning activities within and outside the classroom,

whilst parents could access up-to-date information about their child, including their attendance, timetable, homework, teacher feedback and learning progress. Teachers would have access to online learning spaces and digital resources to use to extend their classroom teaching. The deployment of this system commenced in May 2010.

Simultaneously on an international level there have been similar efforts to take advantage of online learning environments, in education. For example, in United States of America, "42 states [in the U.S.] have significant supplemental online learning programs" (Blackboard, 2008, p.6). This is framed against the targeted interest in providing students the best possible education. The newly appointed President of United States of America Barack Obama, in July 2009, launched the 'Race to the top' competition (US Government, 2009), where the individual States were to be rewarded with a grant for demonstrating clear improvements in students' achievement. During the launch he argued that, "the best jobs will go to the best educated, whether they live in the United States or India or China." Obama closed his speech pleading with all stakeholders to create "the pathways they [students] need to make the most of their abilities; to make the most of their opportunities" (US Government, 2009).

It is against this complex local and global backdrop that educators are constantly searching for new solutions, which can lead to improvements in student academic performance. This search becomes more challenging when teachers take into consideration the unique needs of individuals as well as the daily challenges of the school environment. The integration and use of technologies is providing a medium and innovative tool to address these global concerns in education.

1.2. Personal motivation for the study

My motivation for researching this topic is related to my passion for using technology in innovative ways to create solutions to everyday classroom problems. A secondary motivation for engaging in this research included my desire to work with classroom teachers and provide them with alternative solutions for assisting students in developing their subject specific knowledge and skills through the use of cutting edge technologies. During this study in my discussions with teachers, I was able to document many of the challenges they faced, including catering for the individual needs of students, crowded curriculum issues and a need to increase student engagement with subject content. In my professional role, as an Information and Communications Technology (ICT), specialist, it was possible to see these challenges from a different perspective and make connections with tools and strategies that teachers could use in order to achieve their goals.

I believe that technology can be used to transform learning and teaching practices in ways never before possible and in turn can allow educators to meet the needs of every student in the classroom and beyond. I also believe that students are ready to learn with technology and to engage deeper with the curriculum content when it is fun, challenging and relevant to their lives. I want to be part of this digital revolution and make my own humble contributions by co-constructing with my colleagues effective learning spaces for all students.

1.3. Need for the research and purpose of the study

This research study was important for a number of reasons, including the need to investigate whether the use of iPads can in fact, improve educational outcomes and teachers' professional obligation to prepare students to live and work in a digital rich global society. Studies involving possible digital solutions to this complex problem can generate new insights and novel strategies that educators can employ in order to become more effective teachers. In line

with this view, the Australian Council for Educational Research calls for additional studies "into the success indicators for digital learning" (White, 2008, p.10).

Additionally, there are pressures on teachers to "have the skills and tools to design and deliver programs that meet students' needs and harness the benefits and resources of the digital revolution" (Australian Government, 2008, p.6). This kind of demand can only be met with systematic actions at school level and access to research that guides the use of technology in learning and teaching. Furthermore, the Digital Education Revolution encourages teachers to use resources "that stimulate, challenge and assist students in achieving desired learning outcomes. These include collaborative and interactive activities as well as instructional and reference materials" (Australian Government, 2008, p.5). Hence, research such as this can play an essential role in generating useful knowledge related to how tablet technologies such as the iPad can create new opportunities for engaging students and addressing their needs.

Needless to say that no matter what agreements are put in place whether it is the Digital Educational Revolution (Australian Government, 2008) or the Race to the top (US Government, 2009), the educational benefits will only be realised when teachers and students are empowered with skills and knowledge to harness the potential of the underlying strategies. According to Knight, (2009), teachers need to understand how to draw advantage from an increasingly diverse range of tools and media and select the most suited to their purpose; the appropriate integration or blending of technology-mediated activities with face-to-face learning and teaching is an important dimension of 21st century practice. Knight, (2009, p. 7) also notes that when designing learning, practitioners must also be aware of the impact of technology on the way learners learn and make explicit for them the most effective learning strategies.

It is hoped that herrah study will play an important role in assisting teachers to make the most of the opportunities available when using tablet technologies in teaching and learning.

1.4. Aims of the study

- To review the research literature on the use of iPads by teachers; and research related to the use of tablet technologies in education;
- To examine how tablet technologies (iPads) can be used effectively across curriculum areas in the classroom and beyond;
- To investigate suitable apps, digital resources and strategies teachers in this study employ to engage students with the view of raising academic performance; and
- offer recommendations and inform the educational community about the findings of the study.

1.5. Key research question

How and in what ways has the use of tablet technologies (specifically iPads) enhanced learning and teaching across curriculum areas?

Sub- Questions:

What factors influence students' learning in a one-to-one learning environment?

How do teachers use tablet technologies such as the iPad across curriculum areas?

What types of apps (applications) and activities support the individual needs of students?

What skills and knowledge do teachers require in order to effectively integrate tablet technology (iPads) in their teaching and learning?

1.6. Research Context: Greenfield College

For the purposes of anonymity the independent school where research and data for this study was gathered will be called Greenfield College. One of the driving forces behind the implementation of a mandated iPad program at Greenfield College was related to raising academic performance as evidenced in testing such as NAPLAN (National Assessment Program for Literacy and Numeracy).

The participants for this case study included four volunteer teachers from Greenfield College, a private, independent school on the outskirts of the South Eastern suburbs of Melbourne. One of Greenfield's top priorities is academic excellence in all subjects. The school has put in place specific targets and strategies in order to achieve its objectives. These include explicit teaching strategies, regular data collection and more recently the introduction of tablet technology, specifically the mandated use and purchase of iPads by all students, from Year 5 to Year 12, for teaching and learning. Greenfield College values the use of technology as a tool for learning and teaching as well as an important strategy to prepare students for the 21st century. The iPad roll-out strategy, according to the principal, "is designed to provide students with the latest technology to enhance their learning engagement and academic outcomes" (Greenfield College, Mission Statement 2011). As a result, the school has made significant investment in its technology infrastructure, specialists and an online learning environment that is available 24/7 to students, parents and teachers. A pilot iPad program was introduced in February 2012 for students in Year 5 to 11. The aim of the program was to evaluate the impact of tablet devices in teaching and learning.

It is important to acknowledge that Greenfield College is a unique school in terms of small classroom sizes, its parallel education model and the explicit teaching pedagogy. It provides opportunities for students to excel in any area of interest while pursuing excellence in core academic subjects. A more comprehensive discussion of the school and the context for this research can be found in Chapter Four.

1.7. Outline of the thesis

This study report contains six chapters. Following this chapter, which introduced the nature and the scope of the study, Chapter Two includes a summative review of the main themes and theories related to the use of technology in education. As there is currently a lack of research involving tablet devices such as iPads, this review included a wider range of other types of technologies researched for their effective use of raising standards in education.

Chapter Three examines the use of qualitative methodology and the rational for using it for this specific study. Chapter Four discusses the research design with specific references to the participants, the selection process, data collection and data analysis. This section also outlines the criteria for assessing credibility as well as a discussion on the ethical considerations for the research study. Chapter Five includes the presentation of the findings from the four case studies with emphasis on the patterns that emerged from the data collected. Chapter Six discusses in detail the main thematic threads that emerged during the data analysis, the implications for the use of tablet devices such as iPads in education and specific recommendations in relation to effective use.

Chapter 2: Literature Review

2.1. Introduction

Over the past decade, a number of investigations have been conducted in relation to desktop computers and the use of one laptop per student in education (Holkner et al., 2008, Kar-Tin, 2006; Knight, 2009; Picciano & Seaman, 2009,).   However, whilst studies in the use of these technologies were widespread at the time this review was conducted, it was very difficult to locate research that addressed the use of one tablet technology per student to enhance the learning and teaching across curriculum areas. As a result, this literature review includes studies beyond the use of tablet devices and addressed key themes and theories, related to the use of technology in education, through specific references to computers, laptops, tablets, online learning environments and educational software. The following are reviewed in this chapter:

- relevant definitions related to acronyms and terms used in this literature review;

- a summative review of the main themes related to the use of technology to support learning and teaching;

- a synthesis of the current theories in relation to the benefits of tablet technology, or lack of, for students as well as descriptions of current models; and,

- the possible benefits of tablet technology in education.

2.2. Relevant definitions related to the terms used in this literature review

For the purpose of this study, the following definitions are used in order to clarify the specific technological terms referenced in the literature:

2.2.1. Laptop or Notebook

A laptop or a notebook is a portable computer that includes a screen, a keyboard, a trackpad or a mouse, a battery and a power adapter.

2.2.2. Tablet

A tablet is a portable computer that has a hinge allowing the screen to swivel and then lay flat atop the attached keyboard face up. This allows users to view the screen without keyboard interference." When in "tablet" mode the computer operates as a touch input device for navigation, handwriting or doodling and drawing (Smith, Jan 14, 2010).

A tablet can also be "a portable computer that does not have a keyboard input device physically attached to it. It is essentially a computer that consists of a touch input screen and nothing else" (Smith, Jan 14, 2010). An iPad is an example of such a device. Like other computers, it can be used to access resources online, to create content, to make presentations, to communicate and to perform a number of other tasks.

2.2.3. Online Learning

Online learning is a concept that has evolved rapidly over the past few years and cannot be ignored when looking at new possibilities for teaching and learning especially when students and teachers use tablet devices to share and to access quality digital content from around the globe. Today there are a number of different models of online learning environments. Some models are simple and others are more complex in relation to design, use and purpose. Any of these models can be accessed through a tablet computer from anywhere and at any time provided that the device can connect to the Internet.

This chapter review and synthesis of current themes and theories, differentiates the models of teaching and learning that take place entirely online from those that combine tablet technology to access online activities to supplement classroom instruction. This was necessary as the teachers and students of Greenfield College used iPads in the classroom and beyond to access teaching and learning resources from the school's learning management system (LMS) as a support strategy, together with a number of subject specific apps and digital resources found

on the Internet. Figure 1 illustrates the school's visual model for supporting students' learning through the use of iPads.
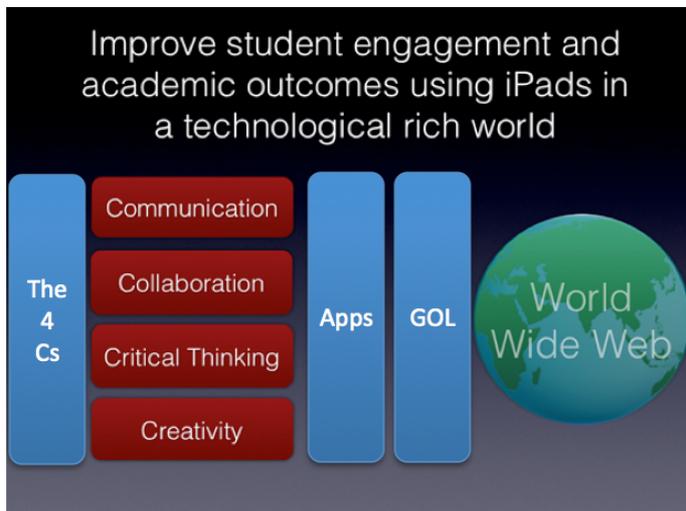
Figure 1:
A Visual Model for Supporting Students' Learning through the Use of iPads

Looking at the Figure 1 from left to right, it is clear that the use of tablet devices at Greenfield College aimed at improving student engagement and academic outcomes through activities that fostered communication, collaboration, critical thinking and creativity. Also, important were the new possibilities for blending face-to-face teaching with online learning through Greenfield's Online Learning platform (GOL), apps and educational resources available on the Internet.

In the context of Greenfield College, when researching how tablet technology was used across curriculum areas, it was necessary to clarify the role of the various types of online learning systems used in education as they impacted learning and teaching in different ways.

2.2.4. Virtual Learning Environment (VLE)

A Virtual Learning Environment or VLE, can be used to hold classes that are entirely online and may incorporate synchronous and asynchronous activities.   Synchronous activities may

include videoconferences and live discussions.   On the other hand, asynchronous activities may include emails, online quizzes, simulations and video clips that students can access anytime from anywhere.

2.2.5. Blended learning

A blended learning model may combine face-to-face teaching and online resources to support student learning at any time, place and pace.   Yoon and Lim (2007), defined blended instruction as "a purposeful mix of delivery media (particularly face-to-face and various forms of technologies) to improve learning/performance solutions, which are derived from the goals and needs of an organization" (2007, p.1). Similarly, a recent report in United States describes this model as "online learning components that are combined or blended (sometimes called "hybrid") with face-to-face instruction to provide learning enhancement" (Means, Toyama, Murphy, Bakia, & Jones, 2009).

The quantity of face-to-face instruction and the amount of online delivery may differ from school to school and from one course to another.   In order to provide a degree of uniformity in the field, Allen and Seaman (2006), defined the methods of delivery according to the proportion of content delivered online. The following table elucidates the differences between courses, in accordance with Allen and Seaman's (2006), definitions.

Table 1

Classification of Courses According to the Proportion of Content Delivered Online

Proportion of Content Delivered Online	Type of course	Typical Description
0%	Traditional	Course with no online technology used - Content is delivered in writing or orally.
1 to 29%	Web Facilitated	Course that uses web-based technology to facilitate what is essentially a face-to-face course. Uses a course management system (CMS) or web pages to post the syllabus and assignments, for example.
30 to 79%	Blended/Hybrid	Course that blends online and face-to-face delivery. Substantial proportion of the content is delivered online, typically uses online discussions, and typically has some face-to face meetings.
80+%	Online	A course where most or all of the content is delivered online. Typically have no face-to-face meetings.

Source: (Allen & Seaman, 2006, p.9)

However, there was still a degree difficulty in formulating a uniform definition of the various ways online learning environments could be used to support student learning in the classroom and beyond through tablet technology. For instance, questions remained unanswered in regards to the boundaries between 'traditional', web facilitated, blended and online courses. Garrison and Kanuka (2004), suggested that, "blended learning should be distinguished from that of enhanced classroom or fully online learning experiences. However, it is not clear as to how much, or how little, online learning is inherent to blended learning" (2004, p.2). This complexity persisted even in more recent studies where researchers attempt "to explain what blending is, determine an ideal mix of various delivery media, and guide the practice of blending" (Yoon & Lim, 2007). The degree of complexity increases further when considering the impact on teaching and learning caused by the introduction of educational apps and the

vast amount of digital resources readily available on the Internet that students can access through tablet devices in the classroom and beyond.

At Greenfield College, the answer to this issue was left with individual teachers who had a better understanding of the specific needs of the students in their care. Thus, the teachers were encouraged to determine the most appropriate response in terms of teaching and learning with iPads and what apps and online resources to use. According to Holkner, et al., (2008), "ICT requirements of each school are unique and no single ICT model can meet the needs of Australia's diverse schools" (2008, p.100).

2.2.6. Greenfield Online

In the context of this study, Greenfield Online (GOL) is a learning management system that students could access through their tablet devices, during class time and beyond school hours to enhance their learning. The amount of time spent using GOL to access information and digital activities, depended on students' needs and the teachers' expectations.

For the purpose of this review, the terms VLE, Learning Platforms and GOL will be used interchangeably when referring to online learning environments that allow teachers to blend online activities with a predominant face-to-face teaching approach.

2.3. Summative review of main themes and theories

This literature review identifies a number of common themes and theories related to the use of technology in education and the impact on learning and teaching. Overall, desktop computers, laptops and tablets were mainly used as vehicles for accessing educational resources online, for creating content, for demonstrating, for collaborating and communicating and for reinforcing concepts that needed constant repetition. The key themes identified include: learning theories; flexibility for learning at any pace, anywhere at any time; student

engagement; individualised learning; academic achievement; intervention, immediate
feedback; repetition and frequency of use.

2.3.1. Learning Theories

The importance of learning theories in developing effective digital activities is a key issue raised in the literature (Baker, 2010; Knight, 2009; Mayes & de Freitas, 2004). In relation to this matter, Knight (2009) argues that a "clear understanding of the approach or approaches to be taken and the underpinning perspective on learning enables the practitioner to make more appropriate decisions about the role that technology-enhanced practice, or any other strategy, will play in the design". Knight summarises these learning theories succinctly by providing a matrix with which educators can engage. Table 2 below provides an overview of the perspectives, the assumptions and the associated pedagogies teachers need to be familiar with in order to effectively design and integrate technology in teaching and learning.

Table 2: Overview of the Perspectives, Assumptions and Associated Pedagogies

Perspective	Assumptions	Associated pedagogy
Associative perspective	Learning as acquiring competence Learners acquire knowledge by building associations between different concepts. Learners gain skills by building progressively complex actions from component skills.	1. Focus on competences 2. Routines of organised activity 3. Progressive difficulty 4. Clear goals and feedback 5. Individualised pathways matched to the individual's prior performance
Constructive perspective (individual focus)	Learning as achieving understanding Learners actively construct new ideas by building and testing hypotheses.	1. Interactive environments for knowledge-building 2. Activities that encourage experimentation and discovery of principles 3. Support for reflection and evaluation
Constructive perspective (social focus)	Learning as achieving understanding Learners actively construct new ideas through collaborative activities and/or dialogue.	1. Interactive environments for knowledge-building 2. Activities that encourage collaboration and shared expression of ideas 3. Support for reflection, peer review and evaluation
Situative perspective	Learning as social practice Learners develop their identities through participation in specific communities of practice.	1. Participation in social practices of enquiry and learning 2. Support for development of learning skills 3. Dialogue to facilitate the development of learning relationships

Source: Knight 2009, p. 13

However, some researchers warn that existing learning theories such as Behaviourism, Cognitivism, and Constructivism were developed before the introduction of technology in education and hence have limitations (Baker, 2010; Siemens, 2004). A limitation described by Siemens (2004), is that they "do not address learning that occurs outside of people (i.e. learning that is stored and manipulated by technology). They also fail to describe how learning happens within organisations." Clearly, this is an interesting and significant observation that may lead to the refinement and perhaps the formulation of new learning theories based on opportunities for individualised, flexible, connected, collaborative, non-linear and authentic learning through the use of tablet technologies and all other affordances that come with the devices.

Moreover, the concept of learning from information that is stored and manipulated by technology is both simple and yet, simultaneously, so complex that it can be ignored or rejected as it is very different from what is widely known and accepted. For instance, at the present time, tablet technology such as iPads can offer students access to a virtual teacher or avatar capable of assessing and teaching subject specific skills according to students' needs at any time, place and pace. Moreover, this system can adjust according to a students' progress and provide powerful and engaging learning experiences, only possible through technology. As yet a pedagogical descriptive paradigm that encapsulates this has yet to be conceptualized.

2.3.2. Flexibility for learning anywhere, anytime and at any pace

Flexible learning is a key theme in most studies related to the use of technology in education as solutions for Primary to Tertiary levels (Kar-Tin, 2006; Knight, 2009; Picciano & Seaman, 2009). Importantly, the degree of flexibility at primary school level differed due to students' limited ICT skills, the amount of access to technology and expert support. This was particularly true for students who had limited access to a device capable of accessing the

resources in addition to advanced skills and knowledge required for operating complex software packages.

Nevertheless, there is increased evidence that schools are using VLEs to support classroom teaching and provide students with opportunities for more flexible learning. In an Australian study (Holkner et al., 2008), researchers found that teachers were asked to integrate online environments for learning beyond school hours. More specifically, at the "Eastern Fleurieu School, the principal has particularly encouraged teachers to explore the capabilities of tools that [would] enable students to participate in online environments, including those that [would] allow access either outside school hours or at home" (Holkner et al., 2008, p.69).

Similarly, in Finland, the use of online learning environments to support education was "seen as one of the ways of providing flexible and equitable learning opportunities" to students. (Armstrong et al., 2004, p.93). Likewise in the United States, "online learning has become popular because of its potential for providing more flexible access to content and instruction at any time, from any place" (Means et al., 2004, p.93).

2.3.3. Student engagement

Student engagement is also one of the key themes outlined in the literature related to technology and online learning (CISCO, 2006; Holkner et al., 2008; Kar-Tin, 2006; Knight, 2009; Lemke, Coughlin, & Reifsneider, 2009; Proske, Narciss, & Korndle, 2007; Robinson & Sebba, 2010). Whilst there may be a general belief amongst educators that engagement is the product of students being comfortable with technology or that technology is a 'cool' tool to have, the literature in this area points to a number of other more important aspects; such as, interactivity (Proske et al., 2007), control of the learning activity (Means et al., 2009), the

ability to experience success (DiPietro, Ferdig, Black, & Preston, 2008) and most importantly, the actual learning taking place.

As Lei and Zhao argue, "the ultimate goal of technology integration into schools is to help students learn" (2007, p.11). Their studies revealed that learning through technology happens when students are provided with a supportive environment and quality resources. This is an indication that if these two conditions are not met, the use of tablet technology may not have the same level of positive impact on students' learning even if they are deeply engaged with the resources provided. Indeed, Knight (2009) found that there was a close link between student engagement and activities that are "well –attuned to their needs" (2009, p. 43).

2.3.4. Individualised learning
For the purposes of this study; "Individualisation refers to instruction that is paced to the learning needs of different learners. Learning goals are the same for all students, but students can progress through the material at different speeds according to their learning needs" (Atkins et al., 2010, p.28).

A review of the available literature reveals compelling evidence related to the positive impact of technology on students' achievement. A major study in Europe in 2006 noted that technology "allows for greater differentiation (especially in primary schools), with programs tailored to individual pupils' needs (Balanskat, Blamire, & Kefala, 2006, p.33). In support of this claim, Abell (2006), also advocates that the greatest advantage of an individualised learning solution involving technology is "the way the curriculum can be digitally displayed and altered through scaffolding and customisation to meet the individual student's preferred approach to learning and unique ability level" (p. 5). These views are also in line with similar

studies conducted in Europe showing that "students learn more independently, at their own pace and according to their needs" (Balanskat et al., 2006, p.57).

2.3.5. Academic achievement

Academic achievement can clearly be seen as one of the most important goals in education. For the past two decades governments around the world have been making significant investments in technology mainly to raise academic achievement and more recently to prepare students for a global digital society (Australian Government, 2008; Machin, McNally, & Silva, 2006). However, a study by CISCO (Computer Information System Company), in 2006, a large supplier of internet equipment like routers, software and network management services, found that education systems did not fully realise the anticipated gains from the investment made on ICT.

The CISCO study suggested four main reasons: First, in being overly confident that they could easily accomplish the depth of school change required to realise the potential technology holds for learning was not an easy task. Secondly, their lack of effort, documenting the effect on student learning, teacher practices and system efficiencies. Thirdly, in overestimating the time it would take to reach a sufficiency point for technology access and fourthly, in underestimating the rate of change in technology, and the impact of such rapid, continuous change on staff time, budgeting, professional development, software upgrades, and curricula and lesson re-design. As a result, the real potential of technology for improving learning remains largely untapped in schools today (CISCO, 2006, p.2).

There is no doubt that continuous and rapid developments can make it more challenging for teachers to harness the full benefits of current and emerging technologies in education. This may also explain why educators have difficulties in documenting the real impact of ICT,

especially in settings where technology is routinely used as an 'invisible' tool for teaching and learning. As a result, the literature presents mixed results in terms of student achievement and also highlights the difficulties teachers have in formally documenting the real impact of technology (Holkner et al., 2008).

Nevertheless, there is a general agreement that the effective use of technology can result in improved academic achievement (CISCO, 2006). This claim is also supported by Knight, (2009), who analysed the outcomes of research in relation to current practice. She found that "learners clearly benefited from the use of collaborative, interactive technologies and the increased flexibility provided by online learning" (2009, p.45). Similarly, Means, et al., (2009) in researching the effectiveness of online learning concluded that "instruction combining online and face-to-face elements had a larger advantage relative to purely face-to-face instruction than did purely online instruction" (2009, p.17).

The following year, in 2010, Apple launched the first iPad, which was designed "primarily as a platform for audio-visual media including books, periodicals, movies, music, games, apps and web content" (Wikipedia). The devices created more opportunities for learning, at a global level, as it connected devices, platforms and people to each other through apps, e-Books and virtual learning environments. As a result, to fully determine the ways in which tablet technologies can enhance learning and teaching, across curriculum areas is a very complex task. Advancements in technology make it almost impossible to control what happens both inside and outside the classroom as students have access to countless digital resources in addition to what schools have to offer.

2.3.6. Intervention

There is evidence to show that technology is used extensively to support specific intervention programs with various degrees of success (Balanskat et al., 2006; CISCO, 2006; Fasting & Lyster, 2005; Torgerson & Elbourne, 2008). Westwood (2008) outlines the difficulties teachers have in addressing the individual needs of students and suggests that "differentiation can be achieved to some degree" (2008, p.40), through the use of technology. Similarly, Fasting (2005), supports that "integrated software technology can be a supporting tool in the remediation of pupils' spelling problems" (2005, p.35).

Despite these positive claims, the current review was unable to find direct research related to the benefits of the latest tablet technologies in education, even though, these devices may offer better intervention options than stand-alone computers and laptops in terms of access to resources, assessment, flexibility, user control, individualisation and personalisation. However, it was encouraging to know that "most educators [were] looking for the value proposition that [would] significantly advance learning, teaching, and school system efficiencies" (CISCO, 2006, p. 15). This view, combined with teacher readiness to integrate tablet technologies and global educational resources as well as current research in the field could result in fruitful solutions to satisfy students' needs across curriculum areas.

2.3.7. Immediate Feedback

The importance of immediate feedback, especially to a generation of students who are used to almost everything happening instantly, cannot be overemphasized. The literature indicates a number of benefits for students linked to immediate feedback. A study on spelling feedback in an ICT learning environment supports that technology can "provide tireless feedback immediately after each response; a clear advantage to conventional paper-and-pencil instruction and a requirement that is obviously impossible to meet for a teacher in a regular

classroom" (Bosman, Van, & Verhoeven, 2006, p.21). However, the same study warns that a "disadvantage of having students practicing the spelling of words solely by means of the computer may be that spelling using handwriting becomes difficult, because it is by no means guaranteed that transfer occurs from computer-learned spelling to handwritten spelling" (Bosman, Van, & Verhoeven, 2006, p.19).

Furthermore, the literature indicates that it is the combination of supplementary activities and immediate feedback that leads to an increase in student achievement (CISCO 2006). Likewise, Bosman, et al., (2006, p.2), found that "delayed feedback is not as effective as immediate feedback". Interestingly, the role of feedback may also serve other purposes. For instance, Kar-Tin (2006, p.12) found that some students preferred online personal feedback, because they could "avoid any embarrassment".

2.3.7. Repetition, frequency of use and time on task

An additional key advantage identified in the literature relating to the use of technology in teaching and learning is the fact that students can repeat an activity as many times as they wish. Moreover, repetition "allows concepts to be reinforced and thus more effectively become embedded in the students' knowledge" (Boyle, Bradley, Chalk, Jones, & Pickard, 2003, p.55) However, Lei and Zhao (2007) challenged this view by arguing that frequency and time on task is only as beneficial as the quality of the activity. In other words if technology is to be used effectively, the digital activity must contribute positively to student learning. For this to happen educators must take into consideration the content of the activity as well as the learning theory behind it.

The literature reviewed provides compelling evidence that justifies research related to the use of tablet technologies to enhance learning and teaching across curriculum areas in order to engage students and to achieve the specific learning outcomes of each subject. The need for research in this area becomes more urgent as governments around the globe are making significant investments in technology aimed at raising academic achievement and preparing students for a global technology-rich society.

At the time of this review the United States Department of Education was developing a new model for educating the next generation of students. The model ask[ed] that we focus what and how we teach to match what people need to know, how they learn, where and when they will learn, and who needs to learn (Atkins et al., 2010). It brings state-of-the art technology into learning to enable, motivate, and inspire all students, regardless of background, languages, or disabilities, to achieve. [The model] leverages the power of technology to provide personalised learning instead of a one-size-fits-all curriculum, pace of teaching, and instructional practices. (Atkins et al., 2010, p.6).

Similarly in Victoria, the Education Department in 2010, launched an online learning platform (Ultranet), that *"supports high quality learning and teaching, connects students, teachers and parents and enables efficient knowledge transfer (Department of Education and Early Childhood Development, 2009). This system claimed that it would "establish a schools environment for the future that improve the educational outcomes of all Victorians." Simultaneously, the Education Department also established a website providing information related to "the value of the iPad, and the applications it can access, as an additional opportunity to engage students and to improve their educational attainment" (Department of Education and Early Childhood Development, 2009). However, these initiatives arrived at a time when research was providing a mixture of results in terms of the impact of technology on student

achievement. Moreover, there was a clear lack of studies in schools, related to the use of tablets such as iPads, to support teaching and learning as well as questions related to school readiness for such technologies. Nevertheless, the Victorian iPad Trial found that the "quality of teaching combined with purposeful and effective use of ICT contributes to improved learning" (http://www.ipadsforeducation.vic.edu.au/ipad-student-trial/ipad-research).

In the context of Greenfield College, an appropriate solution for enhancing the teaching and learning across curriculum areas through the use of tablet technology, emerges from the findings in relation to the themes and theories discussed in this research. However, a consideration of the unique needs of the school in regards to pedagogy, curriculum goals, community expectations and ICT infrastructure, must be made. According to Holkner, et al., (2008, p. 98), a technological solution should always recognize the uniqueness of the school setting and develop "an approach based on adopting 'appropriate practice' as determined by the needs of the learning community". This is a viable point of view especially in the case of Greenfield College, which is a high performing school that uses an explicit approach for the teaching of core skills and concepts whilst aiming to prepare students for further studies and the challenges of the global knowledge society.

2.4. Summary

The themes discussed in this chapter were linked to a literature review related to the use of desktop computers, laptops, software packages and online learning management systems. These themes provide useful information that can be taken into consideration when implementing and evaluating the use of tablet devices such as iPads in the classroom and beyond.   An iPad has significant new and improved features, which may assist teachers to realise their educational goals. It is a personal transportable device with internet access, lighter

than its predecessor, has no keyboards, can act as a video and audio recorder and comes with thousands of educational apps and e-Books. Tablets such as iPads in fact;

- include individualised and personalised activities;

- give users the ability to control the pace of learning sequences;

- incorporate interactivity and multimedia;

- provide immediate corrective feedback;

- incorporate access to quality online resources;

- allow a variety of choices for students to demonstrate newly constructed knowledge;

- allow users to repeat activities through visual interactive learning modules;

- design lessons based on theories supporting connected and collaborative learning; and,

- have in place an 'on-demand' professional learning plan to empower teachers and develop their skills and knowledge in the effective use of tablet technologies.

Overall, there was compelling evidence to support the use of one-to-one computing in education to increase engagement, enhance academic achievement and prepare students for the challenges of the 21st century. What was also clear was that that tablet technologies such as iPads require further investigation in order to determine the new possibilities and opportunities made available through access to online learning environments, multiple sources of information and collaborative strategies.

An interesting insight, evidenced from this literature review is how learning theories keep changing due to new opportunities created by rapid technological developments. Moreover,

the notion that new theories may come into existence by incorporating connected learning strategies as well as learning from knowledge stored in machines and devices that connect to each other, emerged. An early study in the use of tablet technologies suggested that "these are untested possibilities will require time and energy to explore in real classroom situations. Teachers are needed to take up the challenge of integrating these devices in their classrooms and researchers are needed to document the impact" (Banister, 2010, p.129).

The research question, in what ways and how tablet technologies such as iPads can enhance learning and teaching across curriculum areas still remains to be explored. A series of systematic studies in this field can provide a better understanding as to how these technologies will keep transforming education, as we know it today.

CHAPTER 3: Methodology

3.1. Overview

Research in education is a challenging task as it involves the investigation of complex teaching and learning environments where a plethora of factors may influence a particular situation or the people involved (Ross, Morrison, & Lowther, 2010). This is especially true when investigating practices that embrace the use of current and emerging technologies, as these tools extend teaching and learning opportunities beyond classroom boundaries and school bell times, thus; making the research task more intricate. In carrying out this investigation, I was interested in developing a better understanding of the situations and the people involved in their unique educational setting while using touch tablet technologies such as the iPad, to enhance learning and teaching. It was against this background that a decision had to be made in relation to the most appropriate methodological approach for investigating the ways in which tablet technologies were being used to enhance the learning and teaching cycle across curriculum areas. I chose qualitative research to gain a "deeper understanding of experience from the perspective of the participants selected for the study" in their natural setting (Maykut & Morehouse, 1994, pp. 40-41).

The following chapter describes the choices and reasons made in relation to the methodological approach, the study design, participants, data collection methods and analysis.

3.2. Rationale for choosing a qualitative phenomenological approach

In view of the high level of complexity involved in conducting research in educational settings, a qualitative phenomenological approach was deemed appropriate to adopt for this study. Qualitative research is one of the two major approaches in research methodology in the social sciences. It involves an in-depth understanding of human behaviour and the reasons that govern that behaviour. Unlike quantitative research, which assumes that there is a single,

objective reality than can be measured, qualitative research assumes there are; "multiple

realities represented in participant perspectives, and that context is critical in providing an

understanding of the phenomenon being investigated " (McMillan, 2004, p. 256).

This methodological approach allowed for the opportunity to work with participants in their

natural setting and to observe them interacting with each other while exchanging ideas and

strategies related to the ways in which tablet technologies were being employed to enhance the

learning and teaching cycles across their curriculum areas. Another important difference for

the choice of a qualitative approach, is the role of the researcher. Researcher bias is a threat to

the internal validity of quantitative research, however qualitative research acknowledges these

biases and treats them as factors that need to be understood and used when interpreting the

data (McMillan, 2004). This study is qualitative due to its emphasis on descriptive analysis

and recognition of the interpretive role of the researcher.

 Moreover, the descriptive nature of this approach would also assist me in analyzing the

contributions made by the participants during fortnightly focus group sessions and to generate

data that could form the basis for the recommendations of the study. Ultimately, this approach

led to useful insights related to the conditions that impacted on the effective use of touchscreen

tablet technologies (iPads) in education and set the scene for the possible development of a

theory grounded in the data (Fraenkel & Wallen, 2006).

Schools by nature are extremely complex places involving teachers, parents, students,

psychologists and other important key stakeholders operating in an environment constantly

evolving as a result of political, economic and a number of other societal pressures. The

essence of research studies in such environments calls for qualitative research, which is "an

approach that seeks to make sense of social phenomena as they occur in natural settings"
(Kervin, Vialle, Herrington, & Okely, 2006, p.37).

This particular study involved four individual educators who taught different subjects and year
levels. Hence, the study attempts to address different realities according to the unique
experience of each participant.

3.3. Phenomenology (Hermeneutic)

Phenomenology is a philosophy that was initiated by Edmund Husserl at the beginning of the
twentieth century (Giorgi and Giorgi, 2008). Phenomenological research, "aims to remain as
faithful as possible to the phenomenon and to the context in which it appears in the world"
(Giorgi and Giorgi, 2008, p. 28). Therefore the setting in which the experience is situated is of
vital importance to the phenomenological researcher. Most important is the perspective of the
individual and how they make meaning of their experience whilst the researcher's job is to
record and interpret the personal lived experiences of each participant. The philosophy of
phenomenology resonates throughout the purpose, literature and research methodology of this
study.

This inquiry is based on hermeneutic phenomenology. The word 'hermeneutic' derives from
the Greek language meaning interpretive. In simple terms, this type of research allows the
researcher to reflect on the participants' contributions and to document the interpretations
based on his or her ideas and experiences in relation to the question being investigated. In
hermeneutic phenomenology, "the biases and assumptions of the researcher are not bracketed
or set aside, but rather are embedded and essential to the interpretive process" (Laverty, 2003,
p.17). This was a very important choice for this particular research study as participants were
at the beginning of their journey in the use of tablet technology, iPads, in their lessons. They

needed a more supportive and trusting environment in which they could share their experiences in using the new devices by discussing the 'A-ha' moments of their lessons, with their peers as well as with the researcher who was able to provide his personal views.

Both the researcher and the participants in this study, embarked on a path of exploration, discovery, reflection, interpretation, meaning construction and development of a deeper understanding of iPads as tablet technologies and tools for enhancing learning and teaching. It was essential that participants could freely discuss and reflect on their practices simultaneously feeling empowered in knowing that they were collaboratively learning from one another.

Another important aspect of this process was the chance to discover any other relevant points that, at first, were not apparent to all participants. Guba and Lincoln (2001) describe this approach as a two-phase process. The discovery phase where the researcher attempts to understand and to describe what is going on in the specific context according to the participants and the assimilation phase which "represents the evaluator's effort to incorporate new discoveries into the existing construction or constructions" (Guba & Lincoln, 2001, p.2).

3.4. The position of the Researcher: Researcher's beliefs and assumptions

I am a strong believer in the use of new and emerging technologies for engaging students and preparing them for a technology rich global society. Technology allows access to quality educational resources and empowers students to collaborate and make a difference in the world they live. Technology, when used effectively by students and teachers, provides both parties a clear advantage in education. The essence of this study is to find out the key elements that make the use of technology an effective strategy for enhancing teaching and learning in the 21st century. At no stage, prior or during the research, have I tried to influence the

participants in adopting my own views and beliefs other than encouraging them to pay attention and reflect on what worked or did not work for them in the classroom and beyond.

Through the adoption of the qualitative research approach I was able to bring my own experiences related to the integration of a range of technologies in the curriculum, together with my personal journey in acquiring skills and strategies required for working with a number of applications and in turn share this knowledge with colleagues at local and global levels. I have been fortunate to have experienced different teaching contexts, settings and roles since my first appointment as an Art teacher at a government school in Melbourne. Since then, I have worked in a bilingual program and a P-12 private school as an Information and Communications Technology specialist and Professional Development provider in new and emerging technologies as well as a collaborator with the University of Crete on the development of a global learning platform for the teaching of Greek as a second language.

As a researcher, I am able to draw on the knowledge I have built over time dealing with learning and teaching and the use of technologies. The inclusion of these experiences was captured in the use of a reflective e-Journal during the period of data collection. Using this strategy enhanced the aim of this qualitative study, which was to develop better understanding and insights of the participants in relation to the main research question outlined in the introduction of this chapter.

3.5. Case study research

Case study was used for this research project as it allows inquirers to investigate complex educational issues in their natural environment. According to O'Toole and Beckett "cases can be about specific individuals, about specific contexts, or about a specific practice" (2010, p.56). As a result, through case studies, I was able to capture the unique stories of the four

participants who volunteered to share their experiences and the strategies they employed when using tablet devices (iPads), for teaching and learning in different subject areas. This is also a view supported by Guba and Lincoln, who noted that "if multiple realities exist, and they are time- and context-dependent, it is essential that the study be carried out in the same time/context complex that the inquirer seeks to understand (1988, p.133). As a result of having immersed myself in the same environment as the participants, I was able to record in detail, the different approaches and perspectives presented by each volunteer in relation to their experiences in teaching within a one tablet device to one student learning environment and thus gain a better understanding of the situation as it evolved.

A case study is the collection of a large amount of descriptive and detailed data about one entity. They can be conducted in a naturalistic environment and also used in more formal studies. Case studies are preferred when "how, why or what questions are being asked, or when the investigator has little control over events, or when the focus is on a contemporary phenomenon within a real life context" (Burns, 1994, p. 313). The present research study employed a multiple case study design and qualitative analysis. The focus of the research was on how teachers attribute any successful learning experiences using the iPad. The frame therefore of this study is to use individual case studies of four teachers all teaching at the same college.

The purpose of a case study strategy is to illuminate variables, phenomena, processes and relationships that deserve more intensive investigation.

Chapter 4: Research Design

4.1. Participants and Participant Selection

The teachers involved in this study were Mona, Leonardo, Brigitte and Alina (pseudonyms), from Greenfield College (pseudonym), a private non-selective entry school in Melbourne. The school has over three thousand students from Kindergarten to Year Twelve, on three campuses. Greenfield's vision as stated by the school in its curriculum and advertising, is to develop high achieving students who are connected globally. It uses a Parallel Education model, in recognition of the diverse educational needs of boys and girls. Girls and boys learn together in the same classroom until Year 4. In Years 5 to 12 boys and girls are separated in single sex classes. This separation is referred to as "parallel education". There is also an emphasis on an explicit instruction approach to core subjects in the Junior School, supplemented with a thinking and problem-solving pedagogy; an emphasis on deeper understanding in the Middle School; and a diversity of programs in the Senior School. Greenfield has achieved excellent results in the Victorian Certificate of Education over many years, with most students being placed in the top 20% of the Australian cohort.

The teachers in this study, volunteered to participate through an email communication sent out to all staff members in the Senior School, by the secretary of Greenfield College and an advertisement placed in the school's newsletter. The first four teachers who responded to the email were automatically selected for the study. The first participant, Mona, is a 31 years old Mathematics teacher in the Senior School, with nine years experience teaching Year 10 and 12 classes. She had no previous knowledge in teaching with iPads prior to this study. The second participant, Leonardo 26 years old, teaches Science, Biology and Chemistry in Years 9 to 11. He has been teaching for one and a half years. Leonardo is the only teacher who has taught in a one to one environment before, using laptops and not iPads. The third participant, Brigitte 38

years old, is a French language specialist teacher with fifteen years of experience. She teaches French in Years 9 to Year 12 classes. The fourth participant, Alina 39 years old, teaches English, Literature and Sociology in the Senior School. She has fourteen years of experience in teaching Kindergarten to Year 12 students. Currently, she teaches Years 9 to 12 students. Alina was the only teacher who was using an iPad to deliver lessons six months prior to the commencement of this research project. At that time students did not have access to tablets (iPads) or any other devices in the classroom.

When the first focus group meeting was held, Mona, Leonardo, Brigitte and Alina had had their first four weeks of experience in using the iPads for teaching and learning in a one to one environment.

4.2. Data Collection

Data collection commenced half way through Term 1 in 2012. The plan was for the group to meet fortnightly in order to share their 'Aha' moments in the use of the tablet technologies. However, two of the participants were involved in a two-week camp with Year 9 students and as a result the other members decided to continue the focus group sessions in Term 2.

All focus group sessions were audio recorded and transcribed to text in preparation for data analysis. This strategy enabled the researcher to examine the presentations in greater depth. This was done by digitally highlighting major themes and by making notes for further clarification during 'member checks' discussions.

4.3. Focus Groups

According to O'Toole and Beckett "focus groups is the name given to interviews with small groups" (2010, p. 101). In the case of this research study, the participants took part in five focus group sessions from February 2012 to May 2012. During these sessions the participants took turns in sharing their experiences and receiving questions or comments from the group members in relation to the information they provided. The main objective was to provide the participants with a forum where they could freely discuss their experiences in the use of tablet technologies and at the same time gather data that would inform the question of this research study. During the focus group sessions my role was to facilitate the discussions and encourage teachers to freely describe how tablet technologies were being used in their classrooms and beyond.

At the centre of this study were the participants. It was through their valuable contributions that the researcher could identify any common themes in each area and across all subjects. During the data collection sessions, they could provide feedback to each other as well as to seek clarification. Moreover, it was a process designed to empower each person and at the same time inform the study. I chose the focus group approach, as it was the most suitable strategy towards gaining an understanding of the phenomena discussed and the situations in which they occurred. The focus group sessions were held on Wednesdays during lunch times in one of the classrooms where participants could connect their tablet devices to a projector in order to support their contributions with audio-visual digital resources. This approach was used to emulate as close as possible the experiences teachers lived in the classroom and enabled all participants to gain a better understanding of what was happening. Hence, participants not only talked about what happened but also delivered their demonstrations using sound, written texts, video, diagrams, apps and students' samples of work.

During the sessions, the researcher had the opportunity to seek clarifications in relation to the tools used in the lessons delivered, the strategies employed, the degree of success according to the participants and the reasons behind the outcomes. Some of the prompts and questions included:

a.   What was the learning focus?

b.   What specific apps did you use?

c.   What did you do?

d.   What happened next?

e.   How did the student demonstrate mastery of the learning outcome?

f.   What did not go well according to what you had planned?

The introduction of the iPads at Greenfield College for teaching and learning meant that students had access to multiple sources of information and were no longer limited to the teachers and the textbook. Namely, ongoing access to online resources, apps to support subject specific requirements, e-Books, iTunes U lessons and support material, online collaboration and opportunities for learning at any time place and pace. The focus group process was designed to examine this new situation created by the tablet touch technology and to encourage participants to discuss how it impacted on teaching and learning both inside the classroom and beyond.

4.4. Research electronic journal

As the researcher I kept a personal electronic journal (e-Journal) in order to record the transcripts of the focus sessions and any observations that required further investigation. Journals or diaries have a long history as a self-generated form of text. Autry (1991, p. 75), notes that in the ancient world the commonplace book was an ancient Greek journal, where individuals recorded observations, thoughts and ideas, with the purpose of self-mastery and self understanding. These were not a private text but were used in discussions of shared cultural knowledge and values. Over time these more public uses became private where the

purpose of the journal was to reflect on the individual self to enhance self-understanding. The use of a journal and its purpose has changed and evolved throughout the ages. Sa (2002), discusses the significance of journal writing as an interpretative method. Due to the spontaneous and individualized nature of learning, thoughts attitudes and perceptions are a rich source of data for educational researchers. Most of these processes are not observable and yet are of intrinsic importance to the learning environment as a whole.

The use of the reflective journal in this study allowed me to create a reflective text, that is a journal entry, after witnessing and / or documenting a focus interview with participants. This process also allowed for recording the differing rates of learning experienced by the participants of the study. Furthermore, the use of the journal gave me the opportunity not only to improve the detail of comments and events but to also check on the accuracy of these details against the transcribed data from recorded conversations.

Some other advantages of using an e-Journal included the ability to highlight emerging themes, the capacity to create notes on the specific sections of the transcript, the instant access to online digital resources that allowed for immediate investigation of specific concepts and the automatic identification of common themes through colour coding. This strategy supported the researcher to critically review the information from varied points of view and to make more sense of what was happening, further to recording "hunches, feelings, assumptions about people or processes" (Knobel & Lankshear, 1999, p.92).

Journal entries were also made whenever I had a thought I wanted to explore about a specific theme or a new insight related to the information shared during the focus group sessions.

4.5. Data Analysis

Four case studies reports formed the basis for data analysis as a result of the contributions made by the participants during the focus group sessions. These case studies highlighted the specific strategies, apps and other digital resources the four teachers employed to enhance teaching and learning through the use of tablet technology. Their contributions, ultimately, acted as the link between past studies in the area of technology integration in education and new tools such as touch tablets. Each participant brought to the sessions specific suggestions, skills and knowledge applicable to their unique classroom settings, to the needs of their students and to the subject-specific requirements. Immersion in this environment and establishing a professional learning team as part of the inquiry's strategy, enabled the researcher to take notes of emerging themes, to record the issues faced by the participants, their decision making strategies and their reactions to specific outcomes as a result of using iPad tablets for teaching.

The transcripts of the audio recordings were carefully analysed in order to identify emerging themes, followed by 'member checks' to increase credibility, transferability, dependability and conformability. The feedback received from the participants together with the researcher's insights and findings from other studies were highlighted as emerging themes and formed the basis for the recommendations of this inquiry (Guba, 1981). The researcher's task was to create an accurate record of information provided by participants during the focus group sessions. The analysis, interpretation and attempts to understand the data were then carefully documented.

These tasks could not be carried out in isolation due to the complex context and the number of unknown variables affecting the information generated by the study. More specifically, the transcripts of the audio recordings were analysed several times in order to make sense of what

was happening in each scenario presented by the participants. The analysis included

identification of major themes and sub-themes, researcher reflections, further discussions with

participants on the emerging themes and insights and unpacking of each theme in order to

identify how they affected the learning cycle of the lessons. The following table, which should

be read from left to right, illustrates this process.

Table 3: *Reflecting on and Unpacking Participants' Statements*

Research Question	Tools/Strategies Employed	Participants' statements	Theme	Reflections & Unpacking of the theme	Member Check
How and in what ways has the use of tablet technologies (specifically iPads) enhanced learning and teaching across curriculum areas?	All focus group sessions were audio recorded Audio recordings were converted into written files. The written files of the audio recordings were packaged into digital files (iBooks) in order to assist the researcher identify the emerging themes and the supporting statements. Electronic notes were created and themes were highlighted in different colours within iBooks. The Notes app was used to record the researcher's initial reflections on specific themes.	"even the weak students were engaged" (Brigitte) "Also because the year 11 GMF class tend to be the weaker Maths students and getting them involved in something like [a simulation] helped them when we actually got to the theory of [gradients]." (Mona) "…and [the game] just really got them thinking and engaged. Two of them said they were going to play it when they went home." (Leonardo) "Oh, my God, look at the way it's annotated… I can change it all straight away!" (Alina)	Engagement Sub-themes Level of difficulty Fun Multimodal Active participation Game Challenge Distractions	There are a number of factors that affect student engagement: a) students' engagement increases when the level of difficulty is within their comfort zone or just outside. b) Weaker students prefer self-paced, self-controlled multimodal activities. c) Hands on activities especially educational games lead to increased student engagement. d) Student engagement is only valuable when the activities are directly related to the curriculum, of high quality and reinforces the goals of the lesson e) immediate feedback affects positively students' learning and engagement.	All participants agreed with the statements. They made no further contributions.

4.6. Criteria for assessing trustworthiness

This study uses qualitative criteria developed by Guba and Lincoln (1989), also known as parallel criteria, as a way of ensuring that the research is thorough, thoughtful, rigorous and that it balances out the bias that I may bring as a qualitative researcher. These criteria are: credibility (internal validity), transferability (external validity), generalization, dependability (reliability), conformability (objectivity), fairness, ontological authenticity, educative authenticity, catalytic authenticity and tactical authenticity.

The criteria were based on the assumptions that the researcher and participants worked collaboratively expressing different interconnected realities, which were specific to the context where the inquiry took place. A discussion of each criterion employed for this research has been included in this section.

4.6.1. Criterion 1: Credibility

Credibility involves ensuring that the research findings match the views of the participants. Guba and Lincoln (1989) propose six techniques to increase credibility. These include: prolonged engagement, persistent observation, peer debriefing, negative case analysis and member check.

4.6.1.1. Prolonged engagement

Prolonged engagement refers to the time that the researcher spends at the participants' work environment prior and during the research. This time is usually dedicated to getting to know the participants, forming relationships and familiarising oneself with the organisation. It is important that the researcher gains the trust of the participants so that they feel comfortable discussing their ideas in relation to the purpose of the investigation. I spent one day per week in February 2012 at the workplace of the participants, prior to conducting the research. This prolonged engagement allowed me to get to know the participants through informal

discussions and to develop a better understanding of the highly complex and demanding environment in which they worked. It was an opportunity to observe the teachers in action as they familiarised themselves with the technology and explored the new possibilities in teaching and learning. Being part of the team myself created an atmosphere of trust and encouraged teachers to freely share their experiences in the use of tablet devices in the classroom. My weekly visits continued until the end of May of that year giving me the opportunity to revisit the focus group sessions and to clarify with the participants some of their statements.

4.6.1.2. Persistent observation

"In order to understand any human phenomenon we must investigate it as part of the context within which it lies (Maykut & Morehouse, 1994, p.63)". Persistent observation enabled the researcher to form of a deeper understanding of the context and the teachers' motivation for using technology in the classroom. Each lesson cycle lasted for 50 minutes. The teachers were trying to use the iPads to maximise the learning opportunities for students during class time and beyond. A number of teachers were very conscious about dedicating any time for introducing new apps or required technology skills as the prescribed curriculum had to be covered within a specific timeframe. They relied on students helping each other to complete specific tasks inside and outside the classroom. The instructions given by school administrators were for teachers to use the device as a tool to enhance teaching and learning practices. They were also encouraged to maintain a balanced approach in the use of the devices in relation to pen and paper due to the nature of formal examinations.

4.6.1.3. Peer debriefing

Peer debriefing is the process by which the researcher seeks to refine the research methods by seeking constructive feedback from peers in relation to data collection and analysis. Peer debriefing was a regular part of this investigation. It happened through informal conversations with colleagues who had expertise in the integration of learning technologies in the curriculum as well as with my supervisor. This was an important aspect of my research as it allowed me to clarify issues, obtain fresh insights and decide on new directions.

4.6.1.4. Negative case analysis

Negative case analysis is the process of identifying and discussing data that do not fit with the emerging patterns or themes. Hence, data that did not appear to fit into the categories of the emerging themes in this study were discussed with the participants, other colleagues and my supervisor. This process allowed for further clarification and understanding of the emerging themes and patterns.

4.6.1.5. Member checks

According to Guba and Lincoln (1989), member checks is one of the most important strategies in qualitative research for establishing credibility. The technique involves ongoing discussion with the research participants in relation to the preliminary data, themes and interpretations. Hence, throughout this research study the participants were involved in clarifying specific themes through questions and answers during the focus group sessions, as well as through informal discussions and email communications.

More specifically, at the end of each focus group session, I discussed with participants their views in relation to the ways tablet technologies enhanced the learning and teaching cycle of the lessons they discussed. For instance, on one occasion, a participant mentioned that she had used a game on the tablet as a warm up activity during a maths session. The teacher reported

that the students had a lot of fun and appeared to be really engaged and excited. Since the activity involved a timer, the students had to complete the task within a specific time limit. After the 'member check' discussion, it was established that students did indeed enjoy a degree of challenge in maths activities. The process of reviewing the major themes, which were identified during each focus group session, was repeated at the end of the data collection cycle allowing teachers opportunities for extra input or to seek further clarifications.

4.6.2. Criterion 2: Transferability

Transferability refers to the degree to which the findings of research studies can be generalized and implemented into similar contexts. When thinking about the question of transferability of this research project into other educational settings one must take into account "the particular characteristics of the organisation" (Shenton, 2004, p.70). Where the study took place needs to be compared with those of the specific setting where the findings will be implemented. This study is not claiming that its findings are applicable in all educational settings and at all times. The description of Greenfield College, provided in this report, needs to be compared with the degree of similarity to other school contexts in order to determine the degree of transferability to other settings.

4.6.3. Criterion 3: Dependability

Dependability refers to the "stability of the data over time" (Guba & Lincoln, 1989, p.242). The methodological decisions made during this study and the reasons behind them (Guba & Lincoln 2001) can be traced in the audit trail I created throughout the inquiry in the form of an e-Journal. This strategy ensured that the dependability criterion was achieved by constantly examining the preliminary findings, by considering the relevance of the data and by taking into account any additional information brought forward by the participants.

4.6.4. Criterion 4: Confirmability

Confirmability refers to "the extent to which constructions, assertions, facts, and data can be traced to their sources" (Guba & Lincoln, 2001, p.7). Confirmability strategies were included as part of the process used to conduct this study. The two main strategies used were participants' comments on the data collected and constructive feedback provided by my supervisor. Hence, immediately after data collection, the participants were asked to read and to provide any comments related to their contributions in order to expand on the ideas, make any corrections or reject any information not deemed correct. My supervisor was also invited to make comments in relation to the data collected. She was provided with the transcripts of the focus groups, a summary of the main themes, my personal comments and was invited to audit the information. In addition, I kept an electronic journal, as an audit trail. The e-Journal documented any additional comments or observations made by the participants in relation to their contributions.

4.6.5. Criterion 5: Fairness

Fairness, according to Guba and Lincoln (2001), is "determined by an assessment of the extent to which all competing constructions have been accessed, exposed, and taken into account in the evaluation report, that is, in the negotiated emergent construction" (2001, p.7). All participants in this study had an opportunity to examine the emerging themes and to provide constructive feedback in relation to the concepts identified by the researcher as well as to express any agreements or disagreements.

This process took place during the focus group sessions amongst the participants as they sought clarifications from each other, complementing and confirming the evidence presented, as well as through informal discussions during the day. Over time the participants felt more

comfortable with the process as they could better understand the new strategies employed by their peers and compare the similarities and differences in delivering lessons with the iPad tablet technology. Their contributions helped formulate the findings of this report.

4.6.6. Criterion 6: Ontological authenticity

The nature of the focus group approach was instrumental in achieving ontological authenticity, which is related to how the participants' personal views are developed as a result of taking part in the research study. The participants were provided with ample time between data collection sessions to reflect on their practices and then share their 'A-ha' moments in the use of tablets in their lessons. By getting together every two to three weeks and discussing subject specific uses of the devices, participants enhanced their knowledge; demonstrated increased fluency in the use of new technologies and developed further their views in relation to the usefulness of tablet devices.

4.6.7. Criterion 7: Educative authenticity

Educative authenticity can be defined as the development of an understanding of each other and the different viewpoints brought forward by the participants. A number of statements made by one of the participants during the first meeting of the group set this study on the path of educative authenticity by triggering doubts in relation to the usefulness of the study. More specifically one of the participants made the following two remarks in relation to her contribution: "Mine is only relevant to me" and "It's great to see different views for different subjects" (Mona - Focus group discussion #1, 2012, February 29th). The question of relevance and the differences in points of views together with a number of other factors such as access to tablet technology, technical support, skills and knowledge may influence the usefulness of this study to others. Nevertheless, the information provided in this report shows that participants were enhancing their teaching strategies and repertoire of tools whilst

exploring the emerging themes and finding out from each other what worked and what did not work in their lessons.

4.6.8. Criterion 8: Catalytic authenticity

Guba and Lincoln (1989), note that, catalytic authenticity "may be defined as to the extent to which action is stimulated and facilitated by the evaluation processes" (1989, p.249). Evidence of catalytic authenticity includes participants' discussions in relation to novel ideas they implemented, plans to use new apps, effective strategies for addressing individual learning needs and purposefully planned activities to engage students through tablet technologies. Clearly, the participants were determined to become agents of change by embracing both the new technology and the challenges that came with it.

4.6.9. Criterion 9: Tactical authenticity

In qualitative research it is important that the participants are empowered to take any actions planned during the research process. The criterion that addresses this aspect is called tactical authenticity and "refers to the degree to which stakeholders and participants are empowered to act" (Guba & Lincoln,1989, p.250). Tactical authenticity was addressed throughout the data collection process by giving all participants the opportunity to contribute their ideas, to discuss and clarify strategies and to make constructive comments in relation to the input brought forward by everyone. Moreover, the participants actively shaped the strategies and ideas that they believed could enhance teaching and learning through tablet touch technologies and actively implemented them in their lessons. The actions taken by these teachers to implement change and overcome the challenges they encountered while searching for practical solutions have been documented in this report

4.7. Ethical Considerations

Research in education raises a number of questions in relation to the rights of the participants and the school involved. It is important that any study conducted adheres to a set of principles that ensures ethical conduct and fair treatment of the participants. Moreover, the researcher must obtain permission from the Ethics Committee of the University to conduct the proposed research project and seek formal written permission from the school. Furthermore, the researcher must ensure the anonymity of the participants, obtain informed consent and clearly outline their withdrawal rights

In order to ensure this research was conducted according to the guidelines of the ethical committee, a letter was sent to the Vice Principal explaining the study and seeking permission to conduct the research. After gaining permission, an advertisement was placed in the school newsletter, seeking volunteers for the study. An email was also sent out from the secretary of the school to all teachers in the Senior School. The first four teachers who responded to the advertisement were selected to participate in the study.

During the first meeting, further information in relation to the aims of the study, the focus group approach, the participants' roles, requirements and meeting expectations were provided. The teachers interested in the study were then asked to take home the explanatory statements and decide whether they wished to participate by signing and returning the consent form. Furthermore, we discussed issues related to flexible lunchtime meeting schedules, collegiality, and the possible benefits for the participants, the school and the wider educational community. The clarification of these issues were necessary as teachers' schedules could change at any time due to excursions, camps, yard duties and various other issues that arise on a daily basis. It was also an opportunity to discuss the benefits of the project for themselves and the wider educational community.

4.7.1. Confidentiality

Participants in this study were informed, both in writing and verbally that they would not be identified in any reports or presentations. They were also informed that pseudonyms would be used and that the audio recordings would be securely stored at Monash University's Large Research Data Store (LaRDS), for the following five years.

4.7.2. Informed consent

Informed consent was obtained in writing from the participants after providing them with all the information about the research project and ensuring confidentiality. The volunteers agreed to participate in the focus group sessions, share their information and assist each other by providing constructive feedback.

4.7.3. Withdrawal rights

Participants were also informed that they could access any of their data, ask for the elimination of information that had the potential for negative impact on their personal and professional lives as well as the right to withdraw from the research project up to the stage prior to the writing of the report findings.

4.8. Summary

In this chapter, the researcher has provided detailed information in relation to the methodological approach, the research design employed to carry out this study's investigation into the ways with which tablet technologies enhance teaching and learning across curriculum areas. Information about the selection of participants, data collection and analysis, criteria used for ensuring trustworthiness in the qualitative research and ethical considerations were also included.

Chapter 5: Presentation of Findings

5.1. Case Study One: Mona

This report captures how Mona used the iPad in her lessons for students to explore, develop

understanding and to consolidate various mathematical concepts in her Year 10 and 11 classes

at Greenfield College. More specifically, Mona described how she focused on the use of

interactive applications (apps) to achieve her goals.

One of the first apps that Mona introduced to her classes was Sketch Pad Explorer, a program

that allows users to interact with visual mathematical representations related to geometry,

trigonometry and algebra. As a result of the students' interaction with this app, Mona found,

(as the following quote highlights), that it assisted them to understand the concept of slope,

which is also known as gradient.

> [There were] two different lines on the graph, and they had to move those two lines so
>
> they got two different triangles, so the rise and run of the graph was different, but
>
> ultimately the slopes of the graphs were the same. So very quickly they figured out that
>
> the two lines there had to be parallel in order to be able to do that. (Focus group
>
> discussion #1, 2012, February 29th)

However, while reflecting on how she used the Sketch Pad Explorer app in two of her classes,

Mona noticed that it could assist the development of students' mathematical understanding in

different ways. In one class, the app was used prior to the introducing the concept of gradient,

whereas in another class it was employed as a consolidation strategy. The following quote

illustrates these observations;

> [The two classes] were both doing linear relations so I used [Sketch Pad Explorer] to
>
> explore the concept of gradient. In my Year 10 maths class, I decided that I would use
>
> [the app] as a consolidation tool … whereas in my Year 11 General Maths Further

class, the objective was to use it as an introduction to finding the gradient of a line before we discussed too many of the concepts. (Focus group discussion #1, 2012, February 29th)

Overall, through use of the Sketch Pad Explorer app, the students were able to see the simulation, interact with it and enhance their knowledge on gradients. More specifically, the students were able to understand the theory behind solving problems related to gradients as they had full control of the learning content, the pace and the number of times they needed to use it. The students could immediately see the results of their actions through feedback provided by the in-built engine of the app.

Mona also noticed the benefits related to the use of such interactive simulations for her weaker students, which is captured in the following quote;

> The Year 11 GMF (General Maths Further) class tend to be the weaker maths students and getting them involved in something like that helped them when we actually got to the theory of it." (Focus group discussion #1, 2012, February 29th)

It is also clear, from the next statement, that she had discovered how to use the app as a tool for building the students' prior knowledge.

> I think [Sketch Pad Explorer] actually worked better in my [General Maths Further] class where I started off with the app to help explain the concepts, before actually going into, and [students] really did benefit.
>
> (Focus group discussion #1, 2012, February 29th)

Mona also used the tablet device with small groups of students in order to revisit previously taught concepts. She revealed that the device enabled her "to revise and remind [students] of what [they had] already done" (Focus group discussion #1, 2012, February 29th), as well as

creating conditions where "they were able to work together in pairs, and generate discussion."
(Focus group discussion #1, 2012, February 29th)

Furthermore, Mona devoted her energy in exploring ways in which the tablet devices could be used to assist her students in preparing themselves for the semester examinations. Mona talked about the Flashcardlet app, which was "more user-friendly … than the other ones [that she had used previously]" (Focus group discussion #3, 2012, May 2nd) and was "easy to follow." (Focus group discussion #3, 2012, May 2nd)

The Flashcardlet app allowed students to generate electronic flashcards with the questions on the front side and the answers on the back. Mona pointed out that "[the students used the app] in the last ten minutes over a couple of lessons" (Focus group discussion #3, 2012, May 2nd). Mona, in the next statement emphasised that the creation of flashcards throughout the semester could result in the accumulation of resources for assisting students to prepare for examinations;

> But if you deliberately use [the flashcard app] throughout a semester, and every week you have a few words, [students] simply got their reviews at the end. They've got a whole pack of revision cards. (Focus group discussion #3, 2012, May 2nd)

According to Mona, "[the strategy] did work really well. And as I said, the aim there was to get them revising, I suppose, just in a different way" (Focus group discussion #3, 2012, May 2nd). Mona also pointed out that the use of the Flashcardlet app encouraged students to contribute to the lesson through discussions. "But the process of us making [the digital flashcards] in the first place was more my aim, because it did generate discussion and it did mean they were getting involved in some revision" (Focus group discussion #3, 2012, May 2nd).

Mona also shared with her peers, how students could generate their own multiple choice tests using Flashcardlet in order to consolidate their knowledge. The following statement describes her strategy.

> [The students] can create their own multiple-choice test at the same time they study. The idea [was] for them to be able to give [the test] to their peers and see whether [they could] answer it as well (Focus group discussion #3, 2012, May 2nd).
> In this case, the benefits for the students appear to have been the use of the touch tablet as a tool for helping each other to develop the required subject knowledge.

Another simple but effective way in which Mona used the tablet technologies to prepare students for examinations, included the integration of the Timer app combined with pen and paper activities aimed at testing students' knowledge and enhancing automatic response. The following quote demonstrates the strategy;

> At the start of the lesson I would give [students] perhaps four or five multiple choice questions and it was a mad minute', so as quickly as they could, sometimes two minutes or three minutes, but as quickly as they can to get an answer down for each of the multiple choice questions. (Focus group discussion #2, 2012, March 14th)

Despite the apparent simplicity of this strategy, it gave each student the opportunity to complete all questions within their own personal best time. This technique enhanced students learning because students were challenged to improve their personal best score and or do better than their peers.

5.2. Case Study Two: Leonardo

When Leonardo volunteered to participate in this study, he was teaching chemistry and biology to Year 9 and 10 students. This case study highlights the ways he used tablet technology to create an effective learning environment through the use of simulations, educational games, multimedia and interactive resources on the touch tablets. Such activities allowed his students to actively engage with the science content, to collaborate with each other, to receive immediate feedback and to self-direct their own learning.

An example of a simulation program that Leonardo used in his Year 10 class was the Newton's Law app. He used this simulation "to review" (Focus group discussion #1, 2012, February 29th) the laws of motion "rather than just [ask]" (Focus group discussion #1, 2012, February 29th) the Year 10 students to answer teacher-generated questions. This app, assisted students comprehend the laws of motion through text-based information as well as interactive representations. In the following statement, Leonardo gives a brief explanation of the benefits associated with this app.

> We also talked about the force of gravity as well, and we were able to demonstrate that just with that simple motion (drop of a ball) that I showed them [on the device]. And the good thing [about this app] is that there are explanations through there as well. [Students] can read through it if they want to in their own time.
>
> (Focus group discussion #1, 2012, February 29th)

Another example of a simulation that Leonardo used in his Year 10 class to introduce astronomy, was the Milky Way app, which allowed users to zoom in and out of the galaxy. He noted that he "wanted the girls to understand at the start [of the lesson was] how small and insignificant we are compared to everything else" (Focus group discussion #2, 2012, March 14th). His students "thought that [it] was amazing and [the simulation] generated discussion

… in terms of what is actually out there, what extra-terrestrial life is there? That was good as an introduction" (Focus group discussion #2, 2012, March 14th).

Leonardo also used simulations to cater for the different needs of his students. The statement below describes how he took advantage of the iCell app to develop the students' knowledge in relation to animal, bacteria and plant cells.

> For those that are struggling they can go to a basic explanation when they tap on and then go 'oh yes I kind of get that', and then read the intermediate and see what's different, and then they can really understand what parts they do understand and what ones they're struggling with. (Focus group discussion #5, 2012, May 30th)

Leonardo also explored the use of games in his lessons as a way of providing students with the opportunity to work at their own pace through real life scenarios related to food webs. He used the app Pangea Safari, where students could create ecosystems with realistic species behaviour and explore strategies to prevent animal extinction. The "[students] loved it" and they were able to "work through [the game] at [their] own" pace (Focus group discussion #3, 2012, May 2nd). Moreover, Leonardo concluded that:

> [Playing games] was more meaningful learning for them, because they could see how [a food web concept] works in real life… We talked about what was good, what was bad, what doesn't happen in this [game] that happens in the real world. (Focus group discussion #3, 2012, May 2nd)

Leonardo continued exploring the use of iPad, tablet technology to enhance teaching and learning. He noticed that his students had difficulties in understanding "the different structures of the heart as well as where deoxygenated blood comes from [and] where it goes." (Focus

group discussion #2, 2012, March 14th). He came across a free app called Doodle Buddy, which allowed students to "draw the pathway of deoxygenated blood in blue and then the pathway of oxygenated blood in red" (Focus group discussion #2, 2012, March 14th).

According to Leonardo, this activity "allowed [the students] to visually guide themselves through it and they were able to make the links" (Focus group discussion #2, 2012, March 14th). Leonardo explained that the "[students] really enjoyed [the activity]" (Focus group discussion #2, 2012, March 14th). "[I] only planned on spending about a few minutes doing it, but because they were so interested and engaged, [they] did it for about 10 [minutes]" (Focus group discussion #2, 2012, March 14th). A further benefit of this strategy was that students could "put their own diagram in" (Focus group discussion #2, 2012, March 14th) and their notes that they were preparing for the semester examination. Clearly, the above ideas indicate that student engagement was enhanced through active learning strategies and with the use of visual representations.

A vital component related to the effectiveness of teaching and learning is the access to immediate feedback. Leonardo explained how he used eClicker, an app that allowed him to quiz students and to collect data related to specific questions about the content of the chemistry and biology lessons he delivered and provide instant feedback.

> Not only does [the app] produce a graphic result; but the students can actually scroll underneath that and see what the question was, what the four options were, and what the explanation you're giving them is. So I think it's really powerful because then they can see what they answered, what everyone answered, and it's anonymous for them. (Focus group discussion #3, 2012, May 2nd)

In addition to collecting data and providing such instant feedback to students, Leonardo found that the tablet device was "such a powerful tool [he thought], especially for exam revision" (Focus group discussion #3, 2012, May 2nd). However, he justified this statement by saying that students had to be "determined to work hard"

(Focus group discussion #3, 2012, May 2nd).

As Leonardo became more comfortable with the new technology, he expected that the tasks he set up would have led to a more collaborative environment. The next statement reveals his surprise when his expectations were not met after asking students to collaborate on the topic of the overharvesting of fish;

> I don't mind if they're a little bit chatty; they'll probably talk with one another to collaborate.… But I was really surprised because as soon as I [explained that they could work together on the task] the class was dead silent. And I guess it was shocking to me because it didn't make sense … one of them was on YouTube with headphones just looking through fishing videos and overharvesting, and he did ask me so I am like, 'Yeah, that's fine'. (Focus group discussion #4, 2012, May 16th)

Given the choice to collaborate, students opted to work independently by accessing online digital resources, rather than to work with each other. Leonardo was "totally amazed that [the students] were focused on this research task" (Focus group discussion #4, 2012, May 16th). He had arrived at the conclusion that the tablet device could "get [students] hooked" on learning (Focus group discussion #4, 2012, May 16th). It appears that students chose to obtain the information required to complete the task from digital resources found on the internet, rather than consulting their peers. This may be an indication that when students have one-to-one

access to tablet devices, they prefer to develop their prior knowledge on the specific topic through the use of the technology before collaborating with their peers.

Overall, Leonardo had managed to engage his students through simulations, games, interactive and multimedia activities as a result of the introduction of the iPad tablet device at his school. His statements revealed a number of interesting insights in relation to student engagement, active learning and the provision of immediate feedback. However, Leonardo also highlighted some of the difficulties related to the sharing of large size files which students "[could not] email" (Focus group discussion #3, 2012, May 2nd). Nevertheless, when this issue was resolved, Leonardo could not hide his excitement at seeing the new possibilities of the Dropbox system for sharing resources related to "exams and test revision" (Focus group discussion #5, 2012, May 30th). He was very pleased that through the Dropbox solution students "always got access to [the resources]" (Focus group discussion #5, 2012, May 30th).

5.3. Case Study Three: Brigitte

Brigitte had been teaching French to students in Years 9 to 11 at Greenfield College for the past eight years when she volunteered to participate in this study. Like most of the participants in the study, she had never taught in a one-computer-to-one-student environment before. Brigitte's main focus was on finding ways to provide ongoing support through the use of tablet devices to her students in the classroom and beyond as they studied French. More specifically, she had identified the areas of pronunciation, spelling, listening comprehension vocabulary enrichment and verb conjugation as the most challenging tasks for her students.

One of the first resources that Brigitte made available to her students was an app called French 24/7 Tutor. This app matched the school's French curriculum and provided students with a

number of multimedia activities aimed at vocabulary enrichment associated with topics such as "family, town, country, basic phrases" (Focus group discussion #1, 2012, February 29th). According to Brigitte, the students could "hear the pronunciation" (Focus group discussion #1, 2012, February 29th) of a word in French as many times as they wished and have a translation in English appear on the same screen. She immediately noticed that her students "enjoyed" the activity (Focus group discussion #1, 2012, February 29th) because they could work at their own pace, hear the pronunciation in French and get an immediate translation in English.

This supported her students' learning, as they were able to listen to specific French texts as many times as they wished before completing written exercises. Moreover, catering for the needs of individual students became easier as Brigitte could make available to students resources at 'different levels, [appropriate for] beginners to more advanced students' (Focus group discussion #2, 2012, March 14th). The advantages of these resources were that students could 'go back to revise' previous lessons and look at 'the picture with the description and they [could] actually hear [the description in French]' (Focus group discussion #2, 2012, March 14th).

All students learning French with Brigitte were actively involved in learning the language, not only in the classroom, but also at home. She set listening, speaking, reading and writing tasks that involved Year 11 students using their iPad tablets to produce French audio recordings and emailing these to her for assessment. Her strategy was for students to actively support their own learning at home by using the iPad. Brigitte's explanation of the requirements of the task is provided below.

This [task] was set as homework. And then [the students] have to email me back … I

want to see what they've written down and [hear] themselves asking questions in

French. (Focus group discussion #1, 2012, February 29th)

What is important about this task is the fact that students scaffold their own learning by

producing audio and written work that at the same time they are able to share with the teacher

in order to receive corrective feedback.

Brigitte also used the iPad in her French classes to assist students in the skills of listening and

reading comprehension. For instance, in her Year 9 classes she asked students to install

'Busuu', an app that uses the Internet to access multimedia interactive content. It is a simple

application that provides students with four different activities supported by English

translation of the French text, images and interactivity. Students have adequate support to

work on their own without the teacher's assistance. Brigitte explained that for one of the

activities "[the students] have the dialogue, they listen to it, and then afterwards they have to

answer questions on that" (Focus group discussion #2, 2012, March 14th). This strategy,

according to Brigitte, was "more engaging" (Focus group discussion #2, 2012, March 14th).

Brigitte, in the following statement, explains further how the use of the Busuu app engaged her

students with the content of the lesson.

Even the weak students were engaged. … They love it! It works really well. It wasn't

like a boring worksheet where they have to write down much of the vocabulary.

Pictures as well, make it more interesting and it's interactive.

(Focus group discussion #2, 2012, March 14th)

Another benefit of this app, according to Brigitte, was that students became more engaged with the content as they could just touch a word or phrase and learn from the sound, the image or the English translation. She explained that with Busuu, "you touch [the words], so you can identify the noun, the proper noun and so on. Well, it was really engaging" (Focus group discussion #2, 2012, March 14th).

Similarly, Brigitte pointed out that the use of the iPad device was also beneficial to her students in the area of reading comprehension. The following statement shows how Brigitte used GoodReader, an app that allowed users to annotate French text files.

> In the past, I used to just read everything with them and give them the meaning of words. They sat there not listening … but now I say, '… you go through the text, find, try to decipher the meaning of words. [Write the definition] on top of the words and then we [can] discuss it. (Focus group discussion #5, 2012, May 30th)

Indeed, Brigitte was convinced that "the good thing about [this strategy was] that even the weaker students [were] all doing something" (Focus group discussion #5, 2012, May 30th).

Finally, another key aspect of her strategy to improve students' oral comprehension included the use of video clips. The tablet technology allowed students to individually access video files online and view them at their own pace and as many time as necessary for individuals to master the content. For example, "[Year 11 students] went on YouTube, listened to a short [French] documentary on pollution and … then they had to answer the questions" (Focus group discussion #5, 2012, May 30th). This was something that could not have been achieved prior to the introduction of the one iPad per student.

The conjugation of verbs is one of the most challenging tasks for students who learn French, according to Brigitte. More specifically, "the challenge is with different tenses" (Focus group discussion #3, 2012, May 2nd). Brigitte decided to introduce and use interactive apps with her students for this particular skill. One of the apps she discovered, FrenchVerbs, was a flash card based program that showed a verb on the front side and its conjugation on the back. Students could conjugate the verb orally or in writing before tapping on the flash card to check the answer. As students mastered the conjugation of each verb, they removed that specific card from the deck. A score, from one to five, was allocated for how well they answered.

This type of app provided the students with the necessary visual and oral support they needed to achieve the objectives of the lesson. According to Brigitte, the app was 'very useful' and 'easy for [students]' (Focus group discussion #3, 2012, May 2nd). Moreover, Brigitte, claimed that her students could use the digital activities at any time during the lesson, and that they appeared more engaged with the content because of the ongoing support provided by the technology and their ability to keep up with the expectations of the lessons. She justified this strategy in the following statement.

> So if [the students] have to revise for a test, … the tenses will be there, so that's one
> good thing about it. [The students] have [the app] handy so they can use it any time
> during class. And I think [students] are more engaged. … they love it!
> (Focus group discussion #3, 2012, May 2nd)

Another area of concern, according to Brigitte, was the difficulties students encountered in the spelling of French words. Hence, she decided to use game-based apps in order to assist her students in this area. According to Brigitte, a degree of fun and challenge in spelling apps such as 'MindSnacks' kept her students engaged and assisted them in the area of spelling. Through

the MindSnacks app the students were able to practice their French spelling by playing games containing pictures and matching audio clips. The statement below outlines how students used the app.

> A lot of students do have issues with spelling. So, again a game. They need to work out if [the word is] correct or if it's not, because [the activity is] timed.… it goes quicker and quicker ... I think [students] do have fun with it… According to the level, of course, the vocabulary is different. And as an example, this student actually now is at level two. But when he started he chose level one.
> (Focus group discussion #3, 2012, May 2nd)

During the last data collection meeting, Brigitte reflected on the integration of the tablet devices in French lessons and summarised the strategy as a positive one because it 'extended [students'] vocabulary and their knowledge' (Focus group discussion #5, 2012, May 30th). She also made a comparison with previous practices.

> Once it would have been more difficult to go over [the French vocabulary] that many times and then, what would happen probably, some students would be bored.… They would just sit there. So [the strategy] was good because it was self-paced and [students] were all engaged in doing [the work]. (Focus group discussion #5, 2012, May 30th)

The only issue Brigitte mentioned throughout the data collection period was that some 'classes … [did] not have a projector' (Focus group discussion #5, 2012, May 30th). However, since every student had a handheld device, she was still able to use her digital resources by distributing the presentations through email.

5.4. Case Study Four: Alina

Alina's main goals for using the tablet technologies were to enhance students' subject specific knowledge in English and Literature lessons and to assist them in producing the assessment tasks. The strategies she used to achieve these two goals included the use of the iPad tablets for accessing online resources produced by experts, supporting students' writing skills and enhancing their knowledge through apps and digital texts (e-books) and finally for providing just-in-time electronic feedback.

In order to develop students' knowledge in English and Literature, Alina explored and used iTunes U, an Apple based service that allows individuals to create online courses by uploading and sharing resources in the form of audio, video, text and electronic books (e-Books). These resources are generally accessible anywhere and at anytime through an internet connection. The statement below demonstrates how Alina, began using iTunes U to provide her Year 12 students with alternative sources of information, other than the teacher and a textbook, for enriching their knowledge. In this case, the students were studying the theme of stereotyping of doctors through cinema. Alina explains her approach;

> [I] found on iTunesU a lecture from Glamorgan [University] in Scotland called Mad Doctors of Cinema and it was a five-hour series of lectures that explored the whole concept of mad doctors and the stereotyping of them through cinema.
>
> (Focus group discussion #1, 2012, February 29th)

Alina claimed that this lecture "was a really rich discussion on exactly the type of topic that [they] were doing" (Focus group discussion #1, 2012, February 29th). In addition, she indicated that this resource would benefit her students in writing the School Assessed Coursework (SAC), as "they were able to get affirmation that their own thoughts and what

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they'd been learning and discussing in class was along the right lines. So that would have helped them directly for their SAC (Focus group discussion #1, 2012, February 29th).

Another strategy that Alina employed in order to further enrich her Year 10 English students' knowledge, was the use of essays in an e-Book format. For instance, while studying Macbeth Alina made available to her students "a 40-page essay by a professor from Stanford University" (Focus group discussion #5, 2012, May 30th). The benefits of e-Books, in addition to providing students with extra study resources created by experts in this field, included the annotation feature of this technology. Alina described how she used the annotation function.

> I suddenly realised that I could write study questions into the note section of [the e-Book] rather than having to set worksheets with notes in it, … [students can] answer them on the spot. So I've found [this idea,] a really useful way to set my study questions. (Focus group discussion #5, 2012, May 30th)

Additionally, Alina discovered another useful function. Unlike traditional textbooks, e-Books allow users to effortlessly identify themes and create summary notes, which can assist students with work requirements and preparation for examinations. The search, highlight and create notes feature gives a clear advantage to students who have access to this type of technology as it saves them many hours of study. The statement below captures how Alina described such features;

> There's a really good function in [the e-Book] where you can just look up words if you want to be sure of how often something appears. So I was talking today about how one of the themes in [the story] is two facedness and duplicity and I was able to find all the different examples of where that shows up inside it. …Then I can just write a little note

putting in a list of other characters who said similar things … I can also email [my

students] the notes as well. So it's fantastic.

(Focus group discussion #5, 2012, May 30th)

Another way in which Alina used the iPad in her classes was to develop students' prior

knowledge before formally introducing specific texts such as Chaucer's Canterbury Tales,

which were written at the end of the 14th century. This approach helped the Year 9 students

familiarise themselves with the context of the text through images and sounds of that era. In

this case, she wanted to "show [her students] how [old English] sounds, being read out loud,

because it is completely unrelated to regular English, today's English." The quote below

outlines the multimodal strategy Alina implemented.

So I've just started teaching the *Canterbury Tales* by Chaucer for Year 9

[Literature].… The very first thing I'm doing, before I approach the text, is giving them

a social and cultural background to the time period, which was The Middle Ages. So

[the British Library app has] got cool little pictures and videos and information that we

can read as a class, and then we can further narrow it down.

(Focus group discussion #2, 2012, March 14th)

According to Alina, this strategy exposed students to authentic Old English with the minimum

possible effort. She explained that she had found "an app of a man actually reading the

Canterbury Tales in Old English dialect, which [saved her] having to brush up [her] own"

(Focus group discussion #2, 2012, March 14th).

In order to assist students in planning their essays, Alina also encouraged her students to use

the SimpleMind+ app, a concept mapping program, to create topic questions in order to

enhance their essay writing skills. The following statement outlines what students were able to achieve.

> [Students came up] with a load of topic questions and we broke them up into four for each student. They went away last weekend and came back with their topic in the middle, [the concept map] would be like this … and then around each side they put a paragraph focus, so they had their introduction, their conclusion, and three main body paragraphs. (Focus group discussion #2, 2012, March 14th)

Alina summarised the use of the SimpleMind+ app as "a really fabulous tool for essay planning, because [students] can then pop in quotes around the topic sentences and work out what their linking sentences are going to be into the next paragraph (Focus group discussion #2, 2012, March 14th).

Finally, in addition to assisting students develop deep knowledge about the topics they were studying, developing a clear essay plan was also important together with quality individual feedback as part of the writing process of the required assessment outcome. In order to complete this vital task, Alina decided to use GoodReader, an app that makes available to users a number of tools for annotating electronic texts. Her aim was to ensure that timely and targeted feedback could be provided to her students in a more efficient way than in the past through the use of pen and paper;

> I've just had a whole lot of creative pieces of writing, some of them two and 3,000 words coming to me, which I've been annotating for the students … as opposed to having to actually print them out and write all over them.
>
> (Focus group discussion #1, 2012, February 29th)

The feedback was almost immediate and even the students were excited. Alina shared with the group the reaction of one of her students, "Oh, my God, look at the way it's annotated… I can change it all straight away!" (Focus group discussion #1, 2012, February 29th). Moreover, Alina noticed that this strategy had two benefits, namely, "to support [her] own correction of [students'] work and for them to support their drafting process" (Focus group discussion #1, 2012, February 29th). However, as mentioned in the previous case studies, Alina also highlighted a technical issue related to the fact that "YouTube" was not functioning and readily available at all times (Focus group discussion #4, 2012, May 16th).

Chapter 6: Discussion and Recommendations

6.1. Overview

A close examination of the four case studies, presented in the previous chapter, reveals that tablet technologies were used effectively to enhance learning and teaching across curriculum areas. In the context of Greenfield College, this was achieved by using iPads to provide students with opportunities for deep and meaningful engagement with the subject specific content in a variety of ways. Indeed, the teachers involved in this study integrated the physical classroom and digital learning spaces in order to create powerful and dynamic environments where students had ongoing access to quality resources, to continuous learning opportunities, to immediate feedback and to collaborative strategies for clarifying and further enhancing their knowledge. In a very short period of time, after the introduction of the tablet devices, these four strategies contributed to student engagement as well as to enhanced learning and teaching across curriculum areas in ways never before possible.

6.2. Thematic threads that emerged during the data analysis

This section discusses the findings in relation to the key question of this research study:

How and in what ways has the use of tablet technologies (specifically iPads) enhanced learning and teaching across curriculum areas?

6.2.1. Ongoing Access to quality learning resources

According to the literature review, in the past, technology has been used as an intervention strategy in order to assist those students who were struggling with the content of a specific subject. This study points to a more effective and proactive approach where teachers combine face-to-face teaching with information stored online and in apps in order to create learning

environments that do not rely on the physical constraints of the classroom nor the time and the pace that learning resources can be accessed. Indeed, according to all four participants, they were able to create a learning environment where students could access quality resources at the touch of the screen, in the classroom and beyond. In French classes, the teacher used apps and online resources to cater for the individual needs of all students. In English lessons, the students were provided with alternative asynchronous sources of information from experts at Glenmorgan University in Scotland. Leonardo preferred to source apps that allowed students to learn about specific concepts through digital environments based on games and simulations. These apps became a natural extension of his explicit teaching strategies and expanded beyond the four walls of the classroom. He could communicate with his students even when he was away from school. Mona was able to use an app to build her students' prior knowledge on 'gradient' before addressing the topic as a whole class. Students moved from a simulated environment to the physical environment, better prepared to achieve the objectives of the lesson. Combined, the four teachers, managed to use the tablet devices to push the boundaries of teaching and learning through a range of quality multimodal interactive resources stored in apps and online systems.

6.2.2. Ongoing active learning

Soon after the introduction of the tablet devices, teachers began discovering that teaching could take many different forms and that students could assume control of their own learning. Moreover, they used the tablet devices to make learning more active, uninterrupted and ongoing.

In Mathematics, the students were given the opportunity to use the devices to create and to share their own learning resources in preparation for semester exams. The mathematical

concept of gradient was introduced through an app that allowed students to manipulate different values, work out the solutions to various problems and check their answers. The app combined visual representations of the problem combined with interactive modules and unlimited opportunities for the students to practice their skills and to develop their knowledge of the topic both inside the classroom and beyond.

The French classes were transformed through apps that provided all students, regardless of their ability, with 24/7 learning activities tailored at their own levels. All students, according the teacher, could follow the lessons and experience success. The significant element in this case was the fact that students could control both the pace and the amount of information they could consume at any time while studying French. Indeed, even the weakest students were taking advantage of the new situation and were making progress at their own rate. In addition, the teacher was able to overcome the usual difficulties students encountered in the past when attempting to learn the conjugation of French verbs. This was achieved by introducing apps that combined sound, text, images and elements of games where students could have fun racing against time while touching the words that appeared on the screen and learning the verbs. The fact that these resources were accessed on the tablet meant that students could have access to these activities anywhere and at anytime.

In Science lessons Leonardo exposed the students to a variety of new multimodal, interactive and fun resources combined with productivity apps that allowed students to create their own learning resources. Once again, students could explore abstract concepts through simulations and games by interacting with the different elements of the apps. In addition, they had the opportunity to capture the experiments on the inbuilt camera and use these to analyse the phenomenon being studied as well as to retrieve information when writing the school required

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assessment tasks. These strategies brought Science lessons to life and students could have ongoing access to quality digital resources to enhance their knowledge and to revise previous taught concepts at any time both within and beyond the classroom without the assistance of the teacher.

English classes also were positively impacted by the use of the iPad tablet technology. Learning was more active than in the past and took place at any time as the devices where connected to the internet and students could access a vast range of resources including essays and video recordings of lectures made public by institutions around the globe. e-Books also contributed to an ongoing active learning environment as they brought a new dimension to teaching and learning to English classes. e-Books were viewed as a learning space in themselves where students read the texts and used the inbuilt functions to analyse the themes and the characters. They were able to highlight text, create electronic notes and email these to each other. This activity was supplemented by the use of a concept map app, which students used to plan their English essays.

Similarly across all the four case studies, students were active participants in their learning and moved through different interconnected learning spaces created by the use of Internet resources, e-Books, apps and the face-to-face teaching environment.

6.2.3. Ongoing feedback

John Hattie (2009), whose ground-breaking work synthesised research and 800 meta-analyses on the influences of achievement in school-aged students, found that an attention to setting challenging learning intentions, being clear about what success means, and an attention to learning strategies for developing conceptual understanding about what teachers and students

know and understand is paramount to effective learning. Hattie maintained that feedback is one of the most significant factors in student achievement. Feedback through the use of the tablet devices at Greenfield College, as highlighted in all four case studies, was immediate, ongoing, corrective, constructive, on-demand and from different sources. This was a significant educational shift from past practices where students used to rely on teachers as the main source of feedback. In the context of Greenfield College and as a result of the one-to-one devices, multiple forms of feedback became an ongoing process.

In Mathematics students received immediate feedback from the apps according to student input. However, feedback was also accompanied by visual representations of the solution, which made mathematical concepts easier to understand and more relevant to every day life. In addition, as students created their own interactive mathematics questions and answers in a flashcard app, it gave them the opportunity to actively develop their skills, knowledge and understandings by taking control of their own learning. The Mathematics teacher involved was really excited that students could create their own electronic resources and were able to determine the type of feedback by providing the appropriate answers to their questions.

In Science lessons, there was a range of feedback including: immediate feedback through scenarios in game and simulation based apps, on-demand where the teacher quizzed the students during the lesson and teacher provided feedback as required.

In French lessons, the main type of feedback was corrective and immediate through the apps as well as constructive where the teacher provided comments related to the audio recordings that students created on their tablet devices. Immediate feedback in this case allowed the students to progress at their own pace without having to rely on the teacher. Students could

scaffold their own learning and receive individualized feedback avoiding the embarrassment of getting the wrong answer in front of their peers.

In English lessons the two main types of feedback used were corrective and constructive annotations of the work students submitted electronically. The significant aspects of this strategy were the timing of the feedback, the quality and the individualised comments provided to students as a result of the teacher using the iPads.

6.2.4. Collaboration

Although, much has been written in relation to technology being used as a tool for facilitating collaboration among students, this was not as evident in this study. In the context of Greenfield College, learning through collaboration saw a shift from student to student interaction to technology dependency for knowledge development. Collaboration, in most cases happened only as a result of teacher intervention in order to clarify complex concepts and occasionally to share student produced learning resources. Given the choice, the students' first preference was to develop their knowledge independently through the iPad and only after teacher intervention would they discuss their finding as a group or share their resources with each other.

Moreover, the apps and the online resources that students used during the data collection period did not make any provision for students to work together in order to achieve a specific goal. The main collaborative process mentioned during the data collection period, involved students working individually to develop their knowledge or to produce a digital product followed by teacher-initiated discussion. Whereas, "in a collaborative learning environment, knowledge is shared or transmitted among learners as they work towards common learning

goals, for example, a shared understanding of the subject at hand or a solution to a problem." (Brindley, 2009, p.2).

6.2.5. Student engagement

In all four case studies there was strong evidence of high student engagement with subject content. A closer examination of this phenomenon indicates that high student engagement was more due to the fact that every student could learn and experience success at their own level and pace through the use of the iPad tablet technology. Indeed, the tablet device was used to provide students with learning experiences based on content that was differentiated, multimodal, interactive, fun, challenging, self-paced and available anywhere and at any time.

In addition, students were able to receive ongoing support and feedback while learning and were empowered to create their own study resources. Moreover, the tablet technology allowed the students to develop prior knowledge, enhance understanding of abstract concepts, solve complex problems, revise for exams and develop knowledge and skills at their own pace in an environment that combined physical classrooms with digital learning spaces. Overall, student engagement with subject content was driven by the fact that users could control the pace and the frequency of incoming information as well as the amount of time required to turn it into knowledge and actions. This was evident in all four case studies.

Table 4, summarises how iPads were used to enhance learning and teaching across curriculum areas. The use of the devices reinforced active, self-paced, multimodal and individualised learning approaches
Legend: access to resources (AR), produce resources (PR) ongoing learning (OL), immediate feedback (IF) and collaboration (C).

Table 4: *Overview of the use of iPads for enhancing teaching and learning*

Apps used in Maths	Apps used in Science	Apps used in French	Apps used in English
Sketchpad (AR), (OL), (IF) Flashcardlet (AR), (OL), (IF), (PR), (C)	Newton's Law (AR), (OL), (IF) iCell (AR), (OL) Pangea (AR), (IF) Doodle Buddy (PR) eClicker (OL) Camera (PR) Teacher intervention (C)	French 24/7 Tutor (AR), (OL), (IF) Busuu (AR),(OL) FrenchVerbs – flashcards (AR), (OL), (IF) MindSnacks (AR), (OL), (IF)	iTunes U (AR), (OL) iBooks (AR), (OL), (PR) SimpleMind+ (AR), (OL), (PR) GoodReader (AR), (IF), (PR)
How	**How**	**How**	**How**
To enhance existing knowledge	To develop deep understanding	To enhance Listening, speaking, reading and spelling skills	To enhance essay writing skills
To revise previously taught concepts To prepare for exams	To revise lessons To revise for exams To Prepare resources for exams (diagrams & notes)	To revise vocabulary Repetition and revision	To prepare students for exams
To introduce/explain mathematical concept To develop prior knowledge To consolidate knowledge To transfer knowledge from short term to long term memory	To demonstrate new knowledge To develop knowledge through simulations and science specific games	To scaffold own learning To enrich vocabulary - long term memory To extend knowledge	To enrich students' knowledge To develop prior knowledge To expose students to different sources of knowledge
To provide immediate feedback	To provide feedback	To provide/receive feedback	To provide feedback To support her own correction of students' draft
To cater for individual needs	To cater for individual needs	To cater for individual needs To support students at an individual level	To support students writing of SACs
To learn by interacting with apps	To promote learning as an active process To learn by doing (doodling), 3D cell	To promote active learning in class and beyond To make learning French interesting and interactive	To search and identify themes within a text To organise thoughts
To engage students	To make learning meaningful To connect learning to real life	To engage students To listen and see To self-direct	To support students' writing
To create tests and to test each other	To quiz students To assess learning	To audio record questions and answers so that the teacher can assess student learning	
To challenge students through timed activities	To challenge students through games and simulations	To challenge students through timed activities (touch the verb)	
To learn from information stored in apps	To learn from information stored in apps, e-Books and online systems To access online information	To learn from information stored in machines (video/audio clips, apps, LMS etc.) To self-pace learning	To learn from information stored in machines (video/audio clips, apps, iTunes U, etc.) To self-pace learning
To create own learning content	To create own learning content (diagrams)	To audio record questions and answers	To plan essays (Maps) To create annotated notes
To create conditions for collaboration.	To create conditions for collaboration (Enrichment of knowledge from online resources followed by group discussion)	Competing against each other as to who would get the best time. Vocabulary development.	

6.3. Conclusion

I have attempted to investigate the question of how and in what ways has the use of tablet technologies, specifically iPads, enhance learning and teaching across curriculum areas in a specific school where their use has been mandated. The study defined effective learning as the students' ability to use iPad tablet technologies to enrich their learning experiences and to improve academic achievement. Whilst there was no focus in this study for measuring academic achievement, what emerged however, was clear evidence of the enrichment of learning experiences with the use of the iPad. In this study, English, Mathematics, Science and French teachers from Greenfield College have reported a number of strategies related to the ways in which tablet technologies impact on teaching and learning.

6.3.1. Student engagement.

The study's findings clearly indicate that tablet technologies have increased student engagement across four different curriculum areas. This research, points to a number of reasons behind this phenomenon. Namely, the iPads allowed students to take control of their own learning, to receive more immediate quality feedback and to learn from anywhere and at anytime. According to the teachers, their students used the devices to learn from simulations, educational games, electronic texts, three dimensional interactive models, images, diagrams, e-books, video clips, audio and experts from around the globe. In addition, the tablet devices, increased students' ability to control the pace of information they received when studying. This strategy allowed students to have sufficient time to analyse the information according to individual ability and to turn it into knowledge and actions.

6.3.2. Catering for the students' diverse learning styles and needs.

Another significant change, as a result of the introduction of tablet technologies, has been the increased opportunities for teachers to cater for the students' diverse learning styles and needs. Students were provided with choices as to how they wanted to learn and the type of resources that were more suitable and likely to satisfy their individual needs. For instance, in science lessons, abstract concepts were brought to life through 3D simulations and students could choose the level of difficulty, interact with the learning objects and create study notes for later consumption.

6.3.3. The provision of immediate feedback.

Tablet technologies also assisted teachers in providing immediate feedback to students. In my literature review, feedback to students was quoted as one of the most important ingredients for increasing learning outcomes. However, feedback as a result of the tablet devices was different from what educators have provided in the past. That is, feedback is now an ongoing process, more immediate and of better quality. In this study, the teachers used iPads to provide instant quality and constructive feedback to students by electronically annotating their work. In addition, students were also able to receive instant feedback from different sources; such as, subject specific apps, iBooks, and other digital products.

6.3.4. Creation of interconnected seamless learning spaces

Tablet technologies also transformed the educational setting by allowing teachers to create interconnected seamless learning spaces through the use of iBooks, iTunes U, apps, Internet resources and school produced digital materials. The students moved in and out of these seamless learning spaces according to their individual needs and interests. These learning

spaces were available 24/7 in the classroom and beyond. This strategy ensured rigour and relevance in the delivery of the curriculum.

6.3.5. Use of iPads to teach and to clarify complex concepts

Furthermore, the teachers involved in this research project reported using apps such as iBooks, Flashcardlet, SimpleMind+ and a number of subject specific ones, in order to teach and to clarify complex concepts, to revise, to move information from short to long-term memory and to produce digital content for exam preparation. Before the introduction of the iPads it was more difficult to support student learning. Teachers documented clearly that tablet technology had increased students' opportunities to learn at their own pace and to supplement their own learning with multimodal resources in an environment that expanded beyond the four walls of the physical classroom. In Science lessons, students were able to experience success by independently learning from 3D interactive simulations on their devices as well as from guided activities. Prior to the introduction of the iPad program, the Science teacher had reported that some students had difficulties in visualising concepts such as the structure of a cell or a DNA. Now, students had the opportunities to explore these structures by interacting with three dimension learning objects. Student just had to 'touch' in order to see and to learn.

6.3.6. Overview of findings

Overall, tablet technology has transformed Greenfield's classrooms in ways never before possible. It has offered students access to worldwide resources, which could be accessed at anytime, at any pace and from anywhere. Participants described their students as being deeply engaged with the digital resources which came in the form of text, images, sound, video, interactive modules, simulations and games. Indeed, students had greater control of their own learning and were able to move through interconnected learning spaces in order to enrich their

knowledge in different curriculum areas. Learning from information stored in machines complemented direct teaching strategies. There was a continuous scaffolding of knowledge supported by ongoing corrective and constructive feedback from teachers, apps and student created digital resources.

This investigation confirms previous studies related to the use of technology in education to satisfy students' diverse learning styles and needs (Atkins et al., 2010, Balanskat, Blamire, & Kefala, 2006, Abell 2006). The participants reported a very high degree of active learning taking place through the use of multimodal resources. However, elements of collaboration were not as strong when students were using the devices. Indeed, the apps, which were used during the lessons did not naturally integrate any collaborative activities. Collaboration happened as a result of teacher intervention and was restricted mainly to discussions aimed at clarifying what students learned after using a digital resource. Students also created their own learning activities and shared these with teachers and at times with each other. This may be an indication that tablet technology in a one-to-one learning environment is predominantly a personal learning device that provides students with opportunities to enhance their knowledge in an environment that expands beyond the four walls of the classroom and the static two-dimension information in textbooks.

In addition, the tablet devices in this study acted as an extension to learning by providing students with the option of storing information which could then be retrieved when required as well as a tool for brainstorming ideas and clarifying concepts. Data collected illustrates that the combination of all the strategies described by participants makes tablet technology a powerful and effective tool for teaching and learning.

To strengthen this finding, the follow Figure 2 visually elucidates the overall pattern teachers followed when integrating the use of iPads in their lessons.

Figure 2: *Experiential Learning Cycle Facilitated by the Use of iPads*
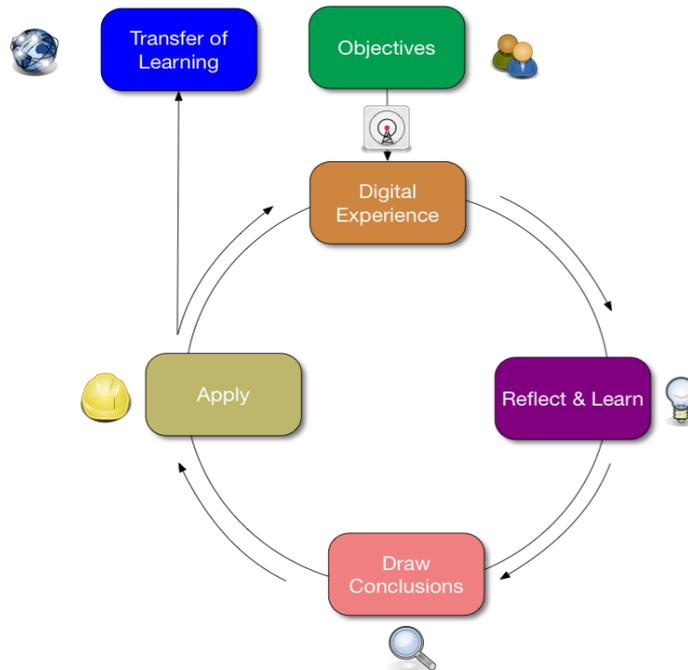
The above pattern reflects David Kolb's (1984) Experiential Learning Cycle involving concrete experience (do), reflective observation (observe), abstract conceptualization (think) and active experimentation (plan). The difference here is that the technology provided students with concrete 'digital' experiences where they interacted with the given simulation, game, model, video and other forms of objects by touching the screen of the iPads.

Students had the opportunity to relive the available experiences outside school hours, individually or in groups, and to control the pace and the amount of information they could consume and turn into knowledge. Hence, the iPad was used as a tool for constructing seamless environments that combined physical and digital learning smart spaces. These smart

learning spaces, unlike, a traditional book incorporated interactivity, multimedia, storage for new or additional information in the form of notes, links, images, diagrams and flashcards.

6.4. Recommendations

6.4.1. Merging physical and digital learning spaces

Teachers should use tablet technologies such as the iPad, to seamlessly integrate physical and digital learning spaces. This allows students to access a range of resources in the form of text, images, sound, video, simulations and interactivity on an ongoing basis. These resources can be made available to students from anywhere, at anytime and at any pace. In addition, learners should have the opportunity to create and to share with each other new or repurposed content suitable for their own needs.

6.4.2. Expanding learning beyond the four walls of the physical classroom

As is the case of Greenfield College, the use of tablet technology allows physical and digital learning spaces to merge into one seamless environment where students, according to their needs and learning styles, can learn and experience success within the classroom and beyond. It is not a simple case of 'flipping' the classroom but rather a case of creating a new learning environment that expands beyond the four walls of the traditional classroom where the students have ongoing access to cutting edge tools, to multimodal learning resources, and to feedback from anywhere at any time.

6.4.3. Apps that encourage learners to collaborate

More attention needs to be placed on the development of apps that encourage learners to collaborate with each other in order to develop new knowledge and understandings. For

instance, in the future concept-mapping apps could incorporate a feature that would permit a group of students to work together by inputting information from their own devices. Similarly, game based apps used in science lessons could integrate virtual spaces that encourage group decision-making and problem solving.

6.4.4. Deep student engagement

Student engagement, as a result of the use tablet devices, must be unpacked and taken beyond a superficial engagement factor, which is the product of the 'cool technology' being employed. Deep engagement is needed for students using tablet devices to control their own learning, to develop knowledge and understandings and to be able to experience success at every step of the process within the classroom and beyond.

6.4.5. Ongoing learning opportunities

Tablet devices should be used to create learning spaces that give students opportunities to learn on an ongoing basis both inside and outside school hours. It is a tool that allows for the development of prior knowledge, understanding of complex concepts, scaffolding and consolidation of new knowledge.

6.4.6. Learning from information stored in machines

Tablet technologies can be used as tools for students to access and learn from information stored in apps, e-Books, games, simulations and learning management systems. Teachers and textbooks are no longer the only sources of information.

6.4.7. Teaching at the learning speed of each student

Students absorb information at different paces. Tablet technologies can be used in order to teach at their individual speed of learning. In one-to-one iPad classrooms students can take control of their own learning by pausing, fast forwarding and repeating activities as necessary without teacher intervention.

6.4.8. Ongoing feedback

Tablet devices should be used to provide ongoing quality feedback to students. Feedback through this technology can take a variety of forms and serve a number of purposes. For instance, feedback can be provided in the form of text, audio or video. It can be corrective, constructive, immediate and ongoing.

6.4.9. Suggestion for future research

In light of the fact that tablet technologies are now transforming education in ways never before possible, there is a need to investigate further the characteristics of effective learning environments that do not differentiate between physical and digital spaces. How can these new environments function as one harmonious learning space in order to provide students with more opportunities for ongoing learning at any time, place and pace?
In addition, there is a need to investigate the implications of such environments on student academic performance, as they rely less on memorisation and more on information stored in machines and from significant others.

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APPENDICES

Appendix 1: Recruitment Letter

<u>Be a part of an important iPad Research Study</u>

Do you teach Year 9 to 11 classes?

Would you like to assist explore how tablet technology can be used to enhance teaching and learning cycles and meet specific curriculum goals?

If you answered YES to these questions, this is your opportunity to participate!

Possible benefits:
- increased student engagement in the different stages of a lesson cycle;
- use of a range of strategies involving tablet technologies in order to improve academic performance in specific areas of the curriculum;
- enhanced teaching and learning skills through collaboration with peers; and,
- enhanced skills in teaching with tablet technologies.

No prior knowledge in the use of tablets for teaching and learning required. You will need 2 minutes per week to document best practices and 20 to 30 minutes a fortnight to share your insights and learn from other tablet users for the duration of a Term.

The study will be conducted under the supervision of Dr Glenn Auld from the Faculty of Education at Monash University.

If you are interested, please email Nikos Bogiannidis for the explanatory statement and the consent form.
Priority will be given to the first five teachers who return a signed consent form.

Appendix 2: Explanatory statement

MONASH University

9 November 2011

Explanatory Statement – Classroom teacher

Title: How does the use of tablet technology enhance learning and teaching?

This information sheet is for you to keep. Please read this Explanatory Statement in full before making a decision.

Student research project

My name is Nikos Bogiannidis and I am conducting a research project with Dr Glenn Auld, a lecturer in the Department of Education at Monash University, towards a Master of Education degree, related to how the use of tablet technology enhances learning and teaching**.**

This means that I will be writing a thesis, which is the equivalent of a 25000 words report.
As a teacher, you were chosen to participate in this study because the current literature indicates a lack of research in relation to the use new tablets to enhance learning and teaching cycles across the curriculum in Secondary Schools.
Hence, there is a clear need to conduct research related to the use of tablets, in order to inform learning and teaching practices.
In addition, as teachers are constantly exploring new strategies to engage students and to cater for individual needs, this project could give educators new insights on how to harness the benefits of tablet technologies in order to support student learning in all curriculum areas.
I will be selecting the first teacher to return the signed consent form from each of the five subject areas to participate in the study. There will be a total of five teachers in the study.

Purpose and Background
The aim of this study is to determine in what ways and how tablet technologies can enhance the learning and teaching cycle across all curriculum areas.

Possible benefits
The results of this study will provide evidence-based practice for Year 9- 11 teachers on which to base their strategies when integrating tablet technologies in teaching and learning.
There are a number of possible benefits for students and teachers:
- increased student engagement in the different stages of a lesson cycle;
- use of a range of strategies involving tablet technologies in order to improve academic performance in specific areas of the curriculum;
- enhanced teaching and learning skills through collaboration with peers; and,
- enhanced skills in teaching with tablet technologies.

What does the research involve?
As a member of a Professional Learning Team you are going to help us investigate how to

enhance teaching and learning cycles through the use of iPads. Your role will be to document good examples of what you or your students do to achieve specific outcomes and then share your finding with the other 4 members of the team.

In summary, participants will be asked to create a two to three minutes report every week related to one successful strategy using tablets in a lesson. These reports will be shared and discussed every second week during a 20-30 minutes focus group session. A total of five meetings for a ten week period. Your report may be supported by images, audio and video recording created on an iPad or a demonstration of an App together with an explanation as to how it was used during the lesson. This study does not seek to collect data from students. However, teachers will make references to what students did in the classroom and beyond in order to achieve specific learning objectives without identifying students.

The researcher will collect your reports for further analysis in relation to current and past studies in this area. During the discussion groups we will explore how your teaching and learning cycles are influenced by the use of iPads.

How much time will the research take?
Evidence of successful use of tablets will be collected as part of your day-to-day teaching. Therefore, no extra time is required for this part of the study. The only time required from you is a 20 to 30 minutes session, every second week, for a period of ten weeks to share and discuss your findings with you colleagues.

Inconvenience/discomfort
I do not anticipate any level of discomfort or inconvenience to the participants, as the emphasis will be placed on valued added teaching strategies with tablets and not on teachers' abilities.
It is completely up to participants how and what they choose to share. They will be encouraged to let me know if they feel in any way uncomfortable about the study or hurt by any undesirable comments.
Our informal discussions and semi-structured interview are non-threatening. You will have the opportunity to make comments on students learning and to contribute your opinion in relation to the value of tablets in learning and teaching.

Can I withdraw from the research?
You may choose to withdraw your participation at any stage of the study prior to the writing of the final report. Withdrawing from this study will not influence our professional relationship.

Privacy, Confidentiality
The researcher and the participants will know the identity of the five volunteers.. Pseudonyms will be used in order to maintain anonymity of the data in the reporting process for the school and the teachers.

Storage of data
Storage of the data collected will adhere to the University regulations and kept on University premises in a locked cupboard/filing cabinet for 5 years. All electronic files will be stored on Monash's storage facilities for researchers (LaRDS). This service provides large data storage facilities to store, backup, archive, share and transfer large research datasets to meet the needs of Monash researchers. A report of the study may be submitted for publication, but individual participants will not be identifiable in such a report.

Please note that the findings of this research may be used to inform other areas of the curriculum. However, the data will remain anonymous and participants will not be identified in any way.

Results of Project
If you would like to be informed of the aggregate research finding, please contact Nikos Bogiannidis by email: ███████████████████ The findings are accessible for 1 year.

If you would like to contact the researchers about any aspect of this study, please contact the Chief Investigator:	If you have a complaint concerning the manner in which this research <insert your project number here> is being conducted, please contact:
Dr Glenn Auld **Phone:** ███████████ **Email:** ███████████████	Executive Officer Monash University Human Research Ethics Committee (MUHREC) Building 3e Room 111 Research Office Monash University VIC 3800 Tel: +61 3 9905 2052 Fax: +61 3 9905 3831 Email: muhrec@monash.edu

Thank you.

███████████████████████

Nikos Bogiannidis

Participant's name:

Appendix 3: Consent form

MONASH University

Consent Form - *Group 1 – Classroom Teacher*

Title: How does the use of tablet technology enhance learning and teaching?

NOTE: This consent form will remain with the Monash University researcher for their records

I agree to take part in the Monash University research project specified above. I have had the project explained to me, and I have read the Explanatory Statement, which I keep for my records. I understand that agreeing to take part means that:

I agree to collect the required information for the study	☐ Yes	☐ No
I agree to share the information with the researcher and my colleagues	☐ Yes	☐ No
I agree to allow the focus group discussion to be audio-taped	☐ Yes	☐ No
I agree to allow the data collected to be used in future research	☐ Yes	☐ No

I understand that my participation is voluntary, that I can choose not to participate in part or all of the project, and that I can withdraw at any stage of the project without being penalised or disadvantaged in any way.

I understand that any data that the researcher extracts from the discussions for use in reports or published findings will not, under any circumstances, contain names or identifying characteristics.

I understand that the data from the focus groups will not be shared outside the focus groups

I understand that I will be given a transcript of data concerning me for my approval before it is included in the write up of the research.

I understand that any information I provide during the group discussions is confidential, and that no information that could lead to the identification of any individual will be disclosed in any reports on the project, or to any other party.

I understand that data from the interview will be kept in a secure storage and accessible to the research team. I also understand that the data will be destroyed after a 5 year period unless I consent to it being used in future research.

Participant's name:

Signature:

Date:

Appendix 4: Samples from my e-Journal Notes

iPads in Education

2 April 2012
Recordings: 1-2, p. 3

The iPad used to introduce maths concepts.

2 April 2012
Recordings: 1-2, p. 3

Interactive modules generate discussion in Maths helping students to clarify concepts

25 May 2012
Recordings: 1-2, p. 3

Student can understand better what is slope by seeing the simulation and through discussion with the teacher. Able to develop a better understanding. Using the device to teach abstract concepts.

2 April 2012
Recordings: 1-2, p. 3

Students interacting, active learning, simulation, instant, visual representation. Students hear, see, touch and learn. Develop better understanding of the concept being taught.

2 April 2012
Recordings: 1-2, p. 3

Abstract concepts taught visually and interactively. Makes more sense to students.

2 April 2012
Recordings: 1-2, p. 3

Maths can be fun and engaging through competition. What is the role of challenge in student learning? How important is it?

2 April 2012
Recordings: 1-2, p. 3

Slope and gradient concepts reinforced through games

2 April 2012

Recordings: 1-2, p. 3
Why did it work better in this Maths class? The App was used before the introduction of the concept. Does it imply that students need a certain level of understanding before being introduced to a new concept? Did the App activate prior knowledge, curiosity? What was the role of active learning, self-directed learning, self-paced, hands on, visual, images, simulation? Memorising facts? The teacher claims that students could recall information acquired from the App during the next lesson.
2 April 2012   **Recordings: 1-2, p. 4**
The teacher claims that the App helped the weaker maths students get actively involved in the session. More specifically, the students were able to understand the theory part of the lesson.
25 April 2012   **Recordings: 1-2, p. 4**
Educative authenticity   Value of the study for others
25 May 2012   **Recordings: 1-2, p. 4**
Subject   Year 12 Literature
2 April 2012   **Recordings: 1-2, p. 4**
Sources of knowledge include information stored on iTunes? Incorporating audio in the lit session.
2 April 2012   **Recordings: 1-2, p. 4**
Access to significant others, rich discussion. Lessons become richer as a panel of professor discuss the topic from different perspectives.
2 April 2012   **Recordings: 1-2, p. 4**
Thinking skills
2 April 2012   **Recordings: 1-2, p. 4**

Quality feedback on student work. Students able to submit their work electronically and to receive feedback.
2 April 2012 **Recordings: 1-2, p. 4**
Student reaction to electronic feedback is positive. It is immediate and changes to documents can be made straight away.
2 April 2012 **Recordings: 1-2, p. 5**
Goodreader used to support teacher's correction and to support students' drafting process. Feedback ...
2 April 2012 **Recordings: 1-2, p. 5**
Used App in physics to review, revise, reinforce Newton's Law
2 April 2012 **Recordings: 1-2, p. 5**
Visual learning - force applied to an object
2 April 2012 **Recordings: 1-2, p. 5**
The girls were able to "see" the law in action. Visual learning Multimodal teaching iPad used to demonstrate a concept
25 May 2012 **Recordings: 1-2, p. 5**
Like in Maths - the simulation generated discussion. Students could clarify their thinking and gain a better understanding of what was happening.
2 April 2012 **Recordings: 1-2, p. 6**
How do you explain a concept such as gravity? Using a simulation on the tablet. Visual learning, active learning, Multimodal lesson more opportunities for students to consume and internalise content.
2 April 2012

Recordings: 1-2, p. 6

Play, fun, active learning

Lesson becomes a game!
"Weplayed around with the mass, how fast is going to move ..."

Access to specialised knowledge stored in an App! Teacher not an expert but supplements his personal knowledge with knowledge stored in Apps - facts, simulation, interactives etc.

Discussion, collaboration, problem solving, critical thinking. Students at the centre of learning.

Self-directed learning can be effective as students are able to control the pace of information consumed, the amount of information, the number of times they read the information etc. it also appears that they become more focused and that their mind is on the task at hand rather than elsewhere. Something that students often do when unable to follow 'chalk and talk'.

"About three quarters of them got it"

Convenience of having everything in one place. Internet, camera, Apps, email, notes etc.

Also, noticeable in this statement is the element of fun or 'entertainment'. Students will engage when the element of enjoyment is present.

learning can be fun and entertaining (to make learning fun and enjoyable)

Subject
French

2 April 2012   **Recordings: 1-2, p. 6**
Access to learning 24/7. Knowledge stored in machines.   The teacher and books are no longer the only sources of knowledge in a French classroom. Students learn from each other, from knowledge stored in computers at local and global levels, from Apps that incorporate multimedia. Learning is a personal affair that moves anywhere with the student in the form of digital multimedia, interactive, resources.   Catering for the individual differences, needs, interests is now easier than in the past.
2 April 2012   **Recordings: 1-2, p. 6**
Self-evaluation - listen to recordings and compare to native speakers.   Capture oral language - create learning resources on the run. Effective integration not as an add on but as an invisible tool supporting every stage of the teaching and learning process.   Example of multimodal lesson
2 April 2012   **Recordings: 1-2, p. 6**
Repetition, work at own pace, don't have to ask teacher. Avoid embarrassment by putting their hands up and indicating that they did not get it!
2 April 2012   **Recordings: 1-2, p. 7**
Students use the iPad in French lessons to refresh their memory when they cannot remember what was taught. All they need to do is listen to the audio recording, revisit an activity, watch a video clip ....   Revision
2 April 2012   **Recordings: 1-2, p. 7**
Access to resources, variety, rich content, role models
2 April 2012   **Recordings: 1-2, p. 7**
Enjoyment and fun
2 April 2012

Recordings: 1-2, p. 7
Extending learning beyond school bells
2 April 2012 **Recordings: 1-2, p. 7**
Use the iPad to demonstrate learning. Oral language stored and emailed to teacher for feedback. Students create their own learning resources. They learn the content while creating the content. They have been observed producing the same task again and again until it reaches a satisfactory level of quality in terms of pronunciation, grammar and expression.
2 April 2012 **Recordings: 1-2, p. 7**
Visual learning
25 May 2012 **Recordings: 1-2, p. 8**
Students underline or highlight the themes in the novel and make notes.
2 April 2012 **Recordings: 1-2, p. 8**
Communication with kids Set activities even when absent
2 April 2012 **Recordings: 1-2, p. 8**
Boys motivated. Doing extra work on their own. Time on activity. Evidence of engagement and extending learning beyond school bell times when student enjoy the activity. Enjoyment here may have been reinforced by the tools used, the fact that they can do the activity, learning taking place, active learning. Used to develop understanding of the text.
2 April 2012 **Recordings: 1-2, p. 8**
Increase students' understanding Scaffolding, active learning. Preparing student for success by absorbing the knowledge required to complete the task.
2 April 2012 **Recordings: 1-2, p. 8**
Engaging boys ... Had to write a song lyric related to the novel. The boys volunteered

to record the song at home... Producing their own digital content. Enjoyment and engagement. Same task different tools, different outcomes

2 April 2012
Recordings: 1-2, p. 8

Student engagement, active learning, time on task. Time on task is only effective when the activity is directly related to the goals of the lesson and it must support student in constructing new knowledge. Scaffolding, zone of proximal development, relevance and rigour are elements to be considered here.

2 April 2012
Recordings: 1-2, p. 9

Identifying the tools that student can effectively use is very important. There are thousands of Apps but which ones will make a difference in learning and teaching? Teachers must decide what will work for then and their students.

2 April 2012
Recordings: 1-2, p. 9

Preparing students for exams

25 May 2012
Recordings: 1-2, p. 9

Students creating their own resources in preparation for NAPLAN TESTS.

"They annotate what they are actually saying" speech bubbles. Thus, creating visual resources from plain text documents.

2 April 2012
Recordings: 1-2, p. 9

Balanced approach iPad, Pen and Paper is important.

2 April 2012
Recordings: 1-2, p. 9

Efficiency, dissemination of information and communication are important aspect of learning and teaching. We are no longer talking about network efficiency but a ALL IN ONE device that is fast, contains all tools required and gives users the ability to consume and to produce knowledge in ways never before possible.

2 April 2012
Recordings: 1-2, p. 9

Time wasting minimisation

"I've just found this great resource. "
2 April 2012 **Recordings: 1-2, p. 9**
Generate discussion, collaborate, learn from each other (peers as significant others) "they were able to work together"
2 April 2012 **Recordings: 1-2, p. 9**
Tool for revision
2 April 2012 **Recordings: 1-2, p. 10**
Game, fun, competition
2 April 2012 **Recordings: 1-2, p. 10**
Revision and connection with previous knowledge "At the star of the lesson I would give them perhaps four or five multiple choice questions and it was a MAD MINUTE, so as quickly as they could.
2 April 2012 **Recordings: 1-2, p. 10**
Active learning, more time to attend to individual needs
25 May 2012 **Recordings: 1-2, p. 10**
Creativity - doodlembuddy
2 April 2012 **Recordings: 1-2, p. 10**
Visual learning, active learning, Different structure of the heart. Again iPads being used to make difficult concepts easier to grasp through images and students actively tracing on the image to demonstrate how the heart functions.
2 April 2012 **Recordings: 1-2, p. 10**

Access to online resources - google search images of a heart
2 April 2012 **Recordings: 1-2, p. 10**
Explaining difficult concepts - visual learning. "where the ventricles are ..."
25 May 2012 **Recordings: 1-2, p. 10**
Students were asked to "draw the pathway to deoxygenated blood in blue and the the pathway of the oxygenated blood in red" Active learning, student engagement
2 April 2012 **Recordings: 1-2, p. 10**
Visual learning "They could visually see exactly which areas of the heart corresponded to the oxygenated and deoxygenated"
25 May 2012 **Recordings: 1-2, p. 10**
They really enjoyed it. Students learn better when the activity is enjoyable.
25 May 2012 **Recordings: 1-2, p. 10**
Using tablets to create diagrams which can be used for exam preparation.
2 April 2012 **Recordings: 1-2, p. 11**
Visual, interactive, simulations to develop knowledge and understanding. "milky way galaxy"
2 April 2012 **Recordings: 1-2, p. 11**
Generate curiosity, discussion, interesting questions, student engagement with subject matter

Zooming out of the Milky Way Galaxy
25 May 2012 **Recordings: 1-2, p. 11**
"screenshots" used for their assignments.
25 May 2012 **Recordings: 1-2, p. 11**
Subject Physics
2 April 2012 **Recordings: 1-2, p. 11**
Capturing the moment, analyse, revise and explore further. Used a video recording to record "looking at the forces of Newtons Laws"
2 April 2012 **Recordings: 1-2, p. 11**
"talking about errors" used video recording to analyse errors. Student excitement.
2 April 2012 **Recordings: 1-2, p. 11**
Video helped the, with their prac report in term of describing what happened.
2 April 2012 **Recordings: 1-2, p. 11**
Preparing student for learning, connecting to prior knowledge "giving them a social and cultural background to the time and period, which was the middle ages"
2 April 2012 **Recordings: 1-2, p. 11**
Visual, multimedia, text
2 April 2012 **Recordings: 1-2, p. 11**
Used as introduction

2 April 2012
Recordings: 1-2, p. 11
Old English - significant others, access to resources, multimedia, knowledge stored in machines
2 April 2012
Recordings: 1-2, p. 11
saving time, access to expert others
"old English"
2 April 2012
Recordings: 1-2, p. 11
Communication, extending learning beyond the classroom
Students coming up with their own questions to write a text response! Use of email
2 April 2012
Recordings: 1-2, p. 12
Enhancing students' learning, planning, resources.
Using it a tool for planning essays
2 April 2012
Recordings: 1-2, p. 12
Catering for individual needs
"beginners to more advanced students"
2 April 2012
Recordings: 1-2, p. 12
Revision
2 April 2012
Recordings: 1-2, p. 12
Visual learning, multimedia
Use of images, text and sound in French lessons
2 April 2012
Recordings: 1-2, p. 12
Visualise

2 April 2012 **Recordings: 1-2, p. 12**
Individuals can listen to the dialogue and answer questions, teacher does not have to repeat the dialogue
2 April 2012 **Recordings: 1-2, p. 12**
Engagement with subject matter
2 April 2012 **Recordings: 1-2, p. 12**
Student engagement, working at their own pace, individualised
2 April 2012 **Recordings: 1-2, p. 12**
Enjoyment, visual learning, active learning, own pace.
2 April 2012 **Recordings: 1-2, p. 12**
Immediacy, email, communicate, share resources
2 April 2012 **Recordings: 1-2, p. 13**
Access to learning resources. Students can concentrate on the lesson rather than taking notes during French lessons. They may access the required pOwerpOint notes online anytime.
2 April 2012 **Recordings: 1-2, p. 13**
Engaged learning, fun and enjoyable
2 April 2012 **Recordings: 1-2, p. 13**
Saving time, revise explanation
3 April 2012 **Recordings: 1-2, p. 13**
Some thoughts!

The degree of challenge in activities determines level of student engagement. The degree of relevance and quality impacts on student achievement. Challenging, high quality, personalised, individualised activities will most likely have the greater impact on learning.

Students are using the iPad and its Apps to teach themselves.

Collaboration among students is a strategy used to raise academic performance.

Students also collaborate with machines, search engines, RSS feeds, Google Alerts ...

Use of iPads for rote learning, long term memory (French, Maths, Physics) as we move into exam period in Term 2. How teachers and students use iPads throughout the Year depends on school expectations, pressures and goals.

Fluency (automation) in the use of the iPads and the Apps maximises learning time. Teachers ability to grab students' attention in order to emphasise or explain, clarify, important concepts matters. The teacher is 'competing' with the iPad. Routine and clear expectations should be established and consistent across all classrooms.

Time on task during class
Time on task beyond school hours
Meta cognitive strategies - what helps me learn. Diagrams, flashcards, audio, video, interactive objects, repetition

NOTES FROM
iPads in Education
21 May 2012 **Recording: 3, p. 25**
Lisa
24 May 2012 **Recording: 3, p. 25**
Subject Life skills
21 May 2012 **Recording: 3, p. 25**
Online learning - GOL Learning at any time pace and place Learning available 24/7
28 May 2012 **Recording: 3, p. 25**
Role play - students have to access GOL through their iPads in order to do the role play.
24 May 2012 **Recording: 3, p. 25**
LMS - accessing weekly resources posted on GoL
21 May 2012 **Recording: 3, p. 25**
iPad used to access theory online. Access to online learning resources
28 May 2012 **Recording: 3, p. 25**
Issue related to accessing the LMSS
24 May 2012

Recording: 3, p. 25
Immediate access to resources through the Blackboard App is vital. However, students can still access the GoL through the Browser. And indication that as the technology gets faster so does our expectations.
21 May 2012 **Recording: 3, p. 25**
"Because we are wasting a lot of time ..." iPad increases efficiency. Student access learning resources almost immediately when needed. Efficiency
24 May 2012 **Recording: 3, p. 26**
Immediate access - teachers and stunts are pressured for time. Technology can speed up things
28 May 2012 **Recording: 3, p. 26**
Content must be correctly packaged and delivered where and when needed in a format that is readily usable in order to minimise time wasting and maximise time on task. This is something that schools must overcome in order to take maximum advantage of these new devices.
21 May 2012 **Recording: 3, p. 26**
Still having some issues. Access to information due to technical problems? Issues
24 May 2012 **Recording: 3, p. 26**
Teachers used iMovie, never used this App before. The same task on a Laptop or stand alone computer would have been a very complex task but not with the tablet. Apps must be intuitive in their use and deliver good product outcomes.
21 May 2012 **Recording: 3, p. 26**
Students as producers of knowledge "all putting in their sound effects"

Students as active learners. iPad allows them to demonstrate their knowledge through multimedia productions. Active learning Demonstrating knowledge through multimedia
21 May 2012 **Recording: 3, p. 26**
Methodology - teachers learning from each other "until I heard from ...."
24 May 2012 **Recording: 3, p. 27**
Subject English
24 May 2012 **Recording: 3, p. 27**
Subject Humanities
21 May 2012 **Recording: 3, p. 27**
" to challenge themselves" Challenge
24 May 2012 **Recording: 3, p. 27**
Email can be a destruction in the classroom.
24 May 2012 **Recording: 3, p. 27**
Photos can be a distraction.
21 May 2012 **Recording: 3, p. 27**
Student engagement may come at a small price of possible distractions. Teachers must develop strategies to keep students on track.

"Have we got everything closed that we don't need to have opened?"
24 May 2012 **Recording: 3, p. 27**
Teachers happy but need to work on their organisational aspects. How to manage students with iPads in their hands.
24 May 2012 **Recording: 3, p. 28**
Working quicker by minimising distractions.
20 May 2012 **Recording: 3, p. 28**
EClicker - teacher taking risks, developing own knowledge and moving forward. Excitement, engagement
20 May 2012 **Recording: 3, p. 28**
Answering questions in real time. eClicker - immediate, effective feedback as teacher can clear up any misconceptions. Feedback is a combination of machine generated followed up by teachers comments.
24 May 2012 **Recording: 3, p. 29**
Subject Biology
24 May 2012 **Recording: 3, p. 29**
Subject Chemistry
24 May 2012 **Recording: 3, p. 29**
Easy to do everything. A key to teachers using new technologies.
20 May 2012 **Recording: 3, p. 29**
Little bit glitchy Technical issues

20 May 2012	
Recording: 3, p. 29	
Integrated feedback - analysis of performance	
24 May 2012	
Recording: 3, p. 29	
'Powerful' tool for assessment. EClicker. Immediate feedback on student performance. Students also receive feedback.	
21 May 2012	
Recording: 3, p. 30	
Exam preparation, review	
21 May 2012	
Recording: 3, p. 30	
Maximum student engagement	
24 May 2012	
Recording: 3, p. 30	
Easy to use. What makes it easy to use? "The layout is so clear"	
24 May 2012	
Recording: 3, p. 31	
Teachers collaborating Trialling the App and sharing the workload.	
21 May 2012	
Recording: 3, p. 31	
What works and does not work depend so the network and teachers' basic technical knowledge	
21 May 2012	
Recording: 3, p. 31	
Use of interactive games to teach about food chains.	
21 May 2012	
Recording: 3, p. 31	
What do you think is happening?	

Students constructing knowledge on what they already know, what hey see and do. Example of active learning and higher order thinking skills   Active learning

21 May 2012   **Recording: 3, p. 31**
Using games to teach concepts.

21 May 2012   **Recording: 3, p. 31**
Use of games and multimedia features. Students were able to work at their own pace. Teacher's role to set the activity and guide the students by he side.

21 May 2012   **Recording: 3, p. 31**
Allows teachers to walk around and to provide one to one guidance and feedback.   " I could walk around ..."

21 May 2012   **Recording: 3, p. 32**
Meaningful learning. Connecting to real life scenarios.   Relevant - content must be relevant to real life in order to make more sense.

21 May 2012   **Recording: 3, p. 32**
Extending learning beyond school hours. Students volunteering to 'play the game'.

24 May 2012   **Recording: 3, p. 32**
Use of games   A powerful strategy to generate discussion and compare results with real world situations.

21 May 2012   **Recording: 3, p. 32**
Boys and girls enjoy learning through games.   Student engagement

24 May 2012 **Recording: 3, p. 33**	
Network issues	
21 May 2012 **Recording: 3, p. 33**	
A case of teachers receiving immediate feedback from students on their understanding of the concepts introduced.	
24 May 2012 **Recording: 3, p. 33**	
Email issues	
21 May 2012 **Recording: 3, p. 33**	
Member check example, co-constructing knowledge with the participants. "No ... Students working at their own pace	
24 May 2012 **Recording: 3, p. 34**	
Using games is French	
24 May 2012 **Recording: 3, p. 34**	
Subject French	
21 May 2012 **Recording: 3, p. 34**	
IPad used to teach the more challenging aspects of language. verbs "but the challenge is with different tenses...	
21 May 2012 **Recording: 3, p. 35**	
Used to do revision work	

21 May 2012 **Recording: 3, p. 35**
"easy, quick, man refer to it" Immediate access to learning resources
21 May 2012 **Recording: 3, p. 35**
"if they forgot" the iPad used as an extension of their own memory. Or as a revision tool?
21 May 2012 **Recording: 3, p. 35**
Find the .... Active learning - hand on minds on
21 May 2012 **Recording: 3, p. 35**
Students keep it in their favourites for further revision, access
21 May 2012 **Recording: 3, p. 36**
"They can use it any time during class" Learning at any pace, time and space
24 May 2012 **Recording: 3, p. 36**
Students are more engaged even when learning about dry topics such as verbs in French
21 May 2012 **Recording: 3, p. 36**
Methodology section. Teacher developing own knowledge.
21 May 2012 **Recording: 3, p. 37**
Games used for French learning. Catering for different abilities of students by including 3 levels.
24 May 2012 **Recording: 3, p. 37**

Students are able to choose the level of difficulty. Self-directed learning.
21 May 2012 **Recording: 3, p. 37**
Students find games fun and develop knowledge at a faster than normal rate.
24 May 2012 **Recording: 3, p. 37**
Timed activities add excitement, engagement and interest in the educational game. Challenge is the key...
21 May 2012 **Recording: 3, p. 37**
Students enjoy learning through games. Games that allows for success, consolidation of knowledge taught through a comfortable degree of challenge.
21 May 2012 **Recording: 3, p. 37**
"it's timed" timed activities provide the level of challenge
21 May 2012 **Recording: 3, p. 37**
App used for revision, engaging and extending learning to home.
24 May 2012 **Recording: 3, p. 38**
Subject Maths
24 May 2012 **Recording: 3, p. 38**
Use of flashcards to prepare students for exams.
19 May 2012 **Recording: 3, p. 38**
Using the iPad for exam preparation
19 May 2012 **Recording: 3, p. 38**

Students and teachers working together to create learning resources

19 May 2012
Recording: 3, p. 39

The technology must be easy to use, practical and serve the purpose of the lesson. In this case, it appears that the flashcards program satisfied all of the above criteria.

19 May 2012
Recording: 3, p. 39

Technology highlights concepts, ideas and generates discussions among students and teachers. Students are engaged in higher order thinking skills evaluating what worked well.

24 May 2012
Recording: 3, p. 39

Student creating their own study cards / learning resources
They are actually learning the content by creating the resources

19 May 2012
Recording: 3, p. 39

Emphasis on the process - students generating learning resources actively participating, taking control of their own learning and collaborating with each other. Could it be that by creating they are actually mastering the content?

19 May 2012
Recording: 3, p. 39

Used for revision, maximising learning opportunities in the last ten minutes of the session.

19 May 2012
Recording: 3, p. 39

Deliberate use of flashcards consistently throughout the semester leads to an accumulation of resources that can be used at the end. Strategic use of iPads.

19 May 2012
Recording: 3, p. 40

Evidence of teacher development and trigger to take further and more consistent action. Use this in your methodology chapter.
"every three days at the end of each week

19 May 2012 **Recording: 3, p. 40**
Can you go through the cards for us? The group is interesting on how they themselves could use the technology.

NOTES FROM

19 May 2012 **Recording: 3, p. 40**
Used to revise previous taught concepts
24 May 2012 **Recording: 3, p. 41**
Students using Apps to learn about independent and depended variables. Maths
24 May 2012 **Recording: 3, p. 41**
Teachers learning from each other
24 May 2012 **Recording: 3, p. 41**
Linear relationships and gradient Maths
19 May 2012 **Recording: 3, p. 41**
Able to give it to their peers. Example of collaborative Learning where students learn from activities they themselves created.
19 May 2012 **Recording: 3, p. 42**
Testing knowledge
19 May 2012 **Recording: 3, p. 42**
Preparing for exams

Focus Group Sessions 4&5

5 June 2012
Using flash cards in maths to prepare students for exams. The App must be user friendly ...
"So I found this flashcard that was more user-friendly I think than the other ones. And the kids seemed to think that as well. "

5 June 2012 **Sessions 1-5 combined-1, p. 50**
"Generated a bit more discussion as they were doing it."

5 June 2012 **Sessions 1-5 combined-1, p. 50**
Value added "The ability to add to their general knowledge unexpectedly"

5 June 2012 **Sessions 1-5 combined-1, p. 50**
Value added General knowledge "when you have an iPad you can answer any question any time"

5 June 2012 **Sessions 1-5 combined-1, p. 50**
Discussion and connections with the real world   "can lead into a discussion about social changes which then links back to the text you're studying, it's really good."

5 June 2012 **Sessions 1-5 combined-1, p. 50**
Issues - network connection and video streaming "I've found at the moment is I guess a network one with YouTube not working"

5 June 2012 **Sessions 1-5 combined-1, p. 51**
Search for the word "Different" Amazing - different ways of doing things, different views, different activities, different sources of information, make a difference.
5 June 2012 **Sessions 1-5 combined-1, p. 51**
Flexibility, access, portable "So the portability aspect I think improves the usability and access to education"
5 June 2012 **Sessions 1-5 combined-1, p. 52**
 "Yeah, it works really well for introducing topics too because it's interesting visually, combine visual and oral together in a way that you can't do just with a whiteboard and you can be very spontaneous and I like that in a classroom."
5 June 2012 **Sessions 1-5 combined-1, p. 52**
File sharing is an issue
5 June 2012 **Sessions 1-5 combined-1, p. 52**
Immediate, convenient, sharing "The amount of time it takes to turn on your laptop, upload something, get the kids to download it. Much easier and quicker to just press email"
5 June 2012 **Sessions 1-5 combined-1, p. 52**
Assessment "The amount of time it takes to turn on your laptop, upload something, get the kids to download it. Much easier and quicker to just press email"
5 June 2012 **Sessions 1-5 combined-1, p. 53**
Student using technology to demonstrate their knowledge. "these are the questions I want you to cover, you can keynote page it, anything you want

with a poster"

"They'll work at their own pace"

5 June 2012
Sessions 1-5 combined-1, p. 53

"I don't mind if they're a little bit chatty, they'll probably talk with one another to collaborate."

Learning is a social phenomenon. Students learn through discussion and collaboration.

"But I was really surprised because as soon as I said it the class was dead silent. And I guess it was shocking to me because it didn't make sense in a way to me. It was just dead silent and they were all silently working. And I didn't know if it was because it was periods one and two. But I've got some loud kids in that class sometimes that I always have to go, "Right, can you keep it down a bit." But I reckon it was probably for about 35 minutes just dead silent. And one of them and one of them was on YouTube with headphones just looking through fishing videos and overharvesting, and he did ask me so I am like, "Yeah, that's fine.""

"And the ability for them to look at a whole bunch of videos differently with their headphones in. Some of them were researching .edu or .org websites, others were on different kinds of apps to get definitions. And I was totally amazed that they were focussed on this research task. "

Globalising, personalising, individualising, own pace, multimedia, online, student engagement, active learning, self-directed learning.

Learning in Collaborative learning environments takes place when the knowledge of significant others is higher that the learners.

Students prefer to learn from experts. Even if that expert is a "Digital System". In this case though, what elements contributed to students being absorbed and engaged with the content?

5 June 2012
Sessions 1-5 combined-1, p. 54

Not every activity has to be exciting. What really matters is the quality of the content.

"The other thing I used it for, nothing exciting just a pages document with a whole bunch of text boxes. They have to look at the glands, the hormone it produced and the function. I jumbled it all up everywhere and they had to use their finger to move everything in the right position."

5 June 2012

Sessions 1-5 combined-1, p. 54

Introduction of new topics

"And as Ann said, we're introducing the topic, there's a great app called Back in Time and we're about to start evolution"

Sessions 1-5 combined-1, p. 54

Introducing topic through software simulation. Use of images, interactive links.

"Yeah, and we're about to start evolution on Friday. So I thought what better way than let's have a look at what happened 10 million years ago and why. And the fact that it's got pictures, interactive links, light bulbs with interesting facts. It's expensive for the kids to download but it's something that we can definitely go, "Look let's spend 20 minutes, 25 minutes looking at it together as a class" and you get them in."

Sessions 1-5 combined-1, p. 54

"get them hooked and I think that helps motivating them"

Motivation, student engagement, curiosity, activating prior knowledge

Sessions 1-5 combined-1, p. 54

Issues

"Why isn't it working?" My Inbox is full, they log onto Greenfield online, they delete it through their deleted and everything. It's a tedious process because you can't delete it from your iPad. You actually have to go onto Safari and I only learnt that today. "

Sessions 1-5 combined-1, p. 55

Issue

"It's driving me nuts to the point where I've said, "Right, I'm not accepting electronic anymore. It's your responsibly to either email it to yourself, Dropbox it to yourself if you can, print it somewhere and I need a hard copy." It's driving me insane to the point where I have to get an iPad to physically mark something. And I completely forgot about that in period four today. So it just puts me behind, I don't like it"

Sessions 1-5 combined-1, p. 55

Focus group - How effective?

What else can I use in my lesson?

"I think the whole point of these meetings is to see how effective this is. So every week, there's not a massive amount of pressure, but I go, "What's something different I could do that we maybe haven't looked at yet" or "Maybe let's try this other app and see if that works." I think I'd still be doing it anyway but I think the fact that we meet and talk about it, it helps you start that process and now it's natural, "What else is out there? What's something different I could do? I'll download that app but I might look at it next week. It looks interesting now.""

5 June 2012
Sessions 1-5 combined-1, p. 56

How useful was the Focus group approach?

"Yeah, and the potential for cross-curricular learning is really important and also knowing what it is kids are doing in something like maths, because I don't have any clue about what kids do in maths really. So it's been really interesting hearing what you do. Because with Natalie or someone, I can picture what might happen in a language class but maths and science it's been very interesting. "

5 June 2012
Sessions 1-5 combined-1, p. 57

Issues - App based

"The eClicker that I was showing. They released a new one called eAudience and ePresenter which is much more fluid but there's a lot of bugs in it still. So I think when they fix it – I'll give them time to fix it with an update. There is an equation writer in there so you can easily do that"

5 June 2012
Sessions 1-5 combined-1, p. 58

Issues - students remembering passwords

"But with using the electronic text books, they often have to remember passwords and things to get onto the internet to do that. And half of them, even though you tell them to write it down in a safe place or something like that, they forget their passwords"

5 June 2012
Sessions 1-5 combined-1, p. 58

Knowledge stored online and downloaded to their devices.

Flexible learning, convenience,

"So for instance I'll say, "This two weeks we're working on this chapter. Everyone needs to get on and download this chapter"

iPads used to check work during class.
Students 'play' with the app in order to learn how to convert measurement units.

"So I used this in class after we'd – I'd done an activity where they had to answer some questions converting between different units of measurement, and I got them to check whether their conversions were correct but then they also were able to play around a little bit and see how the place value actually changed as they were converting either from centimetres to millimetres et cetera."

5 June 2012
Sessions 1-5 combined-1, p. 61

Using a simple App to model quadratic expressions. Combination of game, image and Interactive Axes App

"But it was just a simple app where you can import pictures from your camera roll, and so my idea to use it in class is going to be when we do the topic of quadratics and we want to model quadratic equations"

5 June 2012
Sessions 1-5 combined-1, p. 61

Linking maths to real life structures.

"I could get the kids to maybe take a photo of the McDonalds arches or something like that just to put a bit of real life perspective to it. "

5 June 2012
Sessions 1-5 combined-1, p. 62

The iPad used to make maths relevant to students

"After we've already done quadratics and shapes for quadratics but then going on to actually finding equations and modelling different situations, so yes it would probably form actually the basis for a whole lesson. "

5 June 2012
Sessions 1-5 combined-1, p. 62

Engaging students

"It has allowed me to modify my approaches to class. As an example, I've made many tasks which seem for me more engaging and more fun for the students."

Different pedagogy

5 June 2012 **Sessions 1-5 combined-1, p. 63**	

IPads used to extend students, enhance learning, value added strategy.

" look at the apps that we had and try to find vocabulary having to do with environmental issues so it was an extension for them"

5 June 2012 **Sessions 1-5 combined-1, p. 63**	

Used to:

"extended their vocabulary and their knowledge"

5 June 2012 **Sessions 1-5 combined-1, p. 63**	

Extending learning beyond the school.

"could go home as well to go over this vocabulary"

Revise at home, consolidate knowledge

5 June 2012 **Sessions 1-5 combined-1, p. 63**	

Online learning. YouTube - multimedia. Individualised tasks, multimodal lesson.

"with every student having their iPad so they went on YouTube. So I gave them the address, so they went on YouTube, listened to a short documentary on pollution and what was good about it is that individually they listened to it, they had their (6:37) and if they couldn't understand I set like 10 question and then they had to answer the questions."

5 June 2012 **Sessions 1-5 combined-1, p. 63**	

"once it would have been more difficult to go over it that many times and then what would happen probably some students would be bored because they know already the answer whereas other and they would just sit there so it was good because it was self-paced and they were all engaged in doing that. "

5 June 2012
Sessions 1-5 combined-1, p. 63

iPads used to develop reading comprehension skills

"iPad useful when I do reading comprehension. In the past I used to just read everything with them and give them the meaning of words. They sit there, they not listening just – but now I say, "Well you use your iPad; you go through the text, find, try to decipher the meaning of words. Write on tops of it – on top of the words and then we discuss it"

5 June 2012
Sessions 1-5 combined-1, p. 63

Catering for individual needs. Build up self-esteem and confidence.

"The good thing about that is that even the weaker students all doing something and I think it has built up their confidence because afterwards we share"

5 June 2012
Sessions 1-5 combined-1, p. 64

Active learning, student engagement, revision

"So definitely iPad allows active learning and ensure that students are engaged. And of course for French it's really useful for revision of verbs"

5 June 2012
Sessions 1-5 combined-1, p. 64

Grammar, pronunciation knowledge of the French language.

"grammatical exercises so they could do that the other few apps and I need to say that student's pronunciation has improved a lot with that"

5 June 2012
Sessions 1-5 combined-1, p. 64

iPad used to expand students understanding of issues. The device provide access to current topics.

"my students were missing out on basic understanding issues. They're not engaging with the wider media and issues in general at all. We did a few practise ones and we had things like what's an asylum seeker or what's space exploration? "

5 June 2012
Sessions 1-5 combined-1, p. 64

Developing students knowledge through online newspapers. Herald Sun, The Age Extending learning beyond the classroom.
5 June 2012 **Sessions 1-5 combined-1, p. 65**
"iPad and it allows them to access the full paper. They've got their sport there – I have said to them I'd like them to try and focus on opinions, and front page, and editors choices and things like that but what I've done is for homework "
5 June 2012 **Sessions 1-5 combined-1, p. 66**
iPad used to extend students and build good reading habits. "issues and discussion of issues is – and language analysis is part of the English curriculum from now until they finish so if they don't start now it's not going to be as easy for them but if they do start now, and they take it seriously now, and then hopefully they'll build some good habits that will assist them as they move on up. "
5 June 2012 **Sessions 1-5 combined-1, p. 67**
Anna A. Green
5 June 2012 **Sessions 1-5 combined-1, p. 67**
EBooks as source of knowledge "I noticed in the book that we downloaded which was $3.99 there was a 40 page essay by a professor from Stanford University. "
5 June 2012 **Sessions 1-5 combined-1, p. 67**
IPad used to record study questions with the text and students are then able to highlight and provide the answers.   "set some questions and some activities for the kids to do while I was away so they did that, partly for homework, partly in class. And then I suddenly realised that I could write study questions into the note section of this rather than having to set worksheets with notes in it which like it has them already written and they can just copy them down in classes to get there and answer them on the spot. So I've found it a really useful way to set my study questions. "

5 June 2012	
Sessions 1-5 combined-1, p. 68	

iPad used to filter the main information required in order for students to identify and discuss the themes.

"So I was talking today about how one of the themes in it is two facedness and duplicity and I was able to find all the different examples of where that shows up inside it. And then we can write notes based on that which I did but where is it? Yes, so then I can just write a little note putting in a list of other characters who said similar things, the kids can put that in; I can also email them the notes as well. So it's fantastic. "

5 June 2012	
Sessions 1-5 combined-1, p. 69	

Digital Puppets and and iMovie used to develop plays related to McBeth.

Multimodal, active learning

5 June 2012	
Sessions 1-5 combined-1, p. 71	

Effective integration of iPads need thinking and planning.

"I'm sort of thinking about how I am going to use it. "

5 June 2012	
Sessions 1-5 combined-1, p. 72	

Catering for the needs of girls in biology.

"Yes with a real conscious effort especially with my year 10 girls who are not up to speed I guess with revising."

5 June 2012	
Sessions 1-5 combined-1, p. 72	

Engaging boys

"I've noticed that Friday afternoons, just with boys in general, are not chaotic but they – like they're not as switched on as say in the morning and for Friday afternoon last period they need – like you can't expect that they're going to listen to you all the time, they're going to absorb everything you're saying, so I'm going to try and give them sort of like independent work that they can work on themselves. "

5 June 2012	
Sessions 1-5 combined-1, p. 72	

Engage boys by creating self-paced activity.

"think that labelling the diagram and creating flashcards that each of them can just work on at their own pace will be quite good for a Friday afternoon"

5 June 2012
Sessions 1-5 combined-1, p. 72

Engaging students at their level of understanding. Catering for individual needs.

"there's a basic, intermediate and advanced so we should be at an intermediate level. For those that are struggling they can go to a basic explanation when they tap on and then go oh yes I kind of get that, and then read the intermediate and see what's different, and then they can really understand what parts they do understand and what ones they're struggling with. "

5 June 2012
Sessions 1-5 combined-1, p. 72

Used for revision. Note the the teachers is excited! What is the impact on students' attitude ?

"I think it will be vital to their revision as well so I'm excited about that one."

5 June 2012
Sessions 1-5 combined-1, p. 73

Sharing files through DropBox

"So the fact that you can just go it's on Dropbox, it takes two seconds to upload and you don't have to email it"

5 June 2012
Sessions 1-5 combined-1, p. 74

Storing information in DropBox for students to access prior to exam time.

" I don't have to email, or anything that they need any extra revision I can see it now for exams and test revision up on there and you've always got access to it, so. "

5 June 2012
Sessions 1-5 combined-1, p. 74

Has made teacher's job easier. File sharing strategy is important to be set up in order for teachers and students to store, retrieve and share information.

"Biology, Chemistry, year 9 and year 10. So it's just made my life much easier. "

5 June 2012
Sessions 1-5 combined-1, p. 75

Scaffolding learning - from simple to complex, from concrete to abstract (theory)

"Look even just for an introduction to be able to even tap on something and go I've never ever seen this before, what is it? The basic explanation tells you that. We go into a little bit more detail in the intermediate. So I could have even set homework or can set homework saying, "Download it, have a look at the basic explanations. Just have a bit of a play.""

5 June 2012
Sessions 1-5 combined-1, p. 76

Catering for the top end of the students throughApps

"I've got two or three in there, they could just go to the advanced and say, "I want to know a little bit more.""

5 June 2012
Sessions 1-5 combined-1, p. 77

3D interactive simulation used to teach students about cells. Engaged, visual, interactive learning.

"those that really struggle to imagine they've got something like this where they can visually see it if they do struggle to sort of think about it the way that you want them to".