

***Doctorate in Professional Educational, Child  
and Adolescent Psychology***

*Programme Director: Vivian Hill*



**Teachers' readiness to use computer tablets in inclusive classrooms: Implications for  
developing innovative pedagogies and Professional Development programmes**

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The research work disclosed in this publication is partially funded by the Endeavour Scholarship Scheme (Malta). This scholarship is part-financed by the European Union – Operational Programme II – Cohesion Policy 2014 - 2020, “*Investing in human capital to create more opportunities and promote the wellbeing of society*”.



European Union - European Structural and Investment Funds  
Operational Programme II – Cohesion Policy 2014 - 2020  
*Investing in human capital to create more opportunities and promote  
the well being of society*  
Scholarships may be considered for part-financing by the European Union  
European Social Fund (ESF)  
Co-financing rate: 80% EU Funds; 20% National Funds



## **Abstract**

Computer tablets in classrooms have gained popularity with students as they fit their lifestyle, and are shown to improve students' learning experience when used appropriately. The main challenge for teachers is to seamlessly and efficiently employ educational technology - such as the tablet - to enhance student achievement, while simultaneously learning how to utilise it in the most successful way.

This research investigated Maltese teachers' readiness to integrate tablets in their pedagogy prior to the 'One Tablet per Child' scheme. This research explored effective technological pedagogies, and how teachers are supporting mixed-ability students in their learning process through the use of tablets. It also investigated professional development programmes, and systems which support teachers in developing pedagogies utilising tablets.

A mixed-method research design was adopted. Quantitative data collected involved the use of an online questionnaire from a sample of Year 4 Maltese teachers (n=81). Qualitative data was collected through focus groups (n=13) and individual interviews (n=3) with Year 4 teachers, an Education Officer and an e-Learning teacher. Semi-structured observations (n=14) were carried out in Year 4 classrooms. The epistemology adopted involves pragmatism, and tablet use is explored in light of Systems theory.

Results indicate that teachers' age, years of teaching, training, and ability to use technology has an impact on their readiness to use tablets for teaching. Findings show that tablets help to promote student participation, the development of 21<sup>st</sup> century skills and personalised learning. Teachers discussed their own professional development through discussions with colleagues, sharing of resources and school-based training. Ways forward for teacher training are discussed, together with consideration of how the role of the Educational Psychologist (EP) can support teachers in developing innovative technological pedagogies to support the teaching-learning process.

### **Student declaration**

I hereby declare that, except where explicit attribution is made, the work presented in this thesis is entirely my own.

Signed:

Word Count (Exclusive of Appendices and References): 34, 293

## **Acknowledgements**

Many thanks to both my academic supervisor Dr Maria Kambouri, and my professional research supervisor Ms Helen Upton, for all of their support, guidance and suggestions over the course of the doctoral programme.

I would also like to thank my advisors from the University of Malta, Dr Philip Bonanno, whose questionnaire formed a basis of this research, and Professor Liberato Camilleri who advised on the quantitative analysis of the questionnaire.

A special thank you also goes to the participants for sharing their views and their practices to this study, along with Senior Management Teams for supporting the research throughout, and for making changes to their demanding schedules in order to accommodate my visits.

Finally, I wish to express heartfelt gratitude to my father Joe, his partner Doris, my fiancé Byron and his family for their invaluable support and encouragement over the past three years. I also wish to thank my Uncle Martin and Cousin Tor, who so kindly provided me with warm accommodation and company during my long stays in London.

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## **Chapter 1: Introduction**

### **1.1. Chapter overview**

This chapter outlines the background, purpose and aims of the present research study, and its relevance to the field of education, psychology, and the role of the educational psychologist (EP). This research was conducted in Malta, and therefore the local context and legislative background surrounding this research will be presented. Finally, this chapter concludes with an outline of the structure of the remainder of this thesis.

### **1.2. Background to the research**

Information and Communication Technology (ICT) has influenced contemporary society, including education and schools, where technology has been used as part of the teaching and learning process for many decades. Although not a panacea for all educational problems, today's technologies are considered to offer essential tools for teaching and learning (Jung, 2005). There are several technologies which, although not developed for educational purposes, are increasingly used in present-day schools. These include computers (Flewitt, Messer, & Kucirkova, 2014), interactive whiteboards (Fakazi, 2011), SMART tables (Olive, 2013), smart phones, (Mintz, 2013b, 2013a) and tablet computers (Butcher, 2016; Ditzler, Hong, & Strudler, 2016; Neumann & Neumann, 2013). Mobile technologies - such as tablet computers - are used in schools in ever-increasing numbers, mostly due to the drop of prices in a competitive market, and with the added attraction of thousands free or low-cost educational applications (Apps) (Panzavolta, Lotti, & Engelhardt, 2014).

Kress & Pachler (2007) argue that digital, mobile technologies have influenced pedagogies and environments for learning. Learning experiences can become more flexible, interactive, collaborative and multimodal (Churchill, Fox & King, 2012; Kress & Pachler, 2007). These technological innovations have also provided learning opportunities for students who need additional support in the classroom, and students with special educational needs (SEN)

(Florian & Hegarty, 2004; Johnson, 2014). There is an emerging broad consensus worldwide about the benefits that can be brought to school education through the appropriate use of technology. However, research also indicates that unless merged innovatively into classroom practice, they may be little more than devices which deliver repetitive curriculum content (Flewitt et al., 2014).

### **1.2.1. Preliminary study**

Against this backdrop, the researcher conducted a small-scale research project during the first year of doctoral studies. Considered as a preliminary study to this thesis, the project investigated specialist SEN teachers' pedagogy and use of the iPad® tablet with students having multiple learning difficulties, profound and multiple learning difficulties, and developmental disabilities in a special school in London. The mixed-method study provided valuable findings that described how the tablet was being incorporated within the classroom environment, and the resulting influences on student outcomes as experienced by their teachers. Outcomes of tablet-use included improved student attention, sitting tolerance and motivation. Moreover, the tablet provided students with an alternative learning environment which teachers utilised to support the consolidation of literacy and numeracy skills. The preliminary study also indicated that teachers require continuous professional training to support their development of effective technological pedagogies, especially in light of the continuously evolving field of technology.

## **1.3. The Maltese context and legislative background**

### **1.3.1. The Maltese education system**

Education in Malta is compulsory through age sixteen and is offered through the state, the church, and the private sector, with the majority of students attending state or church provision (European Agency for Special Needs and Inclusive Education, 2014). This study was conducted in state schools, and therefore the main focus of this introduction is state education.

Each state school has its own Head of School and staff, however, it forms part of a network with other schools, which together form a College. The aim of forming a networked system was to facilitate the pooling of resources and sharing of ideas and good practice (Ministry of Education, Youth and Employment, 2004). Each College has a Principal, who leads the whole network and provides direction. At the time of this research, all state schools formed 10 Colleges, which brought together primary and secondary schools of, on average, five localities on the island.

In 2009, a special school reform outlined initiatives within mainstream schools targeted at increasing inclusive practices and support for students with SEN within mainstream schools. These initiatives included the setting up of a Statementing Moderating Panel, the provision of various support services to facilitate access, such as psycho-social services, early intervention teachers and Learning Support Assistants. As a consequence to these measures, there was a considerable reduction in the number of students attending special provision.

Although students with SEN are generally included within the mainstream education system rather than in special schools, a number of special schools still hold a function. Such schools are nowadays termed Resource Centres, and also form part of the College system (Ministry of Education, Culture, Youth and Sport, 2009). There are four Resource Centres in Malta; one primary, two secondary and one for young adults. Each centre offers services to mainstream schools, as well as providing full-time education for only a small number of learners with very complex needs.

### **1.3.2. The introduction of a One Tablet per Child scheme**

The adoption of tablets in Maltese classrooms was driven by various factors. Firstly, Maltese schools are becoming increasingly characterised by children of diverse abilities, attitudes, socio-cultural and economic backgrounds (Ministry for Education and

Employment, 2014b). Secondly, Malta is facing high rates of student drop-out and low achievement in literacy and numeracy (36.3%) when compared to other countries in the European Union (The Malta Independent, 2012). It therefore became evident that policy-makers and educators needed to explore new pedagogies and learning tools which promote improved access to learning, personalised learning opportunities and positive one-to-one student-teacher relationships (Ministry for Education and Employment, 2014a). Technology is an integral part of the 21<sup>st</sup> century daily life, and many young children encounter and experience technology from birth. Tablet computers may therefore be considered as a potential medium for learning which students can easily relate to, but access to this form of technology had not taken place as readily in educational settings in Malta, until recently.

Globally, support for integrating tablets into classrooms has increased, and governments have commissioned research to use tablets in schools as national projects in order to enhance educational environments (Clarke, Svanaes & Zimmermann as cited in Kim & Jang, 2015). For Maltese students to continue building and improving their educational outcomes, the Ministry for Education and Employment (2014a) launched a 'One Tablet Per Child' (OTPC) scheme, with the aim of providing all students with an opportunity to be closer to technology, and consequently benefit from such a learning tool (Malta Digital Education Portal, 2016).



*Figure 1- One tablet /child scheme in Malta (Malta Digital Education Portal, 2016)*

In the 2016/2017 academic year, all Year 4 students and staff members were given a ‘LearnPad’, a tablet computer to be used for educational purposes both at school and at home (Fig. 1). The OTPC scheme began in September 2016, with teachers being given their tablet, together with a three-day In-Service course. Tablets for Year 4 students were subsequently given during December 2016 and January 2017 with the support of the Department of eLearning.

#### **1.4. Purpose and aims**

Being a Maltese citizen, the researcher followed training as an EP with the intention of practicing as a qualified practitioner in her home country. With this in mind, the researcher aimed to continue extending the preliminary study by delving deeper into the topic within the Maltese context, where the introduction of tablets is in its first year in schools. The researcher aimed to understand Year 4 teachers’ readiness for tablet technology in the classroom, the pedagogy being implemented with the use of the tablet, and the value it brings to the learning experiences of both typically developing students and those with SEN. Finally, this research aimed to explore teachers’ current professional development with regards to tablet implementation in Malta, in order to inform effective pedagogies,

training programmes and policies that support the successful integration of tablets in classrooms.

### **1.5. Relevance of research to the practice of an Educational Psychologist (EP)**

The British Psychological Society (2017) describes the work of an EP as extensive; a role which offers services to mainstream and special sectors relating to teaching and learning, behaviour and development. Work is carried out with children and young people, parents and carers, and educational staff. Broad aims of EP services include enhancing social inclusion, social and emotional wellbeing of children, young people and their families, and raising attainment.

The five core functions of EPs are defined as consultation, assessment, intervention, training and research (Scottish Executive, 2002). In this research, the EP's role will be seen in light of schools' increased use of technology and online environments aimed at improving learning outcomes. Such a development within schools is also reflected in the continually developing the roles of all educational professionals, including the EP.

This developing role for the EP can be seen in the emerging standards and competencies which are required from trainee EPs in order to gain certification as practitioners. Currently, two competencies reflect the EP's role with regards to the use of technology in schools:

- a) Criterion 1.6. from the Educational Psychology Standards of England, Ireland and Wales (The British Psychological Society, 2016) states that Trainee EPs need to **'demonstrate knowledge of school and systems structure, organisation and theory; general and special education; technology resources.'**;
- b) Criterion 14.33 from the HCPC Standards of Proficiency (HCPC, 2015, p. 22) states that Trainee EPs need to, **'be able to use information and communication technologies appropriate to their practice'**.

Furthermore, The US National Association of School Psychologists (NASP, 2010, p. 4) in defining the role of school psychologists, states that ‘School psychologists **use information and assistive technology resources to enhance students’ cognitive and academic skills**’.

These criteria and definitions demonstrate that EPs, being professionals who hold specialist and expert knowledge on learning and teaching, are required also to possess understanding about technology, and how it may bring about improved learning and academic outcomes for students. However, the topic of technology in education is not taught on the training programmes currently being delivered for EPs in the UK, or Malta. One of the reasons for this may be because very little is known about how technology can support the work of the EP, and how EPs can advise on the use of technology to bring about improved educational, emotional and social outcomes for all students, especially those with SEN. This is particularly true with regards to tablet computers, since they are rather recent innovations which some adult professionals have not yet experienced.

The researcher therefore hoped that this study would provide insight into this rather uncharted aspect within the wide role of the EP. As previously described, one of the core practices for EPs in schools involves consultations with teachers and school staff to support the development of learning environments that promote the academic, social and emotional wellbeing of students. Currently practising as a trainee EP, the researcher believes that the EP is in a valuable position and should have the capacity to support, assess and interpret a modern learning environment to help bring about effective learning. This study aims to shed light into the different technological pedagogies that support the learning of students in the classroom, especially students with SEN. In knowing more on the subject, EPs may be more inclined to discuss strategies and interventions related to technology when encountering difficulties related to attention, engagement, or attainment.

Another key function of the EP which is hoped to be further developed through this research is related to training. According to the BPS (2016), training provided by EPs for service

providers and educational establishments should be based on an assessment of learner needs in order to identify the most appropriate training and the most suitable way of conveying information. Such training should also be evaluated and followed-up to facilitate the utilisation of newly acquired skills in practice.

This research aims to capture the influencing demographic and contextual factors with regards to Year 4 teachers' readiness for tablets. Such results are aimed to provide a clearer understanding of the factors that would need to be addressed when introducing a technology or tablet-based intervention in mainstream classrooms. Whilst utilising research-based skills to carry out an assessment of teacher needs for training, EPs may also act as consultants on training programmes to encourage the use of technology amongst teachers, to support teachers in reflecting on their use of technology, and ultimately, to also support teachers in developing and improving their pedagogy and teaching practices.

### **Thesis structure**

Following this introduction, this thesis begins with a comprehensive review of the research in the area of educational technology, specifically with regards to the use of tablets in mainstream and special education. Within the literature review, current theory regarding the impact of technology on teaching, and the factors influencing successful technology integration will be explored, with an emphasis on CPD and teacher-training. The literature review will be followed by a presentation of the conceptual framework adopted in this study, which leads to a number of research questions.

The following chapter will present a description of the methodology used to address the research questions presented, outlining the research design, participants, instruments for data collection and related ethical considerations.

In the following chapter, the results of this research will then be described with reference to the data obtained from the mixed-method analyses undertaken.

The final chapter of this thesis will consist of a discussion of findings in relation to the literature and research questions investigated. Subsequently, implications for both future research and professional practice will be discussed, followed by a critical appraisal of the research in order to provide recommendations for future research and practice.

## **Chapter 2: Literature Review**

The use of technology to advance student learning in schools has been identified as a critical feature of 21<sup>st</sup> century education. Subsequently, research in the field of ICT and learning has been of great interest worldwide, and is constantly evolving since new technologies, devices and practices are increasingly being made available (Karagiannidis, Politis, & Karasavvidis, 2014). The purpose of this study was to explore the readiness of Maltese teachers to integrate tablet computers within their pedagogy, to explore their use of tablets within mainstream classes, and to gather their views on innovative, effective pedagogy that supports their continuous professional development in the area.

In order to fully comprehend the nature of the topic, it is important to understand the theory and current literature on the effectiveness of tablets as a teaching tool and their use amongst teachers and students, including those with SEN. It is also fundamental to understand the role of teacher training and Continuous Professional Development (CPD) in developing effective pedagogy.

### **2.1. Chapter overview**

This literature review begins with an explanation of the literature search strategy. This is followed by an understanding of the use of technology in education, in both mainstream and special schools. This chapter will provide insight into the research evidence for the effectiveness of tablets on student outcomes. Moreover, this review will also explain the concept of teachers' readiness for the pedagogical use of tablet technology, and the influencing factors. In addition, this chapter provides an understanding of the theoretical underpinnings for a measure of teacher readiness for technology, which was adapted to fit in with the research questions addressed in this study. Teacher training has been found to greatly influence teachers' use of technology in the classroom (Jung, 2005; Prasertsilp, 2015), and therefore this topic was considered pertinent to explore. Finally, a chapter summary is presented at the end of this chapter.

## **2.2. Literature search strategy**

The strategy used to search the literature varied since a range of techniques was utilised; several databases were searched to identify peer-reviewed, full text articles relating to the topics. Keywords included *tablets, teaching, learning, tablets in classrooms, special education, readiness, pedagogy and CPD*. Some of the database searches included ERIC, ProQuest, PsyINFO, PsyARTICLES, ESCOHost, the Web of Science and the British Educational Index. Additional resources such as work carried out by agencies and organisations focused on the use of technology for learning were located using the UCL Institute of Education library database. In addition, the reference sections in relevant articles were examined for additional applicable studies which were subsequently located through the UCL Institute of Education library database. Other search techniques included accessing Google Scholar and reading hard copies of articles and books. Throughout the process, literature was revisited to search for deeper understanding of a number of concepts as they developed.

## **2.3. Technology in Education**

Educational technology is the broad term used to define the practice of utilising technology to facilitate learning and teaching, with the aim of amplifying students' performance, teaching effectiveness, as well as teachers' productivity (Ismail, Bokhare, Azizan, & Azman, 2013; Januszewski, Molenda, & Association for Educational Communications and Technology, 2008; Labrie, 2015). Effective use of educational technology may also bring about improved student achievement by producing new opportunities for self-directed learning (Ismail et al., 2013) There are many kinds of educational hardware technology used in present-day schools, including desktop personal computers (Flewitt, Messer, & Kucirkova, 2014), interactive whiteboards (Fakazi, 2011), SMART tables (Olive, 2013), smart phones (Mintz, 2013b, 2013a) and tablet computers (Bonds-Raacke & Raacke, 2008;

Butcher, 2016; Ditzler et al., 2016; Neumann & Neumann, 2013). Given the focus of the study, tablet computers and their software will be explored in further detail.

### **2.3.1. Tablet computers**

Tablet computers have become popular in classrooms, as they do not only appeal to students as they fit their lifestyle, but they also claim to have great potential in improving students' learning experience (Karsenti & Fievez, 2013). When comparing the tablet to other types of educational technology, many consider it to be educationally functional for various reasons; it is portable, light-weight and most importantly its software supports a multitude of educationally-oriented Apps, which, once downloaded, help to adapt the device to differentiate content according to students' needs (Draper Rodriguez, Strnadová, & Cumming, 2013; Hutchison, Beschorner, & Schmidt-Crawford, 2012; Milman, Carlson-Bancroft, & Vanden Boogart, 2014).

Research into the successful use of tablets indicates that students become more organised, and teachers are able to post educational material online allowing easy access (Labrie, 2015; Leonard, 2013). Moreover, tablet-based textbooks are becoming increasingly available, possibly replacing hard copy textbooks in the future. However, transition to using technology has also presented difficulties, such as unlimited access to the internet leading to students using the technology for social media and leisure activities (Leonard, 2013).

Research and planning need to occur to ensure the smooth integration of technology in ways that are both cost-efficient, and educationally effective for the school, its students and teachers. As expected, research on tablets in education is fairly new, as many schools in the UK and America only started implementing and using tablet technology in 2011 (LearnPad, 2015). Since then, research on the area has begun to emerge, and although the evidence base is still considered to be limited, it is continuously developing.

### 2.3.2. The Application (App)

The App market is continuously proliferating at an astonishing rate. Within the first three years of introducing the iPad®, over one million Apps became available (Statista, 2015). A top-selling Apps analysis within the Apple iTunes App Store showed that 80% of the Apps within the Educational category target children, ranging from toddlers to high-school age (Shuler, Levin, & Ree, 2012), indicating that there is a growing market for Apps for children. The preliminary study provided insight into examples of learning Apps that teachers used for teaching literacy (*Hairy Letters*), Maths (*Primary Maths*) and communication (*Choose it maker*). Amongst a huge selection of Apps, teachers and educators must be able to differentiate Apps, evaluate their educational use and reflect on whether it is meeting the child's needs or goals.

For this reason, Walker (2011) and Van Houten (2012) created a uniform system to help guide teachers' App choices and to provide an objective review method. Useful characteristics of Apps included curriculum connection, usability, engagement, customisation, levels and age-appropriateness (Van Houten, 2012; Walker, 2011). Although seemingly very useful, teachers' opinion about the usefulness and impact of the resources on educational outcomes are not documented.

Although there are studies that explore the educational value of Apps (Falloon, 2013; Raths, 2013), these studies have failed to examine users' perspectives on the educational value and effectiveness of the technology (Ditzler et al., 2016). Rather than compiling a list of the educationally relevant applications for tablets, it has been proposed that whenever possible, researchers should encourage learners to choose and try Apps, or hold discussions with learners about how and what learning outcomes may emerge from certain Apps in order to inform what and how those technologies are to be incorporated in lessons (Maich & Hall, 2016; Peluso, 2012). Such practices are not evidenced within Maltese schools, and

while teachers should be given control of which Apps to adopt in their lessons, feedback and direct involvement from students should be encouraged whenever possible.

## **2.4. Impact of tablet technology**

Technology advancement has made a significant impact on the learning environment and learning practices in 21<sup>st</sup> century classrooms. There is little argument that technology has changed classroom teaching through, for example, increased student motivation and additional opportunities for differentiated learning (Lambert, 2015). Modern classrooms include children with a variety of learning aptitudes and abilities. With this in mind, this literature review will focus on studies of tablet technology and its use and effectiveness within both mainstream and special educational settings. Although both have been explored in research studies, there is a dearth of research into the effectiveness of specific tablet interventions amongst students with special educational needs.

### **2.4.1. Tablet use in mainstream inclusive settings**

Tablets offer many advantages to both the class teachers and their students if the software is well-designed and the content is grounded in a solid, well-constructed curriculum that is appropriate for the child's developmental stage (Kucirkova, 2014).

Karsenti & Fievez (2013) questioned 6,057 students about their views regarding the benefits of tablets. Students chose portability as their most highly regarded benefit, followed by access to information, quality of presentations, creativity and motivation. Flewitt et al. (2014) researched the tablet's potential in teaching early literacy within diverse educational settings. Teachers in mainstream classes commented on children's increased collaboration and communication. When using the tablet, students shared activities, took turns and supported each other's learning.

According to Pitchford (2015), tablets can deliver one-to-one interactive instruction, with clear objectives, in a consistent manner to all children, thus increasing teaching quality.

Moreover, students can repeat material as often as they need, thus providing them with a tailored learning pace. Teachers may monitor individual progress objectively and easily using assessments built into the software. For example, *Kahoot!*, is an online website that allows teachers to create game-based online quizzes and surveys for students to carry out on their mobile devices (Johns, 2015).

Svanaes & Clarke (2012) explored teachers', parents' and pupils' experiences and perceptions of tablets in three secondary schools in the UK and Ireland. Students responded well to the tablet, and found learning to be fun and creative. Consequently, they were found to be less disruptive in class, collaborated more with their peers, and felt closer to their teachers as a result of improved feedback. Teachers' perceptions were also positive, as many felt that mediation of learning became increasingly facilitative and student-led rather than instructive. Teachers were able to use the tablet with students with SEN, and found that this benefitted them greatly as they could easily monitor their progress and provide feedback appropriately (Svanaes & Clarke, 2012). However, the pedagogy and teaching methods utilised to facilitate the process of tablet integration was not explored, and therefore the effective practice delivered could not be disseminated.

Svanaes & Clarke's (2012) study explored possible restrictive factors, including technological infra-structure, maintenance, cost and lack of teacher training. Parents in the study showed initial concerns on the cost, potential breakages, safety and theft of the devices, but eventually built trust in the system. However, parents remained concerned about excessive use of the tablets, indicating the need for schools to support parents in setting boundaries for their children's digital use at home.

Although research into the effectiveness of specific tablet interventions is sparse, one such study is provided by Pitchford (2015). A randomised controlled trial presented evidence for the effectiveness of a tablet-based intervention made up of four different Apps to support mathematical ability in a primary school in Malawi. Students who benefitted from

the tablet intervention showed improved, transferrable mathematical skills when compared to students who experienced normal, instructional classroom practice. Although this study was conducted in only one primary school in a developing country, the methodology adopted does give evidence that a tablet-based intervention can support the development of mathematical skills in primary school children. Moreover, the study also indicated that for tablet interventions to be effective, they should involve the coupling of technology with well-designed, curriculum-based, engaging software that allows students to work at their own pace (Pitchford, 2015).

Tablets have also been described as a supplementary educational resource which provides new opportunities and experiences for lower-performing students, who may have limited access to ICTs. Kim & Jang (2015) studied student engagement in tablet-based interactive classrooms and explored the activities which students carried out using the tablet. The activities cited include searching the internet, drawing, sharing information, team activities, gaming, watching videos, solving math problems, editing pictures, searching a dictionary, taking a quiz and reading e-books. Within such an interactive environment, students who demonstrated a desire to learn with tablets experienced improved self-efficacy for learning, and consequently improved their beliefs about their future goals and choices. Although this research sheds light on the positive implications of tablets in supporting student motivation and views of themselves as learners, it does not take into consideration school environmental factors. For example, it failed to control for, or explore teachers' role in providing guidance and supporting students' emotional well being and self-perceptions.

#### **2.4.2. Tablet use with students experiencing SEN**

Technological innovations such as the tablet, have also provided learning opportunities for students who need additional support in the classroom, and students with SEN (Florian & Hegarty, 2004). The term 'special educational needs' has varying meaning amongst different people in different places (Florian & Hegarty, 2004). For this research, SEN was

defined as applying to a student who has a learning difficulty or disability which requires the need for special educational provision;

*“A child of compulsory school age or a young person has a learning difficulty or disability if he or she has a significantly greater difficulty in learning than the majority of others of the same age, or has a disability which prevents or hinders him or her from making use of educational facilities of a kind generally provided for others of the same age in mainstream schools or mainstream post-16 institutions”* (Department for Education & Department of Health, 2014, p. 15-16).

Although there is various literature regarding the use of tablets in mainstream classrooms, literature about their use in special schools is less available, but is continuously evolving. Innovative ICTs are responding to SEN, opening new opportunities for participation and inclusion in the curriculum and school culture (Corkett & Benevides, 2016; Florian, 2004; Mintz, 2013a). The tablet is increasingly used with children experiencing SEN as it seems to be socially accepted, and thus less stigmatising when used for example, as a technological aid such as a form of Assistive Technology (Ismaili & Ibrahimi, 2017) or Speech Generating Device (SGD) (Kagohara et al., 2012). Also, the tablet’s touchscreen design and screen size are well-suited for students with poor fine motor skills or limited vision (Riley, 2013).

Kagohara et al., (2013) conducted systematic reviews of studies which used a tablet in teaching programmes for individuals with Autism Spectrum Disorder (ASD). Participants within these studies enjoyed using the tablet and also preferred it over other low-tech options. Results suggest that individuals with ASD may be taught to use such a device to enhance academic, communication, social and transitioning skills.

Similarly, Kagohara et al., (2012) carried out experimental designs using the tablet as an SGD. The two participants with ASD were presented with eighteen photographs from a

book, and asked to identify the subject in each image. Participants had to name the photographs by selecting corresponding items from the tablet which generated speech-output. Both participants successfully named six photographs following five and six sessions respectively. Although this study indicates that students with ASD can successfully make use of a picture-naming exercise using the tablet, it did not have a control sample using traditional SGDs. In addition, a sample of two participants is very small and therefore findings cannot be generalised. Flores et al. (2012) suggest that a tablet communication system may be as good as, or better than, picture-based communication systems (such as PECS) with children having ASD, multiple disabilities, or intellectual disability. However, the setting in which the study took place was experimental and different from a typical school setting, possibly affecting student behaviour and motivation. Moreover, participating students were already skilled in traditional picture exchange, and may have already mastered the basic skills necessary to engage in such a task.

Flewitt et al. (2014) observed tablet use for literacy in special schools for learning disabilities. Compared to computer keyboards, the tablet supported reading independence as students could harness the device with better ease and mobility. Teachers commented on the tablet's potential for engaging children in their work, and how interactive Apps heightened their concentration levels, creating enjoyable and flexible learning experiences. This study is supported by Cumming & Draper Rodríguez's (as cited in Rodríguez, Strnadová, & Cumming, 2014) findings of improved engagement in four students with language-based difficulties, who required fewer prompts to stay on task when using the tablet.

Research exploring tablet use with students in mainstream and SEN classrooms is continuously evolving and current findings provide suitable evidence of potential educational benefits. Evidence also indicated that in order for tablets to be effective within mainstream and special classrooms, teachers must carefully execute, and appropriately

synthesise the technology into the learning environment (Florian, 2004; Rodríguez et al., 2014). This therefore implies new teacher roles, new pedagogies and new approaches to teacher education (UNESCO & Microsoft, 2011).

## **2.5. Inclusive education**

In recent years, the concept of inclusion or inclusive education has emerged as a more equitable approach to meeting the needs of all learners. Children with SEN in Malta are generally placed within the mainstream education system rather than in special schools. An Inclusive Education Policy (European Agency for Special Needs and Inclusive Education, 2014) is in place and students with SEN are assigned a Learning Support Assistant (LSA) together with additional support services from specialised teams when these are required. Audit data indicated that various system factors led to schools being only partially enabled to implement inclusive education effectively, as an integrative approach was found to be adopted for some learners, rather than an inclusive approach for all learners.

As a model for addressing SEN, schools require the elimination of barriers to enable full participation in education (Florian, 2004). ‘Inclusive’ education differs from previously-held philosophies of ‘integration’. Whereas ‘integration’ focuses on helping students with disabilities to ‘fit in’ to the mainstream classroom, inclusion emphasises the skills and resources available within mainstream schools that allow the school to adjust to the pupils’ needs (Plaskett, 2015).

Although ‘inclusion’ is a rather ambiguous and debatable concept of which there exist a variety of definitions, it fundamentally focuses on changing values, attitudes, policies, practices and pedagogy within a school in order to promote increased participation and decreased exclusion of vulnerable students (Ainscow, Dyson, & Booth, 2006; Florian, 2004; Polat, 2011). For educational practices to foster ‘inclusion’, all key stakeholders of the school community must seek to respond to diversity (Polat, 2011).

Inclusion is not without its critics. As noted by Graham & Slee (2008), ‘inclusion’ does not necessarily guarantee inclusiveness in practice due to the assumptions related to identity, difference and academic trajectories that drive policy. The trend towards inclusive education and a more inclusive society has consequently received criticism, not only because of the ambiguity of governmental definitions, but also for their understandings of the concept of inclusion.

With such tensions in mind, it has been suggested that technology may act as an equalizer, meaning that for many students with SEN, technology can serve as means to overcome or compensate for differences, creating conditions for greater equality of opportunity and participations in the curriculum (Ditzler et al., 2016; Florian, 2004; Glaeser, 2016). However, providing access to technology in schools is not the same as making sure every learner has equal opportunity to learn; access for all students may require adaptations to accommodate different learners, and it is here where one may differentiate between the previously discussed concepts of ‘integration’ and ‘inclusion’; it is here that one questions whether inclusive practices and education for all are in fact being promoted.

## **2.6. Learning and teaching within the 21st Century**

A critical component for successful technology integration is how teaching and learning strategies are implemented when using the technology (Ditzler et al., 2016). As previously discussed, various studies have shown that the integration of ICTs such as tablets in education can yield great rewards, and support the teaching and learning process (Kim & Jang, 2015; Pitchford, 2015; UNESCO Bangkok, 2011). Teacher roles in the 21<sup>st</sup> century are described by Johannesen & Eide (2000), who state that “technology will never be able to make the teacher redundant, but make the teacher’s role different”. Research has demonstrated a greater emphasis on teacher preparation and skills needed to use technology effectively to deliver interesting material, to adapt and develop their pedagogy in a rapidly developing era. Moreover, the UNESCO ICT Competence Framework for Teachers

(UNESCO & Microsoft, 2011) states that “teachers need to be able to help the students become collaborative, problem-solving, creative learners through using ICT so they will be effective citizens and members of the workforce”.

Literature stresses that in any educational setting adopting technology integration, the use of technology alone will not necessarily bring about the expected positive change and progress in learning (Karsenti & Fievez, 2013; Kucirkova, 2014; Ren, 2014). This is what Perkins (Loveless, 2011) termed the ‘finger-tip effect’; tools and multimedia do not automatically translate into higher quality learning and motivation, but rather, good pedagogy must be coupled with the technology to bring about desired changes (Clark & Feldon, 2005; Laurillard, 2012). Indeed, these technological innovations and advancements make teachers review their position and role in the classroom, as they assess which strategy is best to engage their students in learning (Laurillard, 2012).

It is therefore evident that teachers play a multi-faceted and crucial role in integrating these learning technologies; they must also become learners themselves in order to meet the challenges brought about with new technologies (Pullicino, 2012). Teachers need to be equipped with 21<sup>st</sup> century teaching and technological competencies; the skills needed to promote a learner-centred classroom, learn about new technologies, collaborate with other teachers, promote project-based learning and most importantly, develop the capacity to keep learning (Palmer, 2014).

### **2.6.1. Developing innovative pedagogies through ICT**

Mellar et al. (2007) developed and tested ICT-based pedagogy through monthly meetings with teachers and development officers who visited teachers individually in order to develop and extend their pedagogy. Reflective diaries and intervention plans were discussed monthly in order to assess progress being made. Results indicated that teachers found ICT motivating, particularly mobile devices, such as tablets or mobile phones, since they enabled greater flexibility in teaching, and provided the opportunity to move learning

outside the classroom. Mellar et al. (2007) presented the CAVA model, which highlights four guiding pedagogical design principles that are considered to bring about effective teaching and learning through the use of ICT:

1. Collaborative learning that goes beyond simply allowing learners to work together, but rather to develop appropriate ways for learners to work effectively and collaboratively;
2. Learner autonomy provides teachers with increased time to get to know their learners better in order to adapt their teaching more carefully to learners' needs;
3. The use of a variety of technologies, especially mobile devices in order to increase teaching and learning flexibility;
4. The construction of artefacts, which allows learners to experiment and results in a differentiation in activities.

A limitation of this research was the small sample size (nine tutors); however a case study of such depth could not have been conducted with a much larger sample. Although this study was carried out in further education provision, it may be argued that when providing insight into pedagogy, effective practice may be transferred and adapted across different settings and populations of students. This model has therefore formed a basis for this study, and has informed the research questions and analysis of this study, with the aim of exploring tablet-based pedagogies within mainstream primary classrooms in Malta.

### **2.7. Teacher readiness to integrate tablets into pedagogy**

What establishes pedagogy is complex and not easily defined (Cogill, 2008). Watkins & Mortimore (1999), define pedagogy as 'any conscious activity by one person designed to enhance learning in another' (p. 3). Loveless (2011), considers also the influence of technology, and develops a contemporary understanding of pedagogy as a 'relationship, conversation, reflection and action between teachers, learners, subjects and tools' (p.301).

The successful integration of ICT into the classroom will depend on the teacher's ability 'to structure the learning environment in new ways, to merge new technology within a new pedagogy, to develop socially active classrooms, encourage co-operative interaction, collaborative learning and group work. This requires different classroom management skills (UNESCO & Microsoft, 2011, p.12). It is therefore clear that ICT competencies alone are not enough, but teachers need to help students become collaborative, problem-solving, creative learners through using ICT so they will become more effective citizens and members of the 21<sup>st</sup> century society. In order to have successful technology-enhanced learning, teachers must adapt and redefine their professional role accordingly.

The Stellenbosch Declaration (Shrum, Benson, Bijker, & Brunnstein, 2007) claims that our current society has led to the evolution of the teacher's role, demanding new specific competencies and pedagogies to access, and deal with knowledge, with a networked world and with new types of cooperation and collaboration, and with lifelong learning. For some teachers, possessing the relevant knowledge, confidence and beliefs is enough to empower them to integrate technology into their classrooms in meaningful ways, in spite of multiple barriers (Ertmer, Gopalakrishnan, & Ross, 2001).

However, research has also revealed that for the vast majority of teachers, their competency to shift their conception of technology and its integration in the teaching-learning process is hindered by factors such as lack of personal experience in using technology and confidence levels, ability to choose and use technology, their beliefs, affect and attitudes (Ertmer, 2005; J. Lambert, Gong, & Cuper, 2008; Tipton, 2015). Consequently, many teachers may be attempting to incorporate the technology into their classroom without having a clear understanding of the implications for learning (Peluso, 2012). It is here that one questions whether teachers are ready to integrate the tablet into their pedagogy. Are they prepared to evolve and make a paradigm shift in their conception of technology and its integration in pedagogy?

According to Merriam-Webster (n.d.), the word ‘ready’ means “prepared mentally or physically for some experience or action”. In this research, readiness for technology is defined as teachers’ propensity to embrace and use tablets for accomplishing goals in the classroom, and to engage in self-development and CPD. Parasuraman (2000) further explains how technology-readiness results from a gestalt of mental enablers and inhibitors that contribute to a person’s inclination to use new technologies. When discussing technology-readiness amongst teachers, literature has also identified systemic influencing factors (BECTA, 2004; Eickelmann, 2011; Tipton, 2015; Zhao & Frank, 2003).

## **2.8. Models assessing readiness for ICT**

Various studies, mostly from organisational and commercial sectors, aimed to develop measures of eLearning or ICT readiness in order to adjust and improve their policies and strategies to create training that fits in with their employees’ needs (Pullicino, 2012). These measures have continuously developed over the years, aiming to capture the true essence of readiness for ICT in schools settings (Bonanno, 2011; Pullicino, 2012).

Initially, instruments developed to measure teachers’ eLearning focused on the assessment of hardware and software availability, accessibility to the internet and ICT-related skills – the underlying assumption being that competence in using ICT and applications led to effective use of digital tools in teaching and learning (Bonanno, 2011). However, later studies about technology (e.g. Shrum, Benson, Bijker, & Brunnstein, 2007) led to increased awareness that using technology effectively involves more than technological competence alone, but rather a combination of many interacting variables.

Table 1 summarises the dimensions measured by four key instruments aimed to assess teachers’ readiness for eLearning or technology-enhanced learning:

1	Hannafin & Land (1997)	Psychological Pedagogical Technological Cultural Pragmatic
2	Chapnick (2000)	Psychological Sociological Environmental Human resources Financial readiness Technological skills Equipment Content readiness
3	Hadjiathanasiou (2010)	Technological readiness Pedagogical readiness Psychological readiness
4	Bonanno (2012)	Epistemological readiness Pedagogical readiness Technological readiness Environmental readiness Psychological readiness Learning Design

*Table 1 - Instruments assessing teacher readiness of technology-enhanced learning / ELearning*

The latest instrument, developed by Bonanno (2012) synthesised the differing factors which were proposed by prior studies (1-3 in table X), in order to create a 6-dimensional model that combined the commonalities of the major instruments developed prior. For example, Hadjiathanasiou (2010) assessed readiness for technology-enhanced learning by considering the technological, pedagogical and psychological readiness of teachers. However, it failed to consider the environment and cultural aspects within the school environment; a dimension which was discussed by Hannafin & Land (1997) and Chapnick (2000) as highly influential with regards to teacher readiness. Bonanno (2012) considered the strengths of each study, to combine a comprehensive model that addressed the variety of dimensions applicable to the school context.

The Bonanno (2012) survey instrument is based on the transformative conception of teachers' competence; the continual need to customise training programmes to the ever-changing needs of teachers, together with the continuously-evolving digital environment and culture. Although this survey has not been piloted on a large population (Pullicino, 2012), its strong theoretical basis through the combination and elaboration of prior models, and the fact that it was constructed specifically for Maltese teachers, makes it suitable for providing insight into Maltese teachers' training needs.

The survey developed by Bonanno (2012) is divided into six sections, each comprising of a number of statements to be scored mostly on a 5-point Likert scale to explore the different aspects of the dimensions: (1) Epistemological readiness, (2) Pedagogical readiness, (3) Technological readiness, (4) Environmental readiness, (5) Psychological readiness, and (6) Learning Design. Each of these dimensions will now be considered in more depth:

(1) *Epistemological readiness*: New technology in education involves new teacher roles, new pedagogies and assessment procedures. More fundamentally, new technology creates the need for new approaches to teacher education. Teacher learning would need to be oriented toward supporting the realization of the potential of ICT in Education, to foster students' digital literacy skills, to support 21<sup>st</sup> Century skills and to promote teacher learning beyond knowledge (Law as cited in Bonanno, 2012). Consequently, ICT integration needs to be considered as an innovation, a transformation. According to the UNESCO ICT CFT (2011), successful integration of ICT depends on teachers' ability to structure the learning environment in new ways, to merge emerging technologies with new, collaborative learning and group work.

(2) *Environmental readiness*: Brinkerhoff (2006) described a variety of obstacles relating to resources, institutional and administrative policies, attitudes and professional development opportunities which had a strong impact on the success or failure of ICT integration. ICT integration flourishes in an institutional environment equipped with

policies that promote pedagogical practices inspired by the acknowledged epistemological principles. Appropriate administrative and logistical frameworks are necessary to guide personal and collective development, promote innovative pedagogical practices and assessment procedures.

UNESCO & Microsoft (2011) conceptualize four environmental scenarios depending on the school's specific stage of development characterized by specific philosophies and policies. Initially at the 'emerging approach', students are taught by individual teachers who have the technical competence to utilise the curriculum to provide opportunities for students to apply their acquired technology skills in some specified learning contexts. The school advances to the 'infusing approach' when all teachers share the vision of bringing about new learning opportunities to students through ICT integration. This demands teachers to possess technical and pedagogical skills in the relevant subject areas, as well as collaborative, cross-curricular uses of ICT. A school reaches the most advanced stage, the 'transforming approach', when it is ready for, and committed to make use of ICT to achieve future visions. At this stage, the curriculum provides differentiated and individualized learning opportunities for students, where learners have to take responsibility for their own learning and contribute to solving real-world problems. The teacher has to be a lifelong learner, integrating theory and research with practice, show leadership both in innovation and in leading the school to become a learning community. At this stage, professional development is a self-managed, continuous, reflective process.

(3) *Technological readiness*: Technological advancements have provided easier access to information, creating innovative learning systems. Availability does not automatically result in implementation - when a new technology is applied for educational purposes, teachers mould it to fit traditional approaches (Hannafin & Land, 1997). Aydin, & Tasci (2005) reviewed studies that show that teachers may be uncomfortable and resistant to technology, and unless this is taken into account promptly, the system may not

succeed. It is therefore fundamental to improve teachers' understanding of the new system in order to support implementation. In this way, teachers can discover the full beneficial uses that technology makes possible in teaching and learning.

According to AICTEC (2008), educators need to be supported in developing the required ICT competencies in order to enhance 21<sup>st</sup> Century student learning outcomes by effectively and ethically incorporating ICT into their pedagogy, and collaborating in the creation of flexible learning environments. Teachers should therefore be competent at performing basic hardware and software operations, and must be knowledgeable about a variety of specific tools and applications that are to be used flexibly in a variety of teaching-learning scenarios, such as the internet (Aydin, & Tasci, 2005).

(4) *Pedagogical Readiness*: Without a clear understanding of pedagogy, learning and teaching will be driven by what the technology makes possible, rather than what learners need (Laurillard, 2012). It is not the technology itself, but the pedagogy that determines the effects on learning (Collis, 1996). New technologies can transform the teaching-learning process, and thus teachers need to be skilful in designing and managing different technology-mediated pedagogies and their subsequent new roles and conditions in connection to the newly available technologies.

Educational technology favours a constructivist approach to learning, where learning material is targeted to the learner, facilitated by additional guidance and instruction by the teacher (Tavangarian, Leybold, Nölting, Röser, & Voigt, 2004). In order to execute such practice, it is assumed that teachers are well-prepared and able to use the new technologies (Pullicino, 2012).

(5) *Psychological Readiness*: This intra-individual, psychological dimension is perhaps the strongest determinant of one's readiness to integrate technology in personal and professional practice (Bonanno, 2011). Chapnick (2000) describes psychological

readiness as “the individual’s state of mind as it impacts the outcome of the e-Learning initiative”. This includes teachers’ personal beliefs and attitudes about technology - a cognitive and affective evaluation of digital tools determines one’s use of technology leading to either engagement or resistance/avoidance behaviours (Selwyn, 1997). Influenced by the Technology Acceptance Model (Davis, 1989), this dimension considers teachers’ extent of perceived usefulness or whether a particular tool will boost personal learning, perceived ease of use or control, or the extent to which they believe that using a particular tool will be free of cognitive effort. All these beliefs influence attitudes, which lead to behaviour towards a particular technology (Siragusa & Dixon, 2009).

(6) *Learning Design Readiness*: Technology brings about a two-way exchange of knowledge in the classroom (Laurillard, 2012). Teachers, nowadays also referred to as “learning designers”, need to be increasingly competent in developing a student-centred, collaborative approach to learning (Donaldson, 2015). This implies that teachers need to provide innovative learning designs, grounded both in students’ learning needs and the realities of their real-world experiences. Considering the labels “Net Generation”, “YouTube Generation” and “Generation M (Media)”, many students are highly skilled at navigating digital tools (Donaldson, 2015). Whether named teachers or learning designers, staff need also to adapt learning to fit the students’ diverse learning styles. An individual’s best learning-mode depends on processing style, context, task, and other factors. Learning designers who want to be optimally effective must take all of this into account (Donaldson, 2015).

The six readiness domains; *epistemological, environmental, technological, pedagogical, psychological* and *learning design* provide a wide exploration of the various factors that contribute to a teacher’s preparedness to utilise technology, such as tablets, in their classrooms. Whilst Bonanno’s (2011) instrument has been piloted to assess Maltese teachers’ readiness for TEL and Interactive Whiteboards (Pullicino, 2012), a measure of

Maltese teachers' readiness for tablets has not yet been conducted, as tablets have only recently been introduced in Maltese schools.

## **2.9. Continuous Professional Development (CPD) in Malta**

CPD has been defined as 'the continuation of a teacher's professional development beyond their initial training, qualification, and induction' (Stevenson as cited in Mitchell, 2013).

CPD is commonly associated with teachers receiving training related to instructional programs or teaching strategies, with the aim of learning new information, improving pre-existing skills or creating new ones to improve student learning and reform schools (Broad & Evans, 2006; De Vera, 2015).

Attard Tonna (2012) explored teacher professional learning, and explained how CPD in Malta typically took place as a response to systemic needs such as policy and reform development. CPD in the form of INSET (in-service training) is typically a one-off or short course, where a specific group of teachers are trained together. Attard Tonna (2012) found that such CPD frequently takes place with no research to justify the needs or to evaluate its effectiveness. Consequently, teachers criticise this approach as they did not feel sufficiently supported, and the ad hoc training provided did not form part of a national, long-term plan of professional learning. Moreover, it was noted that training took place at a time when changes were already taking place, and the teachers concerned could note a 'crisis management' approach to the way training was organised, being intended to ward off criticism of the reforms rather than to develop necessary skills. It was hence suggested that a more consistent, nation-wide and sustained strategy be applied. A legislative and self-regulatory structure can establish a nation-wide framework for professional development, including the accreditation of professional development programmes.

Given the limitations put forward by participants in the study, Attard Tonna (2012) concluded that CPD in Malta needs increasingly to consider the impact of school contexts on the quality of outcomes of teacher professional learning, and that networks, teacher

dialogue and reflection need to be supported and endorsed. Moreover, CPD provision in Malta needs to involve teachers in more active forms of learning and provide time and opportunities to reflect. Finally, CPD in Malta must also build strong links between all school stakeholders and training should be aligned with policy, national standards and assessments.

### **2.9.1. Framework for the development of effective CPD**

The European Commission (2013) identified that teacher competency development and CPD are crucial within the 21<sup>st</sup> century, as many initial teacher trainings did not present the tools and technologies that teachers need to utilise in today's classrooms. Moreover, the report highlighted that teacher training and CPD should not develop in isolation of educational policies, assessment and evaluation, but rather develop within a conceptual competence framework which presents a clear purpose, teacher ownership, and an implementation that leads to improved competencies.

CPD and teacher training should have a clear perspective; what needs are being addressed, whose needs are being addressed (e.g. teachers, students), and the expectations of the different stakeholders (European Commission, 2013). It is important for all parties involved to understand the potential consequences and to surface existing tensions.

When aiming to develop a framework for teacher competence, ownership is an important factor that needs to be considered (European Commission, 2013). The stronger and deeper the involvement of a significant proportion of teachers at all stages of the development process, the more likely it is that they will feel ownership and accept the outcome. Teacher involvement implies more than merely informing and consulting teachers, but rather a culture of teacher self-evaluation, teacher reflection and teacher professionalism. Ownership can be promoted by having a clear educational leadership at all systemic levels, consensus about the change being implemented, circles of consultation and several

opportunities for involvement and ensuring that teachers' involvement in the process is facilitated.

Throughout the process, an assessment of teachers' competence is important as it can raise teachers' awareness of the need to develop his or her competences (European Commission, 2013). This may lead to improvement in competencies, and help to achieve excellence. It can also develop trust in the workforce and can facilitate timely intervention. Assessment of competence may also support teachers' development through formative or summative (monitoring) procedures such as self-assessment, written reflections, individual development plans, classroom observations or videos.

In conclusion, the (European Commission, 2013) highlighted that professional development should entail much more than attending a course, and must comprise a wide range of formal, non-formal and in-formal learning activities over which teachers feel ownership. It is important that all teachers are encouraged to reflect on their own experiences and experiment with new approaches and learn from failure.

### **2.9.2. CPD models**

The literature presents various classifications of CPD. Lieberman (1996) classified CPD into three categories: direct teaching, learning in schools, and out of school learning. In a more comprehensive approach, Kennedy, (2005) presented nine key models, and explored their capacity for professional autonomy, transformative practice and the forms of knowledge that can be developed. The models identified are; The Training Model, The Deficit Model, The Cascade Model, The Standards-Based Model, The Coaching-Mentoring Model, The Community of Practice Model, The Action Research Model and The Transformative Model.

Recent literature has turned interest towards Online Professional Development, which originated from the need for professional development programs that accommodate

teachers' busy schedules while providing real-time, ongoing support (De Vera, 2015). One of the strengths of such a model is freedom and autonomy for learners to learn at their own pace.

The role of a collaborative professional culture in schools is an important but under-researched aspect of CPD. Norwich & Eaton (2015) evaluated Teacher Support Teams (TSTs), an organised system of peer support that consists of a small group of teachers who in strict confidentiality, voluntarily problem solve and discuss the concerns of another teacher. In TSTs, teachers share expertise between themselves, rather than some teachers acting as experts to advise others. Although the researchers were unable to monitor the impact of support on teachers' well-being, results showed that TSTs were successful in some schools. The main challenge in adopting such a system was the schools' high preparation requirements and consequent time restrictions. Similarly, Mellar et al. (2007) implemented the use of teaching buddies, who through collaborative working and peer support became more independent, confident teachers willing to try out their own ideas and strategies, to discuss their practice and to share ideas. Research on partnership teaching (Bourne and McPake, 1991), advisory/support teaching (Biott, 1991), individual support teachers (Dyson, 1990; Garnett, 1988 cited in Norwich & Eaton, 2015) have all highlighted the benefits of bringing teachers with different expertise together.

The impact of infrequent, poorly designed or inadequately delivered approaches to teachers' professional development is evident in the literature (Broad & Evans, 2006). Approaches dominated by 'a one size fits all' orientation to learning are in many ways unproductive, costly, and have been shown to result in no significant change in practice when teachers returned to their classrooms (Warren-Little, 1999). An ineffective professional development approach provides limited opportunities for collaboration and sharing of understanding between peers, acting as a barrier to teachers' self-efficacy (Skoretz & Childress, 2013).

Understanding how adults learn is considered fundamental to designing pedagogically sound training for teachers (Wolf, 2006). Adult learning theories, otherwise known as andragogy (Knowles, 1970), indicate that adults learn best when they are self-directed, when new knowledge is built on pre-existing knowledge and expertise, when intended outcomes are clearly identified and are modelled on effective teaching and learning strategies (BECTA, 2010). Malone & Smith (2010) advocated a move-away from the isolated workshop, towards a professional development model that is ongoing and gives teachers opportunities to collaborate with their peers, share practices and knowledge, reflect on their pedagogic practices, and focus on student learning.

### **2.9.3. CPD addressing teachers' tablet use**

CPD is considered an important link between technology and teachers' likelihood to utilise it effectively in the classroom (Tipton, 2015). New technology creates the need for a change in structure, content and delivery of traditional teacher education and CPD - training should be evidence-based and data-driven, customised to teachers' individual needs, whilst also recognising emerging technologies and their impact on teaching, learning and research (Bonanno, 2011).

Although there is a dearth of research on CPD targeted at supporting teachers' tablet use, it is a research area which is developing due to the increasing necessity to equip teachers with the necessary skills to use such devices effectively in their classrooms. Prasertsilp (2015) utilised an Action-Research Model in which feedback from participants was used to improve the training of K-12 teachers in integrating tablets into the curriculum. The findings from such a model indicated increased teacher understanding of tablet use in a lesson plan and enhanced teaching effectiveness. The training also strengthened teachers' tablet usage skills and knowledge of various Apps. Additionally, the training improved teachers' technology acceptance and helped motivate teachers to transfer knowledge learnt in the training into their classroom environment (Prasertsilp, 2015).

## **2.10. The present study**

The main findings from this review suggest that technology can advance student learning if it is properly introduced and supported. The main challenge for teachers is to seamlessly and efficiently employ educational technology, such as the tablet to enhance student achievement, while simultaneously learning how to utilise it in the most successful way.

The literature review highlighted how the use of tablets can help bring about improved student outcomes, including increased motivation, engagement, and academic achievement. It has also described how tablets may be used with students experiencing SEN to support communication and attention skills. However, effective use of tablets is shown to be influenced by various factors such as teachers' pedagogical, psychological, technological and environmental readiness, which need to be addressed at all stages of implementation for it to be successful. Also of high significance was the value of adequate teacher training – INSET programmes which are evidence-based and evaluated, frequent, reflect teachers' needs and promote teacher group discussions and collaboration. Other forms of CPD discussed included online CPD and Teacher Support Teams.

While the literature review revealed pedagogies that incorporate the use of tablets, the Maltese context has not yet been explored. This research therefore sought to uncover CPD programmes and strategies that would help Maltese teachers make effective use of tablets within a mainstream, inclusive classroom.

Subsequently, this research also sought to uncover a new applied role for the EP in relation to supporting teachers to develop more inclusive pedagogies through technology.

## **Chapter 3: Conceptual Framework**

### **3.1. Chapter overview**

This chapter presents the conceptual framework utilised to underpin this research. Key theories and models derived from the literature review will be utilised to provide an understanding of the concepts explored in this research. In doing so, the main aims of this research become clearer, and lead to the identification of a set of research questions.

### **3.2. Systems theory**

The outcomes of the OTPC scheme and any technology integration can be seen as a result of various influencing systems. National policy, initiatives and student attainment are considered to be the initial driving forces of such a change, together with subsequent forces within schools, more specifically, the teachers utilising tablets in the classroom. As a result of implementation and training, teachers bring about change in pedagogy, policy, and wider systems, indicating cycles of change.

Systems theory is suited to help understand and anticipate key issues with regards to the influences of policy on implementation, and vice versa (Downes, 2014). Systems theory is not a unified field of thinking, but rather encompasses a variety of differentiated approaches. For the purpose of this study, a multi-level approach will be adopted since teachers' use of tablets and their integration in pedagogy is considered to be influenced by a range of connected systems and concepts. The theoretical framework by Bronfenbrenner (1979) is a well-recognised and widely accepted Ecological Systems Theory used in developmental, educational and community psychology, where a range of different system-level interactions are distinguished. Ecological Systems Theory states that "the ecological environment is conceived as a set of nested structures, each inside the next like a set of Russian dolls" (Bronfenbrenner, 1979, p.3). Within this structure are five layers arranged from the closest to the individual at the centre, to the farthest: the microsystem, mesosystem, exosystem, macrosystem, and chronosystem (Bronfenbrenner, 1994). These

systems are described as having continuous impact on an individual's development, and a change in any of the systems consequently affects the other systems (Bronfenbrenner, 1979).

The teacher and their use of the tablet will be considered as the developing element in this framework, and shall therefore stand at the centre of the mentioned layered systems. According to Ecological Systems Theory (Bronfenbrenner, 1979), the innermost system, the microsystem, is considered to have the most impact, and refers to the setting in which a person develops. The microsystem therefore includes the students and other teaching staff as they directly influence teachers' use of technology at school. The EP is considered to form part of the microsystem, as they work directly with the teacher during consultations to help bring about change.

Consideration is given to the relationships between the teacher and those around them, the activities the teacher either engages in or observes, and the roles assumed by those participating in the activities. Often these relationships will occur with one set of people in one microsystem; however, linkages between microsystems may also be seen – between other colleagues and students, for example. It is such a relationship between microsystems that constitutes the mesosystem.

There also exist contexts with which an individual may never have any direct contact, that nevertheless have an indirect influence (Bronfenbrenner, 1979). These contexts form the exosystem and may include the eLearning Department, the E-support teachers, and the School Management Teams. In relation to our role as EPs, the educational psychology services would also form part of the exosystem, as an organisation which may consider providing indirect support to teachers and their use of technology through consultation or training.

The macrosystem gives further consideration to the indirect influences upon teachers' use of technology, at the broadest level. Macrosystem effects are those at the cultural level and refer to the influence of attitudes and ideologies (Bronfenbrenner, 1979). Within this research, the influence of Maltese national legislation, the school ethos, and policies regarding technology are considered as possible influences on teachers' use of technology.

It was in a later model, that Bronfenbrenner & Morris (1988) made explicit the dimension of the chronosystem. The chronosystem represents the passage of time and highlights that a person develops in an ever changing set of contexts at every layer of the ecosystem. Time is pertinent in this research, both because of the time in which data was gathered - when teachers were starting to use tablets - and when several stages of professional development were developing. The chronosystem within this research is considered to influence the developing policies, programmes and CPD for teachers which aim to bring about improved technology-enhanced teaching and learning. Finally the classroom environment is considered to be changing most rapidly through the development of innovative technological pedagogies.

### **3.3. Key concepts investigated**

Although Bronfenbrenner's model provides an understanding of the related systems which are involved with tablet implementation, it is not sufficient in describing the underlying readiness factors, and teachers' subsequent pedagogical use of tablets – concepts which have been considered to be pertinent within the literature review. Three concepts have been proposed therefore as crucial in explaining Maltese teachers' integration of tablets in classrooms: Readiness to adopt tablets, inclusion and CPD.

The first concerns teacher readiness for adopting and incorporating technology in their pedagogies. In this research, readiness for tablets is defined through the six dimensions outlined by Bonanno's (2012) model. Central to the framework, personal teacher attributes, attitudes, beliefs and skills (psychological, technological and epistemological readiness)

are considered to have most influence on teachers' practice (pedagogical and learning design readiness) in the classroom. The impact of national and school-based policies and logistics (environmental readiness) are considered to form part of the macrosystem, as they are considered to have influence on teachers' ideologies. The first research question investigated the factors that are influencing teachers' readiness to integrate tablets at these different levels:

RQ 1: Which factors are influencing Maltese teachers' readiness to integrate tablet computers into their pedagogy?

The second variable refers to inclusion - the literature review described how technology can support students with learning difficulties or disabilities by helping them overcome or compensate for their differences. Teachers' pedagogical innovations help create classroom conditions that provide greater equality by reducing barriers and increasing differentiated, accessible and personalised tasks. The definition of inclusion implies that all key stakeholders within the school and wider community must seek to respond to diversity. This indicates multi-level influences – the values and beliefs of the teacher, the school system and wider legislation and policies. The second research question investigated explored how Maltese teachers use tablet computers to support the inclusion of SEN students, and the pedagogies that support tablet integration:

RQ 2: How are Year 4 Maltese teachers using tablets to support the inclusion of students with SEN in their 'inclusive' mainstream classrooms?

RQ 3: What kind of pedagogy supports teachers to integrate tablets effectively into their practice?

The third and final concept regards CPD - the increased use of technology in the classroom consequently requires development of teachers' roles as life-long learners, where the teacher is required to continuously develop skills to improve pedagogy in ways that bring

about improved learning and teaching (Attard Tonna, 2012). As described in the review, the CAVA model (Mellar et al., 2007) describes effective teaching as one which promotes collaborative learning, autonomy, the use of a variety of technology and the creation of artefacts. For teachers to build effective pedagogies, professional development must take place across multiple systems, starting from the teacher's own striving for improvement, and reflection on practice. Support must also be provided by governmental institutions and schools which provide CPD that is sustained and intensive, involving experimentation, reflection, problem-solving and follow-up.

The remaining research question explored CPD that teachers consider to be effective, and the training that they believe to be most effective in meeting their professional needs:

RQ 4: What forms of CPD and support do teachers perceive to fit with their pedagogical needs?

To support understanding of how the key concepts in this study are investigated, it is helpful to visualise how they connect, and are put into the context of this research as a whole. Fig. 2 provides a visual explanation of the different models previously discussed in relation to their influence on the development of teachers' use of technology in their classrooms, together with the corresponding research question/s.

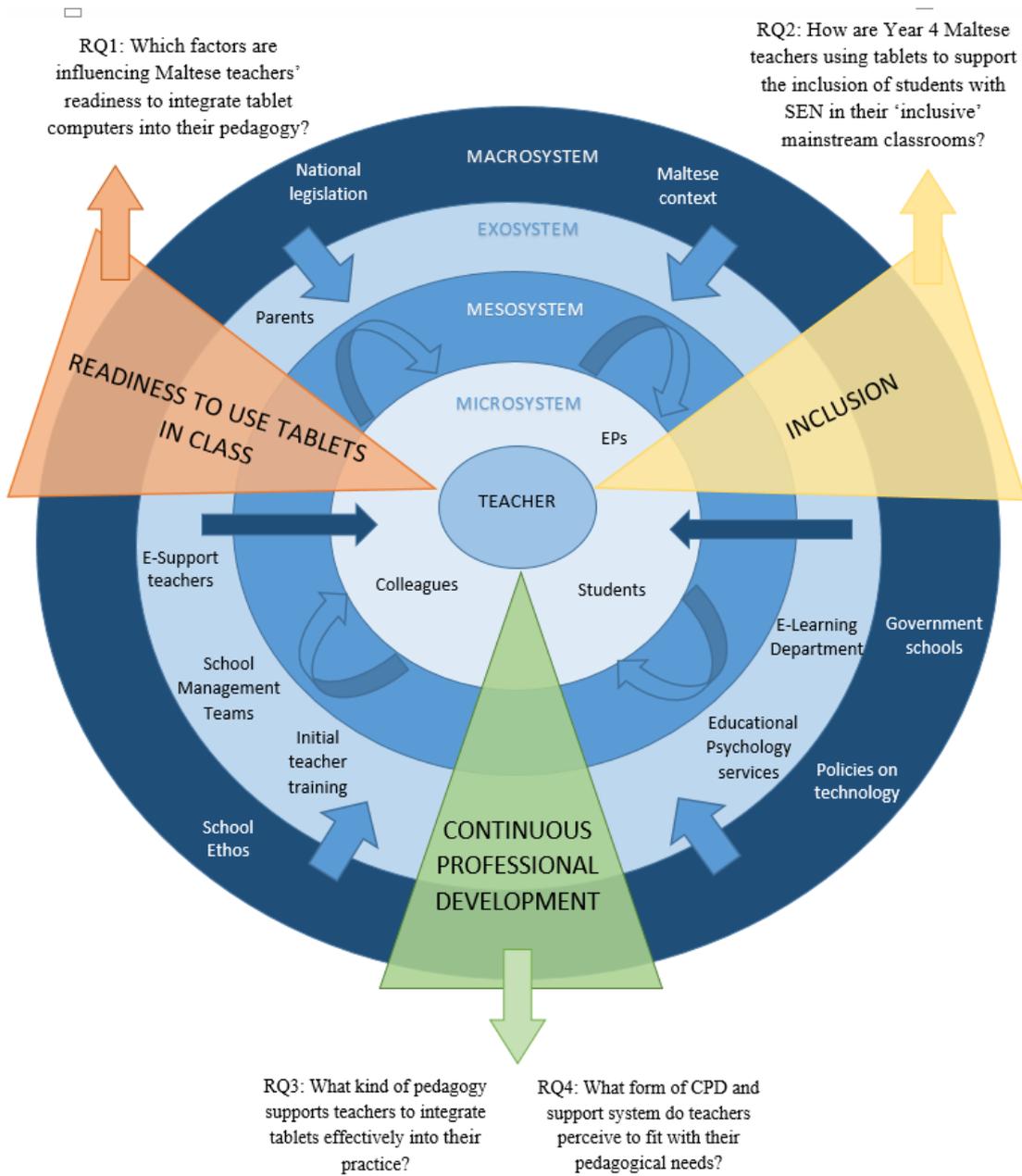


Figure 2 - Conceptual framework for teachers' use of tablets in mainstream classrooms

## **Chapter 4: Methodology**

### **4.1. Chapter overview**

This chapter presents the research methodology used to answer the research questions. The epistemology and research design are discussed, followed by a description of the participants involved in this research. Ethical considerations addressed during the early stages of this research are discussed, followed by the methods and instruments that were created and the procedures undertaken for data collection. Finally, the approaches adopted for data analysis are discussed, followed by a description of the pilot studies.

### **4.2. Ontology and Epistemology**

As asserted by Creswell (2013), it is the researcher's key responsibility to make paradigms explicit. Paradigms, also known as 'worldviews' (Creswell, 2014) or ontologies and epistemologies (Crotty, 1998), acknowledge that there are different paradigms for making claims about knowledge. The worldview chosen frames a researcher's view of what they are studying and determines what research questions are formulated, what type of data needs to be collected, and what instruments or methods are used to collect it. Consequently, it also determines the way results are interpreted, and how our understanding of the research problem develops.

Teachers' individual readiness for technology, their pedagogy and professional development needs were investigated through a questionnaire, individual and focus group interviews, and observations. These are explored through a pragmatic epistemological lens, with the goal of providing a description of participants' experiences of using tablets in inclusive classrooms.

#### **4.2.1 Pragmatism**

This paradigm claims that there are multiple realities that research can explore, with the primary focus placed on the research questions and what methods will best answer the question (Mertens, 2005; Creswell & Plano Clark, 2011). With regards to the mode of

enquiry, pragmatism embraces the two extremes; positivism/post-positivism which emphasise quantitative methods, and the opposing interpretivist qualitative approaches. Such a perspective is underpinned by abductive or inferential reasoning, emphasising for the best understanding of the research problem (Creswell & Plano Clark, 2011). In doing so, a pragmatic epistemological approach provides justification for the use of different research methods, and has therefore been hailed as the foundation of mixed-method research.

Pragmatism asserts that research needs not be either qualitative or quantitative, but rather illustrates that regardless of the perspective adopted, the researcher mixes or combines quantitative and qualitative research techniques, methods, or approaches” (Johnson & Onwuegbuzie, 2004; Onwuegbuzie, Johnson, & Collins, 2009). This implies that data gathered includes both qualitative and quantitative sources and is selected primarily on the basis of its usefulness in contributing to answering the research questions (Hesse-Biber, Nagy, Johnson, Hunter, & Brewer, 2015). Consequently, such a mixed method will also be reflected in the analysis, mathematically for the quantitative part, and thematically (Braun & Clarke, 2006) for the qualitative part. Underlying this methodology is the argument that a combination of both forms of data provide superior results and a better understanding of the research problems presented, than could either qualitative and quantitative data alone (Creswell, 2014; Onwuegbuzie, Johnson, et al., 2009).

Pragmatic researchers also argue for the use of corroborating evidence from a variety of different methods to improve both the internal and external validity of the research. This provides clearer assurance that the sought focus of the research is the result of the underlying phenomena rather than a function or production of the research method or researcher bias (Onwuegbuzie et al., 2009).

#### **4.2.2. Ontological and epistemological assumptions of the current research**

A pragmatist, mixed-method approach was adopted in this study since it was believed that both quantitative and qualitative approaches were needed to collect data for understanding the readiness and subsequent pedagogic use of tablets by teachers in Maltese classrooms.

Pragmatist thinking in this research considers that both past and possible future action with regards to technology and tablet use provide important knowledge to support future developments and training programmes in the area. According to this paradigm, it is through reflection and thought processes that participants show that effective future action is possible (Kalolo, 2015). Dewey (1929) explains that knowing has a strong relationship with our actions, and their consequences. This research aims to provide a platform for knowing, so that effective action (i.e. effective pedagogy through the use of tablet and professional training programmes) in the future can be informed by this research.

#### **4.3. Research Design**

Research can fulfil a variety of purposes; exploratory, descriptive, explanatory and emancipatory (Robson, 2011). This study seeks to explore, but also tries to explain some key issues presented in the research questions. With this design, the researcher aims to deepen understanding in a little-understood area, as well as generate ideas and hypotheses for future research.

This research was developed on the information, knowledge and research experience gained from a preliminary study (page 11). This research was composed of one quantitative research phase, and two qualitative phases through interviews and focus groups, followed by semi-structured class observations. This mixed-method research allowed a greater understanding of teachers' relatively new teaching experiences with the use of tablets, and aimed to provide useful data which answers the research questions presented.

### **4.3.1. Mixed-Method Research**

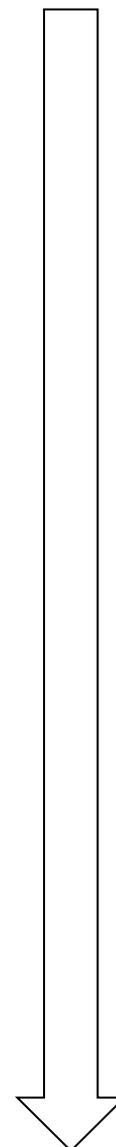
In line with the pragmatic orientation adopted in this research, a mixed-method design was employed, whereby quantitative data and analysis were aimed at ascertaining teachers' perceived readiness levels with regards to the use of tablets. This enabled the construction of subsequent in-depth qualitative exploration of pedagogy and professional development (Creswell, 2014). The conceptual model adopted in this research aims to explain the influence of different systems; a mixed method approach is considered to be in line with such a perspective as it integrated data from participants within various systems, internal (teachers) and external (school system and policies).

Mixed methods design also takes into account whether or not the two methods are mixed sequentially, or concurrently. In this research study, the design adopted was mixed sequentially, with data collection and analysis taking place in a particular order. One important concept frequently raised in mixed sequential studies is the priority, or weight given to each research phase (Ivankova, Creswell, & Stick, 2006). In most cases where the quantitative phase comes first, the quantitative data is given more priority, as qualitative data usually serves to explain statistical data (Creswell & Plano Clark, 2011). In this study, the central part of data was obtained during the qualitative phases through focus groups, individual interviews and class observations.

The mixed sequential design in this study adopted one quantitative phase and two qualitative phases. Phase 1 (Table 2) involved the collection of data from 81 Year 4 Maltese teachers regarding their readiness for the use of tablets in classrooms through the use of an online questionnaire (and so focused on RQ1). Phase 2 (Table 3) involved the collection of data from 13 Year 4 teachers regarding their use of tablets in mainstream inclusive classrooms, their pedagogy and professional development through interviews and focus groups (focused on RQs 2, 3 and 4). Data from the EO and ELearning teacher were also collected and analysed during Phase 2. Finally, Phase 3 (Table 4) involved the collection

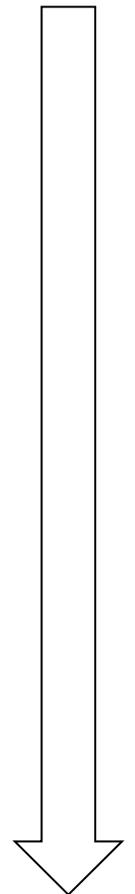
of observational data from 15 mainstream Year 4 classrooms utilising tablets in learning (focused on RQs 2 and 4).

<b>PHASE 1 – Data collection</b>
Aimed to address RQ 1
Ethical considerations
Questionnaire adapted to fit purpose, piloted (n=10)
Online questionnaire and information sheet sent to all Colleges in Malta to reach Year 4 teachers
81 responses collected
<b>PHASE 1 – Data Analysis</b>
Data checked and coded accordingly (also reverse coding where necessary)
Reliability Analysis
Generation of latent variables
Pearson Correlation test
Normality test
One-way ANOVA and Tukey post-hoc tests
<b>PHASE 2</b>



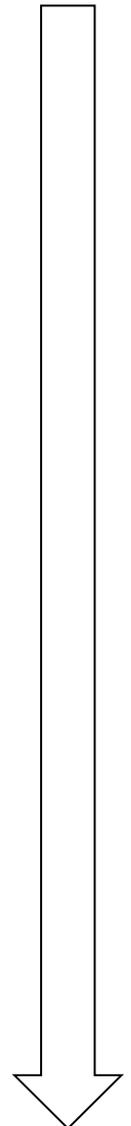
*Table 2 - Phase 1 research design procedure*

<b>PHASE 2 – Data collection</b>
Aimed to address RQ 2, 3, 4
Ethical considerations
Interview guide and information sheet formulated, piloted (n=2)
Convenience sample of 14 Year 4 teachers based on previous work as TEP Purposeful sample of 2 professionals from Gov. E-Learning department
Focus groups and individual interviews
<b>PHASE 2 – Data Analysis</b>
Recordings transcribed
Thematic Analysis
Codes and themes
<b>PHASE 3</b>



*Table 3 - Phase 2 research design procedure*

<b>PHASE 3 – Data collection</b>
Aimed to address RQ 2, 4
Ethical considerations
Observation schedule formulated, piloted (n=3)
Sample of X teachers, obtained from previous sample of focus groups/interviews
Semi-structured class observations of teachers using the tablet
Field notes
<b>PHASE 3 – Data Analysis</b>
Field notes formed a narrative summary
Thematic Analysis
Codes and themes
Integration of quantitative and qualitative results
Discussions, implications and further research



*Table 4- Phase 3 research design procedure*

To support research transparency and to enhance the reliability of this research, the participants, methods and instruments used for data collection, together with the process for data analysis carried out for each phase will be described separately, in section 4.5.

#### **4.4. Ethical considerations**

When comparing this research amongst professionals to others involving children and vulnerable populations, it may be thought that ethical dilemmas may be more easily addressed. However, from an early stage of design it was recognised that this research aimed to explore a sensitive area in teaching and learning, particularly due to the fact that the tablet had just been introduced in schools, and that teachers seemed to have mixed feelings about this novel educational technology.

Therefore, when planning this research, careful attention was given to possible ethical dilemmas which may arise in all three phases. A full application for ethical consideration was submitted and subsequently approved by both the UCL Institute of Education Research Ethics Committee and the Directorate for Quality and the Standards in Education within the Ministry of Education in Malta. Ethical considerations included informed consent, fair access, right to withdraw, anonymity and confidentiality.

*Informed Consent:* All state school Year 4 teachers were informed about the online questionnaire via an email through their Head of School, which provided an outline of the current study and the purpose of their requested involvement (Appendix J). Similarly, participants who formed part of focus groups, individual interviews and observations were provided with an information and consent form (Appendix K) which indicated that they had understood the research conditions (such as the presence of a voice recording device).

*Fair Access:* When teachers felt comfortable speaking in Maltese, they were allowed to do so to ensure fair access. Although this language switch happened minimally during this research, translated transcripts carried out by the bilingual researcher were sent to participants to ascertain that the meaning being conveyed was still present.

*Right to Withdraw:* Although participants had agreed to form part of this research, they were given the opportunity to withdraw from the research at any stage if they wished to do so.

*Opt-Out sampling:* Following receipt of the email or information sheet, potential participants had the opportunity to make an informed decision on whether or not to participate.

*Anonymity:* The interview and focus group transcripts were anonymised at the earliest stages possible by making the names of participants unidentifiable through assigned codes. Codes were also utilised when gathering observation field notes.

*Confidentiality:* All form of data was held solely by the researcher and stored in an encrypted memory stick.

*Post Research:* Feedback to participants will be carried out by the researcher, without making comparisons between teachers or schools, and reference will be made to the sample as a whole.

#### **4.5. RESEARCH PROCEDURE: Phase 1**

##### **4.5.1. Instruments and data collection**

In Phase 1, the researcher wished to gain an understanding of the factors that influence Maltese teachers' readiness for tablets to be introduced and integrated into their teaching in mainstream classes. It was decided that a multiple choice questionnaire comprising of closed questions would suit this purpose, as it would make it easier and quicker for participating teachers to complete, considering their busy schedules. The questionnaire used was adapted from that originally created by Bonanno (2011) from the various instruments outlined in the literature review (parag 2.8), compiling six factors that were found to influence teachers' readiness for technology. One of the major adaptations to the questionnaire involved directing questions which were originally relating to ICT, to

questions about tablets exclusively. A second major adaptation was the introduction of questions related to the use of tablets amongst students with SEN. A few examples are illustrated in Table 5 below:

	<b>Bonanno (2011)</b>	<b>Adaptation by researcher</b>
Question number 14, statement (e)	ICT can provide advanced forms of student-centred learning	<b>Tablets</b> can provide advanced forms of student-centred learning
Question number 14, statement (f)	No reference to SEN students' use of ICT	The tablet helps students with SEN benefit from individualised, adapted learning

*Table 5 - Examples of adaptation of Bonanno's (2011) instrument measuring 'Teachers' Readiness for Technology-Enhanced Learning'*

In order to assess suitability for data collection, the questionnaire underwent a piloting process which will be described in further detail at a later stage in Section 4.8.

Like any other method of data collection, an online questionnaire has specific limitations, specifically confidentiality. By directing participants to a website, in this case Google Forms, efforts were made to help respondents feel more anonymous. Another limitation with online questionnaires is response rate. Although a 34% response rate was obtained, more responses would have provided a richer picture, and increased opportunity for generalisability. Such a low response rate may be due to the fact that the online questionnaires were sent out towards the end of the scholastic year, when teachers may have been too engaged in examinations and corrections to find time to complete the questionnaire.

#### **4.5.1.2. Questionnaire construction for quantitative data collection**

The online questionnaire (Appendix A) begins by providing the participants with an outline of the aims of the questionnaire, their right to voluntary participation, and to decline

continuation at any stage. Participants were also reassured that their anonymity would be respected. The researcher's contact details were provided to address any of the participants' queries.

#### *Questionnaire Part One - Introduction*

*Part One* of the questionnaire aimed to gather specific demographic information from participants - questions about their gender, age, and years of teaching. In order to gather a general overview of the responses from across all Malta, teachers were asked to specify in which College they teach.

The teachers were asked to provide their plans for tablet use, whether they wished to use the tablet in class only, or whether the students would be allowed to take the tablet home. Teachers were also asked to provide information on the subject lessons in which they wished to incorporate the tablet; whether for all subjects, core subjects or specific subjects. Moreover, teachers were asked to indicate planned activities for tablet use, such as individual learning, group work, searching for information, and social networking, amongst others. They were also provided with the option of including any other activity which was not mentioned.

#### *Questionnaire Part Two – Experience in ICT*

*Part Two* of the questionnaire aimed to gather information regarding teachers' prior training in relation to ICT and whether they would consider taking up ICT-specific courses. Teachers were asked about the ways in which they develop their professional and pedagogical skills in relation to ICT (for example, through communication with other teachers and searching for new information). Teachers were also asked to rate their confidence levels in relation to a variety of tools and technology which may be used in a classroom environment (for example, games, Learning Management Systems and Interactive Whiteboard).

### *Questionnaire Part Three – Opinions about Teaching and Learning*

*Part Three* of the questionnaire aimed to gather teachers' perceptions and opinions regarding pedagogy and technology. Statements about different methods of teaching and learning through technology were presented, in which teachers were asked to tick their level of agreement on a 5-point Likert scale. Concepts explored include the teachers' role, information sharing, online learning and differentiated learning. In the subsequent question, teachers were asked to rate their use of technology when carrying out particular teaching and learning activities (e.g. teacher presentation, student group work, projects, practical hands-on activities).

A short open-ended question provided teachers with the opportunity to describe their plan for how they were going to integrate tablets into lessons. This question aimed to gather information about teachers' pedagogy and the strategies they wish to put in place to support student learning through the use of tablets.

Finally, teachers were asked whether they utilise technology to carry out student assessment in various learning experiences (e.g. log, projects)

### *Questionnaire Part Four – Psychological Readiness*

*Part Four* of the questionnaire aimed to gather information regarding teachers' feelings and agreements with regards to ICT and tablets in education. For example, teachers were asked to rate their level of agreement on a 5-point Likert on statements related to their perceived confidence and preparedness to utilise the scale technology and manage student behaviour when utilising the technology.

*Questionnaire Part Five – Teachers’ role in the schools’ teaching-learning environment*

The final part of the questionnaire, *Part Five*, aimed to gather information regarding teachers’ perceived preparedness in relation to changes in school ethos and culture as a result of technology integration. Teachers were asked to rate their perceived level of preparedness on a 5-point Likert scale. Statements in this part of the questionnaire included preparedness to contribute to a school vision that promotes tablet use, to promote tablets within the school’s CPD Plan, to share experiences of tablet use with colleagues and to participate in online teacher communities and to share content developed with other teachers online, amongst other statements.

**4.5.2. Participants in Phase 1**

Year 4 classes were involved in the OTPC scheme during the year in which this study was conducted, and therefore only Year 4 teachers were included in this research.

In Phase 1 of this investigation, all ten Maltese colleges, comprising of 59 schools, were sent an email containing an outline of the study and a link to the survey. Heads of Schools were asked to disseminate the email to the Year 4 teachers in their school.

A total of 81 Year 4 teachers from all over Malta submitted their responses. Considering that the online questionnaire was sent to approximately 253 teachers, the response rate was 34%, which is considered to be the norm for online questionnaires (Sheehan, 2002).

Table 6 below illustrates the percentage of teachers by their College in Malta.

	Frequency	Percentage
A College	7	8.6%
B College	7	8.6%
C College	11	13.6%
D College	6	7.4%
E College	16	19.8%
F College	12	14.8%
G College	8	9.9%
H College	2	2.5%
I College	3	3.7%
J College	9	11.1%

*Table 6 - The percentage of responses from each College in Malta*

Sample characteristics were identified through the data collected from the first section of the questionnaire. Table 7 gives sample composition by gender: 92.6% (n=75) of teachers were female and 7.4% (n=6) of teachers were male. This representation reflects that the majority of the teachers in the primary years in Malta were women.

	Frequency	Percentage
Female	75	92.6%
Male	6	7.4%

*Table 7 - The percentage of male and females teachers*

Table 8 gives frequency by age; the age groups with the highest number of respondents were the 26-35 years (38.3%, n=31) and 36-45 (35.8%, n=29), while the groups with the lowest number of responses were over 45 years of age (7.4%, n=6). This indicates that the majority of respondents are between 26-45 years of age.

	Frequency	Percentage
26 - 35 years	31	38.3%
36 – 45 years	29	35.8%
25 years and under	15	18.5%
Over 45 years	6	7.4%

*Table 8 - The percentage of teachers from different age groups*

Furthermore, the teachers were asked to specify the number of years they have been within the teaching profession (Table 9). The majority of teachers (39.5%) have been in the teaching profession between 1-5 years, 19.8% have been teaching for 11-15 years, 19.8% for 16-20 years, 12% for 6-10 years, 4% for 21-25 years, and the lowest percentage (1%) have been teaching for over 26 years.

	Frequency	Percentage
1 – 5 years	32	39.5%
11 – 15 years	16	19.8%
16 – 20 years	16	19.8%
6 – 10 years	12	14.8%
21 – 25 years	4	4.9%
Over 26 years	1	1.2%

*Table 9 - The percentage of teachers' years of teaching experience*

#### **4.5.3. Data analysis in Phase 1**

Quantitative data collected via the online questionnaire was entered into the SPSS software package. Prior to analysing the data, it was cleaned, verified and checked by the researcher. Furthermore, since the items formulating the online questionnaire were not obtained from standardised tests, an internal reliability test was carried out. Prior to analysing for findings, the research also generated latent variables in order to minimize the data for increased comprehensibility. Although these were carried out prior to any analysis, these will be presented in Chapter 4 (Section 5.2.4) to help the reader better understand the results obtained.

##### **4.5.3.1. Reliability Analysis**

A reliability analysis was carried out through the Chronbach's Alpha, which measures the internal consistency between a number of related items assessing a dimension (sub-scale). The Cronbach alpha has an upper bound of 1, and a lower bound of 0. Cronbach's Alphas exceeding the 0.7 threshold indicate satisfactory internal consistency between the items (Nunnally, 1978).

For all groups of items (sub-scale, e.g. 10a – 10g), the Cronbach's alpha exceeded the 0.7 threshold value, indicating that the items describing each sub-scale have satisfactory internal consistency. Moreover, all inter-item correlation tables (Appendix B) display a large number of positive correlations implying that in the vast majority of cases, the rating scores provided to any pair of items were positively related.

#### **4.6. RESEARCH PROCEDURE: Phase 2**

##### **4.6.1. Instrument and data collection**

Interviews and focus groups are useful methods for providing in-depth information about participants' views (Braun & Clarke, 2006). As suggested by Jupp & Sapsford (2006), interviews can be highly structured, semi-structured or less so. In this research, semi-structured, open-ended interviews in the form of focus groups were selected as the primary mode of data gathering, allowing the researcher to interview multiple teachers at one time, consequently gathering more information in a shorter time period and obtaining richer information due to the nature of small group interview processes. Moreover, the use of open ended interviewing allows the researcher to carry out any clarification, probing or exploration required (Hesse-Biber, 2010). From the participants' perspective, this form of interviewing encourages them to talk to one another, ask questions, encourage anecdotes and comment on each other's experiences and views (Barbour & Kitzinger, 1999).

As with any form of research, some unexpected events are likely to take place as one engages with the data collection process. On the days scheduled for the focus groups, two teachers happened to be unwell, or had no assistant replacement, and as a result could not participate in the focus group. The pragmatic approach adopted in this research permitted the researcher to resolve this issue by offering these teachers the opportunity to take part in an individual interview. Although this was beneficial as it still provided them with means of participation in the research, the limitation experienced was that the focus groups had fewer participants than initially planned, and the teachers could not benefit from

participating in the group process, which could have given them more ideas or insight on the subject being discussed.

Year 4 teachers were interviewed in a group setting at their school. One of the challenges presented in undertaking the focus groups was getting the participants to be available at the same time. Possible solutions to this drawback were discussed by the Heads of Schools, who offered a Curriculum Time slot, during which teachers would not be engaging in classroom duty and could be available to participate in this research. The focus groups allowed the researcher to get quick, reliable impressions in a time-effective manner, given the limited time available (Willig, 2008).

Both the semi-structured interviews and the focus groups were guided by a list of questions that were designed to develop an open discussion relevant to the research area (Appendix C). Such discussions allowed a relationship to be built with the participants, enabling them to feel comfortable describing their experiences of tablet integration in the classroom, and considering that the topic was a pertinent theme for the scholastic year, for some teachers it may be a sensitive area that brings up strong emotions. This aspect was taken into consideration when designing this research, and consequently, semi-structured discussions were seen to be most fitting as they are flexible, and the researcher could adapt the discussion to suit the style of communication and needs of the participants as the interview progressed.

The questions used in the semi-structured interviews and focus groups were not adhered to rigidly, but were designed to offer a direction through the range of topics that needed to be discussed. The guide was considered more as a series of discussion points, and open-ended, exploratory questions were designed to act as catalysts for discussion.

The disadvantage faced during the interviews was that although kept to the minimum, the interviews took longer than anticipated, and this may have reduced the quality of data gathered.

Some interviewers may at times be susceptible to influencing the interview process, and possibly inducing bias through leading questions or wording (Willig, 2008). In this research, bias was minimised through researcher reflexivity, and an attitude towards attuned interaction and listening rather than directedness. This orientation is also reflected in the research questions, where the researcher avoided leading questions and introduced more open-ended, exploratory questions in order to minimise bias.

#### **4.6.1.2. Questions used in focus groups and interviews**

The researcher believed it to be essential that professionals who formed part of the tablet integration initiative and have knowledge in CPD are also interviewed in parallel to teachers. Therefore, in order to enrich the data obtained in this research, the ELearning Education Officer from the Ministry of Education and Employment in Malta was interviewed on the subject through an individual interview. For this specific interview, different questions were constructed in order to address additional issues, such as the organisation of teacher training programmes, and tablet technology implementation in schools (Appendix D).

The questions have been built upon the main research questions, expanding each research question into more in-depth, exploratory questions. For example, in relation to RQ4, '*What form of CPD and support do teachers perceive to fit with their pedagogical needs?*', questions in focus groups and interviews asked about the approaches that teachers are applying to help their pedagogy develop, the within-school support they are offered and whether it is helpful, and in what ways future support may be more effective. Such questions aimed to target broad issues regarding teachers' use of technology and tablets in their classrooms, allowing the participants to discuss and elaborate on their answers

(Langdridge, 2005). It may be argued that some questions may not be considered as open-ended (e.g. ‘thinking of those students with SEN in your classroom, do you envisage that tablets might help you to meet their needs?’), however when participants gave a closed answer, the researcher gave prompts to encourage further elaboration (e.g. How will it help? In what ways? Can you tell me more about that?). These prompts were also effective when participant discussion deviated extensively from the main research questions, as they helped bring participants’ thoughts back to the main topic discussed.

In general, the open approach adopted during the focus groups and interviews fits well with the exploratory purpose of this research. Whilst encouraging participants to give examples and share stories of their experiences of technology integration and training, it also encourages them to think and explore any possible future actions for teachers undergoing the process of technology integration in mainstream classrooms.

#### **4.6.2. Participants in Phase 2**

In phase two of the research, participants were chosen via convenience sampling, since the researcher contacted three schools in which prior TEP-related work had been conducted. Four focus groups and three individual interviews were held, with a total of fifteen teacher participants. Twelve Year 4 teachers formed part of the focus groups, together with one eLearning teacher who since the OTPC scheme, visited the school regularly. Two Year 4 teachers who were unavailable for the focus groups were interviewed individually. The eLearning Education officer (EO), who had first had experience in teacher training, was also interviewed individually. The involvement of the eLearning teacher and the EO was conducted specifically with the aim of gathering a different perspective on teacher pedagogy and tablet use in schools.

#### **4.6.3. Data Analysis in Phase 2**

Focus group and interview recordings were transcribed, and analysed through Thematic Analysis. This form of data analysis was chosen over other qualitative methods such as

Interpretative Phenomenological Analysis, Narrative or Grounded theory since it is was considered to be a flexible method which allows the identification, and highlighting of the most significant aspects of information gathered, therefore providing a rich account of the data (Braun & Clarke, 2006).

In order to analyse the data with a good level of rigour, the researcher drew on Braun & Clarke's (2006) process of Thematic Analysis. Using this process, themes and sub-themes were generated from a number of cycles of coding. In line with Braun & Clarke's (2006) model of data thematic analysis, the following analytic process was carried out:

- 1) The recorded interviews from individual interviews and focus groups were played and then transcribed to produce verbatim transcripts. The transcribing process allowed the researcher to become more familiar with the raw data. Each transcript was read out several times to ensure that it was recorded accurately (Appendix E);
- 2) Each transcript was re-read on a line by line basis. In doing so, initial codes were given to sections of the text. As codes began to emerge, the data was read again with a specific focus of identifying further examples of the emerging codes. When the initial code was exhausted, the codes were reviewed as a whole - some codes were discarded and others were re-arranged or combined (Appendix F);
- 3) The emerging codes typically developed across the data. However, even when codes were only contained in data of one or two participants, these were included in the findings in order to ensure breadth of experiences and ideas;
- 4) As the codes were refined, they were categorised into themes and subthemes based on similar meaning. The themes chosen were linked to the research questions posed in this research. Lichtman (2010) provides guidelines with regards to a thematic structure; the author suggests that research in the field of education should generate approximately 80-100 codes, 15-20 sub-themes and 5-7 themes. With this in mind,

the thematic structure was reflected upon and drafted several times before constructing the final presentation (Chapter 5, Figure 3).

- 5) In order to establish internal consistency, each theme was reviewed with a peer researcher. Internal consistency is a measure to ascertain whether the codes represent the same construct. Codes were also reflected upon as a whole in order to ensure coherency across themes that provide an understanding of the research problems presented. This practice also helped the researcher to reflect back on the raw data, and consider whether the final themes and subthemes reflect what was said by the participants during the interviews.
- 6) As themes became more consolidated, they were given appropriate titles. This was done following extensive consideration and reflection in order to ascertain that the essence of each theme is captured in the title. In the final presentation of findings, the main themes linked to the main research questions, while the sub-themes provided a small cluster of codes.

Thematic analysis allowed the researcher to capture the most salient points made by participants, all of whom are in some way involved in the OTPC scheme in Malta. Together with other forms of data and analyses, the researcher aimed to uncover a wealth of information and subsequently, a number of possible explanations to the research questions asked (Teddlie & Tashakkori, 2009).

#### **4.6.3.1. Inter-Rater Reliability**

In order to ensure that the analysis is understood by others and that it has developed in a way that reflects the data, coding was corroborated across two or more individuals (Smith, 2015). To this end, one coded transcript was shared with both supervisors and a colleague, also completing the Professional Doctorate and familiar with the process of thematic analysis as outlined by Braun & Clarke (2013). The raters made the same, or very similar

data selections, and there was only a slight variation in the codes assigned to these selections.

#### **4.7. RESEARCH PROCEDURE: Phase 3**

##### **4.7.1. Instruments and data collection**

Observation in research can be defined as “the systematic description of events, behaviours, and artefacts in the social setting chosen for study” (Pettigrew, 1990). The rationale for adopting this method was to provide a wider description on how teachers are utilising the tablet technology in their classroom to meet the learning needs of students, and how students are subsequently responding to learning. The researcher believed that the observational element would add something vivid, and ‘real’ which may not become apparent through data collected from semi-structured interviews and focus groups.

Adler & Adler (1994) highlight that direct observation allows researchers to collect data without directly interacting with participants. By combining direct observations with other methods, the researcher is able to claim rigour and validity in the subsequent findings (Gillham, 2008). Furthermore, when attempting to understand complex social phenomena, Pettigrew (1990) argues that direct observations can indicate “the discrepancies between what people said in the interview and casual conversations and what they actually do”. In this study, this will be validated through the combination of mixed-method data gathered from focus groups, interviews and observations.

As with the questionnaire and interviews discussed previously, observation techniques can also differ in their degree of structure (Gillham, 2008). One technique involves short, prescriptive formats using structured observation schedules that record categories of behaviour, and are easily analysed in quantitative terms. Structured observation was initially going to be used as it is described by Robson (2011) as a good method of quantifying behaviour by taking a detached stance, thereby reducing observer subjectivity. The researcher had piloted, and made use of a systematic technique for observation during

the preliminary study, and whilst it was found to be highly specific, one of the limitations experienced was that since the observation is confined to the predetermined categories within a short time frame, the essence of the teaching-learning process could not be captured fully.

It was decided that semi-structured observations of lessons (approx. 40 minutes each) involving the tablet would be best suited for this study. Qualitative data was gathered through narrative field notes in relation to specific categories which were 'open' in such a way that cannot be predicted prior to the observation. Extensive observation field notes were collected for 15 lessons under the categories: Curriculum focus, Lesson context (e.g. group, pairs, one-to-one), student engagement and participation, SEN students (Appendix G).

#### **4.7.2. Participants in Phase 3**

Participants taking part in Phase 2 were informed through an information and consent sheet (Appendix K) about the possibility to accept being observed during a minimum of one lesson where tablets are being used. Ten Year 4 teachers from three schools volunteered to be observed, and fifteen observations were carried out in total, with five teachers observed twice.

#### **4.7.3. Data Analysis in Phase 3**

Hand-written field notes were transferred into a Word document and structured in order to form a descriptive narrative. The researcher also included any thoughts which were deemed relevant to the research questions. Field notes were analysed through Thematic Analysis (Braun & Clarke, 2006) and the process conducted during Phase 2 was repeated, and resulting codes (Appendix H) were combined with focus group and interview themes in order to provide a unified understanding of the research findings.

#### **4.8. Pilot studies**

The questionnaire, interview, focus group and observation schedules were piloted to ensure that the methods were fit to address the research purposes.

The questionnaire was distributed to a sample of ten Year 4 teachers in two different schools. On the last page, teachers were asked additional questions about whether they thought the questionnaire was of suitable length and whether they had considered that their privacy was respected (Appendix I). By being physically present while the teachers completed the questionnaire, the researcher could gather feedback on these issues, in order to produce a more refined version of the questionnaire. The pilot questionnaires brought about a number of changes; the researcher could locate and alter questions which teachers found difficult to answer, misunderstood, or omitted, and also assess whether the multiple choices were exhaustive to include their answers. Questions that could possibly make participants feel uncomfortable, or hesitant when answering were avoided as much as possible, in an endeavour to ensure that the response rate would be high enough to provide sufficient data.

Moreover, the researcher also became aware that by providing teachers with a physical copy of the questionnaire, some put it to one side, and forgot about it. It was therefore decided that the questionnaire would be disseminated online. In this manner, teachers could access the questionnaire more easily through the online link, and they could also be sent a quick reminder about their voluntary participation after a one week lapse.

The interview guide utilised for the focus groups and interviews was also piloted, to explore whether questions provided suitable guidance for the discussion in order to provide a discussion that would answer the research questions posed. When piloting the interview guide, some teachers happened to be unwell, and only two participants could take part in the focus group discussion. It was here that the researcher decided to alter this research methodology to also incorporate individual interviews in order to allow individual teachers

who wished to participate to be able to take part in this study and voice their views and opinions.

As previously mentioned, the structured observation schedule utilised during the preliminary study was not found to capture fine details or descriptions of collaborative work, or positive teacher engagement. This research sought to highlight positive practice and pedagogy in order to help shed light on positive practice, and bring about increased development of such practice. A new, semi-structured schedule was formulated, which presented headings to support the organisation of field notes, whenever possible. Following the pilot, it was noted that the 'flow' of notes and descriptions was not helpful for an outsider reading the notes. It was therefore decided that following each observation, the researcher would take time to restructure observational notes into a descriptive narrative, with specific examples of practice wherever possible.

## Chapter 5: Results and findings

### 5.1. Chapter overview

This chapter presents an overview of the main findings of this research, derived from both the quantitative and qualitative parts of the study. Firstly, this chapter will present the quantitative results collected in the form of descriptive and inferential statistics using SPSS v23. Secondly, the results of the qualitative parts of the research are presented in the form of themes derived from a Thematic Analysis.

### 5.2. Phase 1: Quantitative results

In total, approximately 230 Year 4 teachers were sent an email by their Head of School containing an electronic link that directed them to the online questionnaire. The link was accessible from July until October 2016, during which 81 responses were collected.

#### 5.2.1. Teachers' plan for tablet use

In question 5 of the questionnaire, teachers were asked whether they planned to utilise the tablet for school activities only, or whether they also wished students to utilise the device at home (Table 7). The majority of teachers (n=59, 72.8%) planned to utilise the tablet for both class and home activities, while 27.2% (n=22) planned to utilise the device during school activities only.

	Frequency	Percentage
Class and home	59	72.8%
Class only	22	27.2%

*Table 10 - Teacher's plan for tablet use*

Furthermore, teachers were asked whether they planned to incorporate the tablet in all subjects, in core subjects or in specific subjects (Table 11). The majority of teachers (49.4%, n=40) planned to utilise the tablet device during all subjects being taught, while 28.4% (n=23) planned to incorporate the tablet in specific subjects which may not be

considered part of the core-curriculum, while 22.2% (n=18) planned to incorporate the tablet in core subjects.

	Frequency	Percentage
All subjects	40	49.4%
Specific subjects	23	28.4%
Core Subjects	18	22.2%

*Table 11 - Teachers' plan for tablet use in class*

Teachers were asked to indicate whether the tablet would be used for individual learning or group work, and which activities and subjects they planned to implement using the tablet (Table 12). 82.7% of teachers planned to use the tablet for individual learning compared to 56.8% who preferred group work. 76.5% of teachers wish to use the tablet during class for the purpose of looking up information, 30.9% (n=25) for gaming, and only 9.9% (n=8) wish to incorporate activities related to social networking.

The majority of teachers, 88.9% (n=72) planned to use the tablet during the Maths lesson, 84% (n=68) for English/literacy, and 75.3% (n=61) for Maltese/literacy. Science and Social Studies were also prevalent subjects chosen for tablet use amongst teachers, with 65.4% (n=53) and 63% (n=51) responses respectively.

		Frequency	Percentage
Planned activities for tablet use	Maths	72	88.9%
	English/Literacy	68	84.0%
	Individual learning	67	82.7%
	Searching information	62	76.5%
	Maltese/Literacy	61	75.3%
	Science	53	65.4%
	Social studies	51	63.0%
	Group work	46	56.8%
	Religion	44	54.3%
	Gaming	25	30.9%
	Social networking	8	9.9%

*Table 12 - Planned activities for tablet use in class*

### 5.2.2. Teacher training in technology

In question 8 teachers were asked whether they consider engaging in further training possibilities in technology. 46.8% (n=37) of teachers considered taking up a course on tablet use in a particular subject, while 30.4% (n=24) considered taking up a basic course in ICT. Unfortunately, 21.5% (n=17) did not believe that they need training and only 10.1% (n=8) felt that they would consider further postgraduate training leading to a Diploma in technology enhanced learning (Table 13).

		Frequency	Percentage
Training considered besides in-service	Course on tablet use in particular subject	37	46.8%
	Basic course in ICT	24	30.4%
	None	17	21.5%
	Diploma in technology enhanced learning	8	10.1%

*Table 13 - Training in technology teacher consider taking*

Teachers were asked about their opinion with regards to the formal ICT training they previously attended with the aim of informing their use of tablets in the classroom; 44.4% (n=36) described their previous training as very basic, 42% (n=34) did not attend any training in relation to tablets, and 13.6% (n=11) described their training as sufficient (Table

	Frequency	Percentage
Very basic	36	44.4%
None	34	42.0%
Sufficient	11	13.6%

Table 14 - Description of previous training in relation to tablet use in classrooms 14).

### 5.2.3. Generation of Latent Variables

For the remainder of the questionnaire, latent variables were created in order to reduce the dimensionality of the data. This process could only be carried out following a process of reverse coding where necessary and satisfactory internal consistency tests within all the sub-scales (Appendix B). By carrying out this statistical process, the number of variables under consideration was reduced in order to enhance the understanding of the data. Latent variables are therefore not directly observed, but inferred from other variables within the questionnaire. The following latent variables were created:

- a) The variable *Technological Readiness* was generated by averaging the rating scores provided to items 10a to 10g. The scores range from 1 to 5, where 1 corresponds to never and 5 corresponds to always. The larger the score, the higher the frequency of use of technology.
- b) The variable *Confidence in Using Technology* was generated by averaging the rating scores provided to items 11a to 11j. The scores range from 1 to 4, where 1 corresponds

to not confident and 4 corresponds to highly confident. The larger the score, the higher the confidence.

- c) The variable *Epistemological Readiness* was generated by first reverse coding items 12a, 12b, 12h, 12i and 12j, and then averaging the rating scores provided to items 12a to 12m. The scores range from 1 to 5, where 1 corresponds to strongly disagree and 5 corresponds to strongly agree. The larger the score, the higher the agreement.
- d) The variable *Pedagogical Readiness* was generated by averaging the rating scores provided to items 13a to 13l. The scores range from 1 to 5, where 1 corresponds to never and 5 corresponds to always. The larger the score, the increase use of technology in pedagogy.
- e) The variable *Psychological Readiness* was generated by first reverse coding items 16d and 16i, and then averaging the rating scores provided to items 16a to 16j. The scores range from 1 to 5, where 1 corresponds to strongly disagree and 5 corresponds to strongly agree. The larger the score, the higher the agreement.
- f) The variable *Environmental Readiness* was generated by averaging the rating scores provided to items 17a to 17k. The scores range from 1 to 5, where 1 corresponds to not at all and 5 to very well. The larger the score, the higher the preparedness.

#### **5.2.4. Pearson Correlation test: Relationships across different latent variables regarding teachers' readiness for tablets**

The Pearson Correlation test was used to determine whether the relationship between any two latent variables is significant or not. The null hypothesis specifies that there is no relationship between two latent variables and is accepted if the p-value exceeds the 0.05 level of significance. The alternative hypothesis specifies that there is a significant relationship between two latent variables and is accepted if the p-value is less than the 0.05 criterion.

All resulting pair-wise Pearson correlations were positive, indicating positive relationships between the six latent variables. Moreover, the vast majority of these pair-wise relationships were significant since the p-values are less than the 0.05 level of significance (Table 15, yellow highlight). The alternative hypothesis was therefore accepted for all subscales, with the only exception being the relationship between *Confidence in using technology* and *Pedagogical Readiness* (Table 15, red highlight).

		Technological Readiness	Confidence in using technology	Epistemological Readiness	Pedagogical Readiness	Psychological Readiness	Environmental Readiness
Technological Readiness	Correlation	1	.424	.319	.357	.494	.456
	P-value		.000	.004	.001	.000	.000
Confidence in using technology	Correlation	.424	1	.256	.084	.383	.463
	P-value	.000		.021	.458	.000	.000
Epistemological Readiness	Correlation	.319	.256	1	.237	.509	.496
	P-value	.004	.021		.033	.000	.000
Pedagogical Readiness	Correlation	.357	.084	.237	1	.330	.239
	P-value	.001	.458	.033		.003	.032
Psychological Readiness	Correlation	.494	.383	.509	.330	1	.587
	P-value	.000	.000	.000	.003		.000
Environmental Readiness	Correlation	.456	.463	.496	.239	.587	1
	P-value	.000	.000	.000	.032	.000	

Table 15 - Pearson Correlation across readiness latent variables (sub-scales)

This result therefore indicates that, for example, an increase in rating with regards to technological readiness, is likely to be accompanied by a positive increase in confidence in using technology, and vice-versa.

### 5.2.5. Tests of Normality

Considering that the sample size was less than 100, the Shapiro-Wilk test was used to determine whether the score distribution for each latent variable is normal or skewed.

The null hypothesis specifies that the score distribution is normal and is accepted if the p-value exceeds the 0.05 level of significance. The alternative hypothesis specifies that the

score distribution is skewed (not normal) and is accepted if the p-value is less than the 0.05 level of significance.

	Statistic	Shapiro-Wilk df	P-value
Technological Readiness	0.967	81	0.065
Confidence in using technology	0.983	81	0.341
Epistemological Readiness	0.984	81	0.425
Pedagogical Readiness	0.988	81	0.636
Psychological Readiness	0.981	81	0.259
Environmental Readiness	0.986	81	0.541

*Table 16 - Shapiro-Wilk values for identified sub-scales*

All the Shapiro-Wilk *p*-values exceed the 0.05 level of significance, indicating that all sub-scale score distributions satisfy the normality assumption (Table 16). For this reason, one-way ANOVA parametric tests were used to analyse the quantitative data.

### **5.2.6 One-way ANOVA**

The One-way ANOVA test was used to compare mean readiness latent variable (sub-scale) scores between independent groups clustered by demographic and school-related variables. The null hypothesis specifies that the mean sub-scale scores vary marginally between the groups and is accepted if the *p*-value exceeds the 0.01 level of significance. The alternative hypothesis specifies that the mean sub-scale scores vary significantly between the groups and is accepted if the *p*-value is less than the 0.01 criterion. Yellow has been used to highlight significant analyses.

A 0.01 level of significance was chosen, rather than the more usual 0.05 level, to make some allowance for the large number of significance tests involved; too many results might appear statistically significant just by chance at the less stringent level of significance.

Moreover, the Tukey post-hoc test was used to compare mean latent variable (sub-scale) scores between groups pair-wise. Again, a 0.01 level of significance was adopted. This post-hoc test was only used when the One-way ANOVA test yielded a p-value less than the 0.01 level of significance.

### 5.2.6.1. Readiness according to teachers' age

Table 17 illustrates that younger teachers aged 35 years or less scored significantly higher in Confidence in using technology than their older counterparts aged 36 years or more, since the p-value of 0.001 is less than 0.01 level of significance.

However, the mean scores for the other five sub-scales varied marginally between the various age groups since the p-values exceeded the 0.01 level of significance.

		Sample size	Mean	Std. Deviation	P-value
Technological Readiness	25 years or less	15	3.90	0.67	0.032
	26-35 years	31	3.59	0.65	
	36-45 years	29	3.28	0.75	
	Over 45 years	6	3.07	1.34	
Confidence in using technology	25 years or less	15	2.86	0.40	0.001
	26-35 years	31	2.91	0.43	
	36-45 years	29	2.49	0.54	
	Over 45 years	6	2.30	0.68	
Epistemological Readiness	25 years or less	15	3.33	0.46	0.799
	26-35 years	31	3.41	0.43	
	36-45 years	29	3.32	0.38	
	Over 45 years	6	3.42	0.19	
Pedagogical Readiness	25 years or less	15	3.24	0.54	0.544
	26-35 years	31	2.98	0.61	
	36-45 years	29	3.12	0.61	
	Over 45 years	6	3.19	0.90	
Psychological Readiness	25 years or less	15	3.46	0.66	0.512
	26-35 years	31	3.31	0.51	
	36-45 years	29	3.24	0.51	
	Over 45 years	6	3.13	0.35	
Environmental Readiness	25 years or less	15	3.39	0.77	0.292
	26-35 years	31	3.11	0.87	
	36-45 years	29	2.90	0.75	
	Over 45 years	6	2.94	0.86	

Table 17 - Sub-scales distributed by teachers' age

### 5.2.6.2. Readiness according to teachers' years of experience in teaching

Table 18 illustrates that teachers who have been teaching for less than 10 years (i.e. more recently qualified) scored significantly higher in Confidence in using technology than teachers having more years of experience (16 years or more), since the p-value of 0.001 is less than 0.01 level of significance.

The mean scores for the other five sub-scales varied marginally between years of experience since the p-values exceeded the 0.01 level of significance.

		Sample size	Mean	Std. Deviation	P-value
Technological Readiness	1-5 years	32	3.55	0.76	.214
	6-10 years	12	3.71	0.78	
	11-15 years	16	3.66	0.66	
	16-20 years	16	3.14	0.89	
	Over 20 years	5	3.20	0.69	
Confidence in using technology	1-5 years	32	2.81	0.40	.001
	6-10 years	12	3.09	0.35	
	11-15 years	16	2.63	0.60	
	16-20 years	16	2.47	0.62	
	Over 20 years	5	2.14	0.26	
Epistemological Readiness	1-5 years	32	3.36	0.41	.829
	6-10 years	12	3.32	0.51	
	11-15 years	16	3.43	0.35	
	16-20 years	16	3.39	0.41	
	Over 20 years	5	3.20	0.26	
Pedagogical Readiness	1-5 years	32	3.01	0.58	.613
	6-10 years	12	3.19	0.63	
	11-15 years	16	3.28	0.76	
	16-20 years	16	3.00	0.62	
	Over 20 years	5	3.10	0.28	
Psychological Readiness	1-5 years	32	3.35	0.57	.710
	6-10 years	12	3.27	0.42	
	11-15 years	16	3.31	0.52	
	16-20 years	16	3.32	0.61	
	Over 20 years	5	2.98	0.16	
Environmental Readiness	1-5 years	32	3.21	0.83	.061
	6-10 years	12	3.23	0.97	
	11-15 years	16	2.98	0.70	
	16-20 years	16	3.08	0.67	
	Over 20 years	5	2.09	0.56	

Table 18 - Sub-scales distributed by teachers' years of experience in teaching

### 5.2.6.3. Readiness according to teachers' plan for tablet use

Table 19 illustrates that teachers who plan to use tablets for both class and home activities scored significantly higher in Psychological Readiness ( $M = 3.41$ ) than teachers who plan to use the tablet for class activities only since the p-value of 0.002 is less than the 0.01 level of significance.

The mean scores for the other five sub-scales varied marginally between teachers' planned use of tablets, since the p-values exceeded the 0.01 level of significance.

		Sample size	Mean	Std. Deviation	P-value
Technological Readiness	Class only	22	3.23	0.79	.058
	Class and home	59	3.60	0.76	
Confidence in using technology	Class only	22	2.76	0.50	.585
	Class and home	59	2.69	0.54	
Epistemological Readiness	Class only	22	3.25	0.40	.117
	Class and home	59	3.41	0.40	
Pedagogical Readiness	Class only	22	2.90	0.48	.080
	Class and home	59	3.17	0.65	
Psychological Readiness	Class only	22	3.01	0.54	.002
	Class and home	59	3.41	0.49	
Environmental Readiness	Class only	22	2.75	0.69	.028
	Class and home	59	3.19	0.83	

*Table 19 - Sub-scales distributed by plan for tablet use*

### 5.2.6.4. Readiness according to teachers' description of previous training on tablets

Table 20 illustrates that teachers who consider their training experiences on tablets to be sufficient scored significantly higher in Technological Readiness (p-value 0.001) and Psychological Readiness (p-value 0.004) than teachers who consider their training as very basic, if at all.

The mean scores for the other four sub-scales varied marginally between teachers' descriptions of previous training on tablets, since the p-values exceeded the 0.01 level of significance.

		Sample size	Mean	Std. Deviation	P-value
Technological Readiness	None	34	3.20	0.83	.001
	Very basic	36	3.58	0.69	
	Sufficient	11	4.14	0.43	
Confidence in using technology	None	34	2.66	0.46	.012
	Very basic	36	2.61	0.57	
	Sufficient	11	3.14	0.38	
Epistemological Readiness	None	34	3.27	0.32	.158
	Very basic	36	3.42	0.42	
	Sufficient	11	3.49	0.53	
Pedagogical Readiness	None	34	2.97	0.61	.297
	Very basic	36	3.18	0.57	
	Sufficient	11	3.20	0.79	
Psychological Readiness	None	34	3.12	0.49	.004
	Very basic	36	3.34	0.48	
	Sufficient	11	3.71	0.58	
Environmental Readiness	None	34	2.88	0.86	.033
	Very basic	36	3.09	0.79	
	Sufficient	11	3.61	0.50	

Table 20 - Sub-scales distributed by teachers' description of previous training on tablets

### 5.3. Summary of quantitative results

Analysis of the quantitative results gathered from the questionnaire (n=81) indicated that the majority of Year 4 teachers planned to utilise the tablet for both class and home work (72.8%). 49.4% plan to use the tablet for all curricular subjects, with Maths, English literacy and Maltese literacy being the most prominent.

Prior training on tablets was described as sufficient (13.6%) to none (42%). 46% of participants would consider taking up a course in tablet use in a particular curricular subject, rather than a basic course in ICT or a Diploma in Technology-Enhanced Learning.

Higher levels of confidence in using a range of applications and tools was found amongst teachers below age of 35, and those who have been teaching for less than 10 years. Higher psychological preparedness was found amongst teachers planning to use tablet for home and school activities, rather than for school work alone.

Sufficient training experiences on tablets led to increased use of technology when carrying out a range of tasks such as information searching and student assessment, and higher psychological preparedness.

#### 5.4. Phases 2 & 3: Qualitative results

The following section presents the results obtained in the qualitative phases of this research. Transcripts of the interviews, focus groups and field notes were subjected to a thematic analysis and this rendered several important themes identifiable. Following the presentation of a theme, a brief summary will be provided to help signpost the reader.

As described in Chapter Four (Section 4.4), codes were assigned to all participants in order to respect their anonymity. These codes will be applied when presenting quoted examples from the transcripts and field notes. For reference purposes the codes are identified in Table 21.

	<b>Participant</b>		
	Year 4 teachers	The E-Learning teacher	The Education Officer
<b>Code</b>	T1, T2, T3 etc.	ET	EO

*Table 21 - Participant codes applied in the reporting of data*

Furthermore, data obtained from observations shall be identified through the code OBS followed by the allocated number (e.g. OBS3 would indicate that the data was obtained from the third observation). In the presentation and discussion of themes, the number of participants who contributed to the development of that theme will be stated (e.g. 9/16).

Owing to the range and depth of data gathered, only indicative quotations thought to exemplify points, are presented within this section. Additional quotes have been included in Appendix L.

#### **5.4.1. Thematic map of qualitative data**

This section presents the themes that arose from thematic analysis of the data. Fig. 3 was created to facilitate the reader's understanding of the results of the qualitative section of this research. It presents a summary of the 5 identified superordinate themes, with the 24 associated subordinate themes.

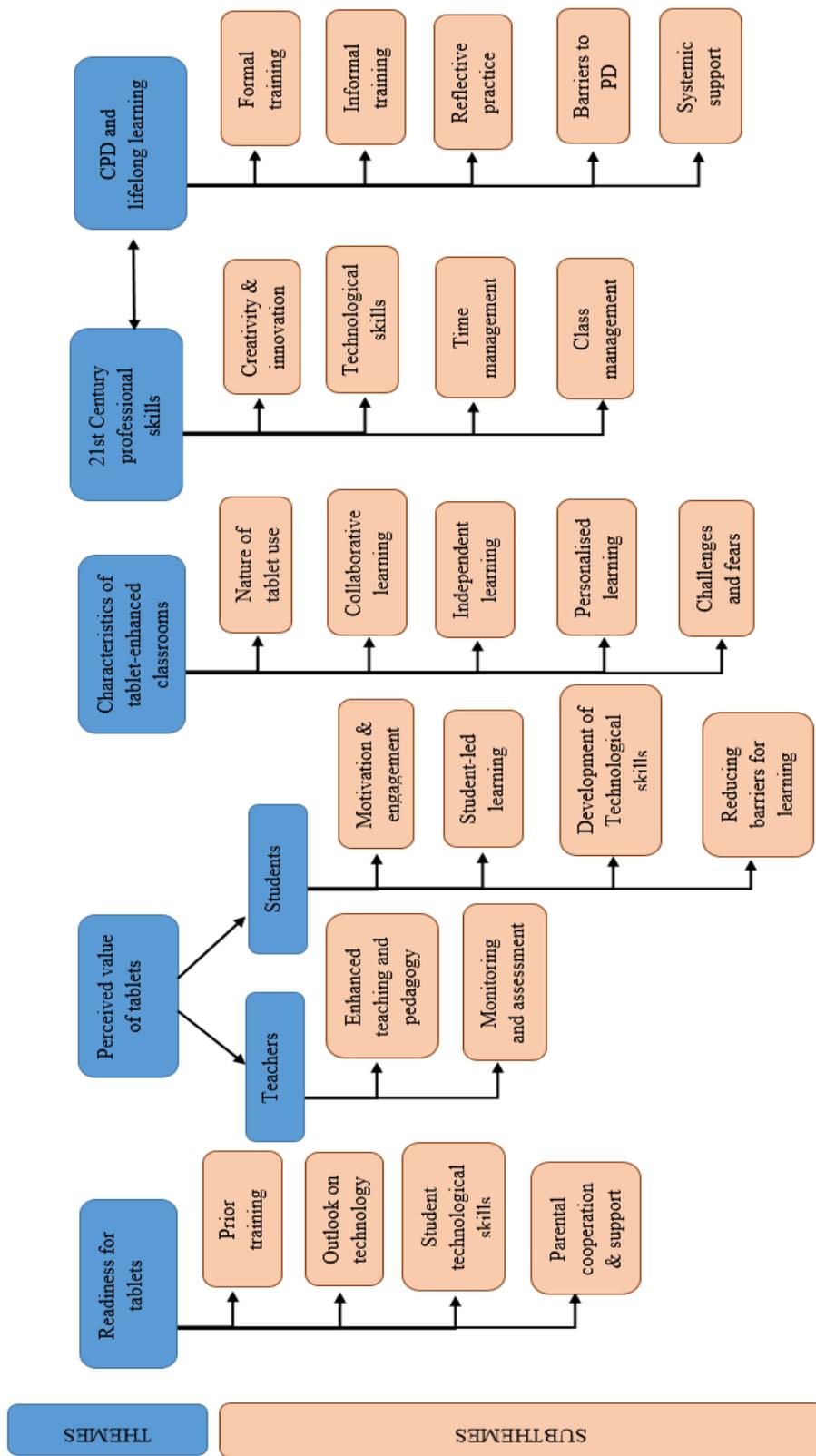


Figure 3 - Map of themes and sub-themes as a result of Thematic Analysis

### **5.4.2. Theme 1: Teachers' Readiness for tablets**

This theme explores the various factors which Year 4 teachers believed influence their ability to develop their pedagogy and use of tablets in their mainstream classroom. Participants discussed their prior training experiences in relation to the use of technology and tablets (15/16), perceptions and beliefs on tablets (12/16), parental involvement and support (9/16), students' technological skills (10/16), preparedness with regards to supporting students with SEN using tablets (4/16), and also the anticipated challenges that are hindering their readiness (7/16).

#### **5.4.2.1. Prior training experiences in relation to the use of technology**

Out of the 14 Year 4 teachers, six teachers reported having some form of training on the use of technology in their teacher training at University. Teachers who had been in the profession for a number of years (eight to twelve years) recall their training on technology to be somewhat out-dated nowadays, and not relevant to their practice;

*"We had lectures about technology but surely not the interactive whiteboard at that time it wasn't mentioned, the tablet obviously it wasn't mentioned...software on computers...on PCs...it was different as well... I remember using Pics and Print-shop, these are things we don't use now" (T5).*

Those teachers who recall having training on the use of technology, do not feel that the teaching aspect was very useful for their developing practice, but rather it was the professional teaching practice that gave them a true sense of the reality of teaching;

*"you really get the hang of it when you're actually in the class... at university they couldn't give us that experience, there was only one teacher who had showed us 'you can do this, you can do this, you can do this'... it's like we do in the class... but you can't tell them you do this and that, they need to do it themselves... so when we go out for teaching practice, we're faced with the reality and you ask what I'm going to do? And in a split second you need to learn it [the technology] because the next day the tutor might come in and you might be examined on it and they expect brilliant stuff" (T4):*

Although some teachers considered teaching practice as an opportunity to learn, some did not feel that they were adequately supported.

*“They throw you in, sink or swim... it’s up to you now from now on...you don’t do that with the kids so you don’t do that with the teachers either’ (T14).*

Teachers who do not feel confident with using technology felt that it is crucial that support be provided with each piece of technology introduced:

*‘We need a lot of support for it to be successful, if we are left on our own, like we did with the interactive whiteboard was introduced...we were completely left on our own...um... people like me who are not very confident at technology would give up’ (T2).*

Apart from providing sufficient training opportunities, the majority of participants agreed that teachers need to be provided with opportunities to explore, and experiment with the device, in order to gradually accustom to its many functions:

*“It’s only till you get used to it... I mean with these things [technology] it’s always like that I think... like with the interactive board at the beginning...it was difficult but nowadays I can’t work without it” (T12).*

#### **5.4.2.2. Teachers’ outlook on technology**

Teachers presented mixed feelings about using various forms of technology. While most teachers felt moderately confident, two participants who have been teaching for over ten years described themselves as anxious or nervous when using technology, especially when they encountered difficulties utilising the devices, or were learning about multiple pieces of technology at once:

*“It [confidence] depends on a lot of stuff, it depends who you’re talking to... the age... it’s impossible, if you’re like over 50...you’re still getting used to the IWB [interactive whiteboard]” (T14).*

As T7 reported, feelings of insecurity also extended to technology use within their personal lives, such as owning a smartphone or using a computer:

*“I struggle... even to find an app and to open something...I struggle sometimes because it doesn't respond quickly... even I use the stylus sometimes and I don't make contact...I struggle in these things... with gadgets... and in fact I don't even own a smartphone!” (T7).*

However, all teachers agreed that building confidence in using technology is essential for them to begin shifting their attitude and pedagogy to include new technology;

*“For this to be successful you have to be confident... to...to do these things because it entails a lot of work... from our part... to be able to shift your way of thinking” (T2)*

Participants agreed that although a challenge, technology is the way forward in education and some practices are no longer suited for the student population. Pedagogy therefore needs to develop accordingly;

*“They [other teachers] are getting used to the idea that they need to learn about it so they need to fix things...and that's a good sign... you need to learn to move on with the times...” (T4)*

*“But you need to learn, in time they [current methods] will become obsolete” (T6)*

#### **5.4.2.3 Students' technological skills**

Teachers presented mixed opinions about students' technological skills; while some teachers commented about students' advanced skills, others felt that some students lacked the necessary basic skills due to a lack of exposure to technology at home, and consequently need to be taught the necessary skills prior to engaging with learning using the tablet:

*“[have been] in a school where you ask them to switch on the computer, and they've never touched a PC, so with kids who are not into technology...if nobody taught them or they were brought up away from technology, we can't expect them to know” (EO).*

This led to a discussion of a broader issue regarding the possible gap between the skills of the teacher and the student. The majority of teachers did not consider this to be a disadvantage, since technologically able students can use these skills to support the teacher:

*“I don’t think it’s a problem having the children be knowledgeable in technology... I mean we’re always learning and we learn from the children as well” (T2).*

*“This summer, children taught me... they managed to download and showed me how to play ‘Pokémon Go’... something very small... but what I want to say is that we cannot say I’m a teacher and I don’t want to show children that I don’t know how to do this; you are good at one thing and they are good at another” (EO).*

Support for students with limited technological skills can also be provided from their more technologically-able peers, who tend to be eager to help each other in the classroom and show off their skills:

*“One student did not manage to locate the App on her own. She raised her hand to attract the teacher’s attention but was not successful since the teacher was attending to other students. She therefore turned to the student sitting next to her for support, who was able to help her navigate and locate her work” (OBS7).*

However, one teacher felt that students might take advantage of their increased skill-set, and the teacher would be perceived as an ‘underdog’ (T4). Contrasting behaviours were also observed during class observations; most teachers responded positively to student direction when they encountered technical difficulties or found difficulties navigating the device (e.g. OBS7, OBS3). However, one teacher did not take directions from students well; she got rather cross at students for attempting to give her instructions (OBS11).

#### **5.4.2.4. Parental involvement and support**

Parental involvement and cooperation was a prominent issue discussed by Year 4 teachers. Teachers believed that while they tried to promote online-based tasks for homework, parents were still opting for work that is based on hand-written, traditional ways of learning and that for their teaching to be successful, these parental beliefs need to be challenged:

*“The idea of 21<sup>st</sup> century learning is still developing...we need to try to change...try to change the ideas that it’s not only what is written that counts” (ET),*

*“some parents are objecting because they still expect to see work on their copy books, and in fact they are saying that I am not giving any homework...so parents have to change their mind-set too” (T1).*

Teachers (9/16) also believed that students’ approach towards technology at school is shaped by their exposure to technology at home. Teachers felt that they need to support parents in understanding the educational value of the tablet, beyond the typical entertainment purposes;

*“I expect it [tablet] to help the children if used properly...by us the teachers...but if they [students] consider it as a toy then it won’t be successful...but if I manage to convey the idea that they’re there to use to learn... I think it should be very helpful” (T4).*

Teachers (5/16) therefore concluded that for parents to understand the role of technology at school, support and training is needed to provide parents with the skills needed to help promote their children’s technologically-enhanced learning. Examples of parent support mentioned included school meetings, classroom visits during tablet use, and the organisation of parent-child activities such as reading an online book in class:

*“I believe it’s important that we give them [parents] the opportunity...because if they [students] come across something they don’t know, this way they [parents] will be prepared, and can become more involved in the process, and know what to do” (T12),*

*“Maybe also in terms of support for home, for parents...maybe they have meetings...to see what’s going to happen at school with tablets” (T10).*

### **5.4.3. Theme 2: The perceived value of tablets**

This theme explores the positive aspects that all professionals described in relation to the use of tablets and technology in learning (hence, the subtheme ‘Value for students) and teaching (‘Value for teachers’).

#### **5.4.3.1. Value for students**

With regards to student learning, professionals reported increased motivation and engagement (13/16), increased independent learning (10/16), development of technological skills (2/16) and reduced barriers for learning difficulties and SEN (8/16).

##### **5.4.3.1.1. Motivation and engagement**

Growing up within a digital era, students are reported to be motivated by the familiarity and fun aspects of the device:

*“Children may be more engaged, because nowadays technology has become a part of their life” (T9).*

All professionals agreed that the tablet is motivating because it presents students with an exciting modality and environment for learning, contrasting to the less appealing traditional pen and paper methods:

*“It’s motivating, it’s not pen and paper, it’s a tablet, I can use my finger, I can use my stylus...so I think that’s the main strength... a big motivation for the children” (T4).*

Furthermore, activities using the tablet are more engaging. During the observations, tasks using the tablet required students to participate more creatively by carrying out their work through various methods such as power-point presentations, videos or pictures, providing students with the possibility to choose according to their learning style:

*“Instead of the teacher giving notes for them to read from, they are given the tablet and they present the information in slides or a video” (T15).*

Linking also to the theme ‘student-led learning’, the fact that students rely less on teacher instruction, and do tasks more “hands-on” is reported and observed to support student motivation to attempt the tasks, and engagement to complete it;

*“You can draw and colour and write in any size, any shape...insert pictures, that kind of creativity...and the fact that they can do it themselves, like the teacher just not on the board but on their own tablet it helps engage them” (T4)*

*“A student sitting at the back of the class got very excited with the quiz activity on his tablet, and he stood up with his knees on his chair. He was bouncing slowly on his chair. He attempted each of the questions presented, and was on-task throughout. He raised his arms in excitement whenever he got a correct answer” (OBS3)*

Teachers are taking advantage of the fact that the tablet is engaging and motivating for students, and are utilising the device as a reward which is, in itself, reinforcing learning;

*“the positive thing is you can use it as a reward like with one child...if we are using it for writing...even if it’s an educational game on the tablet, for him... he’s enjoying it” (T12)*

*“Using the tablet as something they look forward to” (T9)*

The tablet features an individual screen and headphones which are reported to facilitate engagement, since students are better able to disengage from the class noise and focus on their work.

#### **5.4.3.1.2. Student-led learning**

The tablet provided opportunities, and encouraged students to work more independently. Teachers believed that through activities on the tablet, students rely less on the teacher’s explanation and are more in control of their learning. This was confirmed through observations, as students were seen to attempt tasks on their own, move around the classroom and work at their own pace:

*“The advantage is that students can practise what you’re saying rather than just listening to you” (T9),*

*‘the fact that it’s handy and light...the children can go literally around, take photo of a shape if we’re doing maths for example...and they look around the room, they can take photos and show them...or they can make a document and put all the shapes they find, so it’s very handy’ (T4).*

For those students who typically require more time to do their work, the tablet provided a less demanding environment since only the students themselves were seeing their work, making their progress less apparent to their peers:

*“When she is for example, doing an exercise and during her classwork...and we have to hurry up to finish, you know... um...doing it on the tablet will diminish that...that feeling that she did not manage to finish” (T2).*

On the other hand, the more-abled students who finished quickly in comparison to their peers were provided with *“additional work and they can continue working instead of wasting time. They can continue scaffolding and practicing” (T3).*

#### **5.4.3.1.3. Development of technological skills**

Although only one participant commented about this, this subtheme links well with the previous subtheme on ‘students’ technological skills’. The EO reported that the tablet can be used to teach students important technological skills which involve the use of coding;

*“there aren’t much games on it but for example, one of them is computations thinking, when it comes to coding... so although it’s a game, at the same time we are teaching them a form of programming which in Malta is lacking” (EO)*

#### **5.4.3.1.4. Reducing barriers for learning (and SEN)**

Within mainstream classes, students present with a range of abilities, with some students having significant difficulties with regards to academic, social or emotional needs. Teacher responses, and observations carried out, indicated that participants’ classes include students with difficulties related to developmental delay, attention difficulties, Autism Spectrum Disorder, and literacy difficulties. The tablet was observed to support students with SEN as it made learning activities increasingly personalised, in such a way that they fit with their

abilities and needs. Teachers perceived the tablet as facilitating this differentiated learning through a multitude of Apps which can be targeted at various levels of ability:

*“there are different Apps... that will cater for different needs too” (EO).*

Two teachers who have students with fine motor, handwriting difficulties explained how the tablet can help reduce the barriers students experience when expressing themselves through writing, especially when they need to read their own handwriting:

*“Sometimes they don’t even read their own handwriting, so with typing it will be easier for them to read” (P9).*

Teachers (6/15) also believed that the tablet can help encourage students who are not confident to speak in front of other students, and who typically shy away from class participation. The tablet is reported to help such students participate more in lessons as they are able to share their answers in a less direct and anonymous manner:

*“the fact that they are too embarrassed to come up in front of their peers...to do games, to talk, to read...the embarrassment... and the tablet will help them overcome that because nobody will be watching except me through my tablet” (T1).*

#### **5.4.3.2. Value for teachers**

With regards to daily practice, teachers reported that tablets may bring about enhanced pedagogy (13/16) and facilitation of student assessment and monitoring (9/16).

##### **5.4.3.2.1. Enhanced pedagogy**

Most teachers (13/16) considered the tablet as an additional resource which should be used to the advantage of both the teacher and the students. While it is a useful tool for the teacher, it can make learning easier, and more appealing for students:

*“I feel that it guides my work, technology guides my work... It’s like having technology as part of your resources sort of...technology and resources go together, um, it makes the learning process easier for the children” (T5),*

*“Learning as we know it is no longer interesting for children ‘cause they do come to school with a baggage that is already full of technology...so you have to integrate, you need to have these aspects in your teaching too!”(T5).*

Through the incorporation of technology in teaching, teachers believed that learning will become more modern, and therefore become increasingly familiar, enjoyable and interesting for students;

*“we won’t continue teaching in an old style... that they will see school as something boring...school is changing, becoming more modern...more student-centred and more fun...more chance for exploration” (T11).*

An example of an enjoyable activity was observed during a creative writing task, where students were presented with a colourful, visual, interactive map onto which to insert their chosen words:

*“When presented with a mind-mapping activity to support creative writing, students were able to type words into a multi-coloured map on their tablet by selecting different parts of the map with their fingertips. This provided students with a structure, and a visual aid. All students attempted the task. After a stipulated time frame, students were asked to feedback to the rest of the class any interesting words that they inserted into their web” (OBS9).*

Finally, teachers (2/16) believed that with the tablet, it is easier to differentiate learning amongst students since they are able to send different activities to different students instantly on the tablet:

*“A particular feature that the tablets have is that you can send one particular lesson to one particular child, and you’ll have that child working on that lesson and another child working on a different lesson”*

In doing so, teachers did not bring the different activity to the attention of others, and did not cause any unintended embarrassment to the student;

*“Differentiation like we do using handouts, it can be done in an easier way on the tablet, without the other children knowing that that particular child was given a different task” (T2)*

#### 5.4.3.2.2. Monitoring and Assessment

With tablets, teachers explored new, improved ways of monitoring student work and carrying out assessments. The tablet provided teachers with the facility of observing their students' work on the tablet in real-time. Teachers believed this to be a superior method to the usual physical monitoring in the classroom and provided multiple advantages:

*“It could be very beneficial because even with the ‘class connect’, the fact that you can see a student doing really well and you can show it there and then to the other children... They participate more actively” (T4),*

*“even Kahoot... it’s great... they get so excited... and even sometimes instead of giving them paper tests, I have used Kahoot...for example they need to study the times tables... we do the test on it... and I feel they make more effort to study..” (T5).*

Apart from monitoring, teachers reported that through certain features, they are able to respond to, and prompt students' attention indirectly through the device, thus resulting in less distractions for the rest of the students:

*“Imagine, right now I want to point him out, I say Paul...shh! And everyone will know...but this way I can just click \*gesturing click\* and nobody will know why...or what it is he did... they won't be distracted and they'll be able to continue on their work” (T4).*

The facilitation of teacher assessment and monitoring was also confirmed through observations:

*“The teacher could see students' work in real-time on the IWB. This way, she could see that all students were on-task on their tablet and prompt as needed. Once receiving pictures on the cloud, the teacher clicked on student work and showed their good work to the rest of the class” (OBS4).*

#### **5.4.4. Theme 3: Characteristics of tablet-enhanced classrooms**

This theme explores the pedagogies that teachers employed with the use of tablets to support the learning of students in their mainstream classrooms. The most pertinent issues emerging from the data were information about teachers' structure and planned use for the tablet. Teachers' pedagogies using tablets are considered to bring about increased independent and personalised learning, whilst also facilitating increased opportunities for collaborative learning. Although such practices were found to be progressive, teachers also voiced presenting challenges and fears, which should also be acknowledged in order to link to possible support structures and training programmes.

##### **5.4.4.1. Nature of tablet use**

Teachers who spoke about duration of tablet use in the classroom agreed that the device should not be used for a long period during the day, but rather used as a task to complement the teacher's learning objectives:

*"my idea is not to use the tablet for example for a whole lesson...it's up to the teacher, depending on her lesson or the learning intention and everything, whether to start with it or sort of use it for an introduction or it can also be the main task too" (T5).*

During observations, a typical lesson or explanation took place, followed by tablet-based tasks. Teachers believed that by having the tablet for a prolonged period, it would be difficult for them to structure the lesson, and by becoming too accustomed to its use, students would no longer be as motivated:

*"I wouldn't want it all the time...first of all time management would be impossible and children would get so used to it, it will lose its effect" (T14).*

Teachers spoke about various Applications which are used to set up creative, fun activities to support student learning. Some examples included Apps for Maths, English creative writing and reading:

*“it could be used properly I think if you use the right tools...the right Apps... and obviously not just for I don’t know...browsing the internet... Apps which you can use effectively with students...for example, I already started using Simple Minds for the composition” ... “there are ways of how we can present a Web ...everyone brain storms and everyone writes words” (T11, T6).*

While teachers commented on the vast range of Applications available online, they believed that focusing on a few applications in which they can become more fluent and competent was the best approach. In fact, during the observations, teachers were seen utilising Applications which could be easily applied across curriculum areas: one example is an App which presented a whole class multiple-choice questions activity during different Maths and English comprehension lessons.

#### **5.4.4.2. Collaborative learning**

When discussing successful pedagogy, teachers gave examples of whole-class activities using the tablet which promoted student collaboration. Through a paired or group class dynamic, and interactive games and activities, students were observed to work together in such a way that lead to more opportunities to interact with one another. In doing so, they were seen to build friendships, learn from each other’s answers, and support one another when in difficulty:

*“All the students in the class were given a role (main journalist, small journalists, videographers, photographers). Each group of students were to come to the front of the class and present the slide being shown on their tablet. While one student read the power-point, another student took a picture using the tablet and the other filmed a video using the tablet” (OBS4),*

*“Students were divided into pairs, and instructed that one student takes responsibility of reading out the questions found on the power-point which had multiple pictures, while the other student will type their answer on the tablet once it is discussed and agreed” (OBS2).*

#### **5.4.4.3. Independent learning**

Through the use of individual tablets, and improved monitoring systems, teachers believed that they are better able to provide opportunities for students to take control of their own learning, by having them attempt tasks on their own more freely:

*“The document presented on each student’s tablet contained a story, with large text and pictures. Students were asked to read the story independently. Students could be observed to read at different speed, and some students enlarged the text print to facilitate their reading” (OBS1).*

Independent learning was also encouraged within the home environment through the use of the tablet. The teachers reported that by taking the tablet home, students may be more inclined to do their homework, and are also provided with the opportunity to revise or carry out additional work which they can locate online;

*“You [the teacher] can upload something that they’ve already done at school and from home they [the students], at any time... they can revise...including in summer...so there is a lot of independent learning going on” (EO).*

#### **5.4.4.4. Personalised learning**

The EO reported that prior to learning about the device and integrating it into daily lessons, teachers must acknowledge the need to change pedagogy, and aim towards more personalised learning through work that is matched to each student’s abilities:

*“all the teachers need to know where each and every girl or boy stands, and where they want them to be...every child gets to work at their own pace...the idea that through a handout or comprehension you are teaching your 20 students irrelevant of whether it’s targeted at a good level or not, needs to stop” (EO).*

Through the tablet, it was easier for the teacher to assign different pieces of work to different students, and to have different students working on different tasks. Moreover, observed teachers used the tablet for a range of activities such as videos, group work and

class discussion all in one lesson, thereby utilising a range of resources that address different learning styles:

*“The student with ASD carried out a different activity from the rest of the class on his own tablet. The class teacher presented the student with a reduced number of printed questions, with multiple visuals and large text. The student connected his tablet with the back PC with the help of his LSA. The LSA read the question out for the student, and together they counted till the student reached an answer, which he typed on the tablet. The App displayed his score, which at the day was the highest he obtained all week. The student seemed truly happy about this, and he asked his LSA to take a picture of the monitor to show to his mother” (OBS2).*

#### **5.4.4.5. Challenges and fears**

Challenges and fears was a recurring theme that was identified at various points in the data. Teachers (5/16) were concerned about the use of technology amongst students with behaviour difficulties, since they believed that students may become frustrated or tired during a school day, and may vent these emotions when using the tablet, causing it damage:

*“I think he [student with behaviour difficulties] would get motivated...but only I think, it’s short term...when he gets fed up he would start banging... I would imagine he’d start banging” (T7).*

*“You need to keep in mind that these children are unpredictable...you have to keep in mind that...after a whole day... I mean, a whole day is long for these children at school” (T7).*

When delivering lessons with the use of the tablet, teachers reported that planned activities were taking a lot of time, more than they initially anticipated, thus taking time from other important activities needed to be carried out.

*“It was very interesting, but the lesson took a good hour and a half, that’s the problem...like two and a half lessons” (T14)*

Teachers also reported the increased workload and preparatory work for tablet-based activities, especially when this is required within a short time-frame;

*“We’ll have the course in September and they [the school senior management team] will expect us to finish our planning by the week after, and for NQTs it is more difficult, like my file...it’s...everything is like disorganised for now... I’m still getting used to it and I have summer to work on it...but I’ve just finished planning and now have to start from scratch” (T15)*

*“We are going to have more work ‘cause we need to prepare a lot of things...” (T12).*

All teachers also agreed that they have undergone other major changes during the year, such as the introduction of a new curriculum, which was considered by participants as too many changes happening at once:

*“We are going to have a lot of changes, we do feel exhausted you know, you want to do it right but with all these things going on... (T9).*

Technical difficulties were reported by some teachers; mainly in relation to some applications not working properly, or the device not working altogether. This consequently required the teacher to pause the lesson in order to address these technical difficulties.

*“Students were guided by the teacher to locate the App that will be used for this activity. This was done by verbal instructions and written instructions on the whiteboard. Students attempted to do so; while most of the students did so independently, some needed guidance navigating the device and asked the teacher for help” (OBS4)*

During one observation (OB15) the teacher reported that technical difficulties created so many distractions that she questions whether or not to do the activities at all.

#### **5.4.5. Theme 4: 21<sup>st</sup> Century Professional skills**

This theme explores the professional skills that teachers and professionals are currently practising, or wish to develop, in order to deliver a pedagogy that integrates the use of tablets in an effective manner.

##### **4.4.5.1. Innovation and creativity**

Teachers felt that innovation and creativity constituted a major part of their role, especially with regards to creating activities that would combine traditional teaching methods with new, technological innovations that would be appealing to students and still result in the necessary teaching and learning outcomes:

*“you need to imagine how you can make it fun...it’s already difficult in real life but with the tablet it’ll become easier like I mentioned in the previous example, instead of just drawing or writing what the item is, they can take a photo” (T4),*

*“you have to start new lessons because that’s the thing then... okay, you use material that you already have but you have to change it according to the tool you have” (T5).*

##### **5.4.5.2. Technological skills**

Three teachers who felt that they are still getting accustomed to tablets believed that technological skills such as successful use of the tablet and its applications are important, as it leads to feelings of confidence in their role as teachers.

##### **5.4.5.3. Time management**

Two teachers and the EO reported that new pedagogy begins with the creation of new lessons, and new material for students. However, when considering their other duties (corrections, preparation for concerts), they felt they have little time to spare to do such work. With less time on their hands, teachers reported that such adaptations are carried out at home in their own time:

*“We understand that there is a need for preparation...and many times this happens at home...so we appreciate the sacrifices that teachers do, or a number of teachers do at home*

*to prepare...there are a lot of teachers who are very willing...that as soon as they took the tablet home, they were already preparing work to give over the holidays” (EO).*

#### **4.5.5.4. Class management**

Teachers considered class management an important skill, and they strongly believed that the teacher should have control in the classroom and its management since the addition of exciting tools is seen to influence the class dynamics. The pilot project described by the EO indicated that teachers requested measures in order to ensure that they have control of the tablets within the classroom. Results indicated that while teachers requested close monitoring of students and limited access to the internet, the EO believed that students are being denied the wide access to knowledge that the tablet can provide;

*“teachers wanted full control of what happens on the tablet and what children are seeing, in fact the learning management system you have class connect where the teacher, anytime, can see the children’s tablets... what they’re doing, what they’re accessing...”, “they can’t search for anything they want, not even google for example...”, “it’s good to have full control because the teacher knows what is good for her children, but I believe that children also need to be given responsibility...and some independence” (EO)*

*“It’s helpful that it [the tablet] is controlled... you just don’t want to abuse it too much” (T4).*

#### **5.4.6. Theme 5: Continuous Professional Development (CPD) and Lifelong learning**

This theme strongly links to the previous theme, 21<sup>st</sup> century skills, since it is believed that CPD and lifelong learning are professional attributes that teachers must develop in today’s society. This theme encompasses teachers’ views about professional development, specifically, aspects which they felt were supportive, and others not so. During these discussions, teachers provided insight into future CPD which they believed will support the

development of further innovative pedagogies utilising tablet. These programmes include a range of formal and informal training programmes.

#### **5.4.6.1. Formal training**

All participants were in agreement that three days formal INSET training alone is not effective, especially when teachers felt overwhelmed with theoretical information presented. Teachers reported that, similar to students, hands-on practical activities which they can attempt themselves are most effective in helping them develop new activities and pedagogies involving the use of technology.

Two teachers experienced formal training where they were presented practices carried out in foreign countries. They reported that such training is not effective, as such practice does not reflect Maltese students and classrooms. It is therefore apparent that any practices adopted in foreign countries need to be tested and adapted for the local educational context;

*“I don’t know why they show us Swedish schools... you know, they’re number one, they have no homework, no exams... and children are doing very different things” (T15,*

*“Leaders of education in Malta say that although they have visited a lot of educational places... Singapore, Finland...so the top of education... you can’t get a system as it is and get it to Malta...so you definitely need to adapt, and the same with the tablet...it can’t be the same a 100%” (EO)... ..”This particular tablet has been in the UK for years and certain comments and certain arguments did not come up... the reason is that we have not only a different culture, but also the way we teach is different” (EO).*

Teachers (3/16) also believed that training could be more effective if targeted at particular schools, rather than the larger national scale in which INSET is typically implemented. They believed that this facilitates the sharing of ideas of practices as they would all be coming from the same school environment.

*“We know the needs of our schools not...not teachers who come from schools that are totally different from ours...that have...different challenges different problems...different kind of student population” (T7)*

Teachers also agreed that since technology and pedagogy are continuously evolving, developments should also be reflected in ongoing training in order for them to be well-informed of the latest practices and strategies.

#### **5.4.6.2. Informal training**

In addition to formal training, teachers also commented on different forms of informal training. Following formal INSET training, a support teacher from the eLearning department visited their schools frequently to provide continuous support and training through individual or group sessions on lesson planning and delivery of lessons using the tablet:

*“You need to understand that teachers, if you show them all at once, they’ll give up... but then the positive thing is that support is not only based on those three days of INSET, our support teachers continue to support and help the teachers in schools and they will remain in schools...so support will be given throughout...ongoing training will continue” (EO),*

*“the eLearning teacher is doing a good job, she’s assisting us and giving us sessions...we do ask questions and we do send her a lot of emails to ask about things... and we do get an answer quickly” (T5),*

*“It’s good that if you don’t know something, you ask the expert and they will help you overcome your difficulties” (T10).*

Six teachers reported that having informal sessions involving the observation of a colleague, or simply being exposed to different methods of teaching using the tablet can be beneficial;

*“If you see another teacher, and you observe, it helps a lot because I used to go...before I started teaching, I used to go every day for thirty minutes and she used to do interactive activities while I was there...and it helped a lot... I understood how to manage the class at that time...it helped a lot...that week that I went to observe her, everything, even how to manage a class... I learnt a lot from her...” (T11).*

All participants described the sharing of good practice between teachers as an effective means of professional development. They described how they often sought information and resources from one another verbally and online, to help the development of more innovative ways of working. One teacher stressed the fact that teachers have many areas of expertise and such skills should be shared amongst one another. Moreover, they believed that such sharing is mostly beneficial when done between colleagues in the same school, rather from an external person such as the eLearning support teacher:

*“Our advantage is that as a group we work a lot together, and we work well together and we share...work and resources and such” (T11),*

*“During certain PD sessions we could split up in groups, in this case we could talk with our colleagues and say look I’m finding this difficult...do you have any help? Not only the support teacher can help us, but we can help each other after all...the class connect is linked to all the school so we’ll be able to see each other’s lessons when they are uploaded...we’re all on one page, might as well even share the experience” (T4),*

*“The support teacher can help, but she’s not experiencing the class and so we’ll be able to help the others more... she’s helping us... she can help us with new developments and teach us how to use them, but then we’ll be implementing them and trying things out” (T4).*

On the other hand, one participant felt that some teachers tended to be overprotective of their work remits, often not allowing other professionals to share their work or help out. However, it was acknowledged that such practices should be challenged for collaborative professional development to be successful:

*“What needs to change also, which I forgot to mention is that with some Maltese teachers it’s like I have my boundary, my resources and I don’t want anyone stepping on my land...with regards to the tablet, if I’ve made a lesson and there are let’s say two or three year 4s, the other year 4s can see it, use it or copy it or amend it...so sharing of resources is not an option, it will happen” (EO).*

#### **5.4.6.3. Reflective practice**

Only five teachers explained how engaging in reflective, critical analysis of their practice helps them develop and improve their pedagogy:

*“After you do a lesson you always reflect on what went well, what went wrong and what can be improved...maybe you could have managed your time better...you do an evaluation of the lesson so that you continue to improve” (T11).*

#### **5.4.6.4. Barriers to Professional Development**

Teachers frequently acknowledged that more dedicated time for professional development on their work using tablets is required. One of the main challenges discussed were the other managerial priorities and demands:

*“The problem is that... curriculum time is always full and we don’t have much time to meet...during the session with the eLearning teacher” (T9).*

Moreover, some teachers felt that their busy schedule made them less available to take up support offered by the school, as they needed engage in corrections, IEPs and other demands, thus providing teachers with less time to explore the tablet and to discuss practice with other colleagues.

#### **5.4.6.5. Systemic support**

Teachers advocated increased support regarding technology from within the school system. Examples mentioned by participants included dedicated time for collaboration with teachers, training top-ups, support with preparatory work and opportunities for exemplary lesson demonstrations by colleagues or other professionals:

*“in fact I was thinking of suggesting it to the head, because he’s doing all these PD sessions in-house...so we could ask the eLearning teacher to do us... a general overview for the year 5 and 6 especially...a PD session about tablets” (T4).*

*“I think there should be ongoing training in schools so it’s not just one training before you start using it and that’s all...I think there should be ongoing training like for example you*

*find like two, three sessions per year to refresh what you already know and perhaps then...you are given new skills” (T5).*

## **5.5. Conclusion of results and findings**

The results point to important dimensions related to different aspects of teachers’ use of tablets in the classroom. While the first phase provided insight into teachers’ readiness for the use of tablets in their mainstream classrooms, subsequent phases explored their experiences of technology in the classroom, the new pedagogies that are being developed as a result of tablet integration, and also the CPD and support systems that are crucial in bringing about effective teaching and learning experiences using the tablet.

Revisiting the results of the quantitative section, one can see that the majority of teachers reported that they plan to utilise the tablet for both classwork and homework for all subjects, with the most popular being Maths, Maltese and English. Prior training among teachers was often limited, with many teachers reporting that their training was described as sufficient, if that. If deciding to take up training, most teachers opted for a training course on tablets in relation to a particular subject.

With regards to the variables related to teachers’ readiness to use tablets, four latent variables produced were found to be statistically significant to some form of demographic or school-related variable, indicating that they contributed in some way to the development of teacher readiness to harness tablets in their teaching. Therefore, factors that had been found to influence teacher readiness included:

- **Age:** younger teachers indicated having higher confidence in using a range of technological applications and tools;
- **Years of teaching experience:** more recently qualified teachers indicated to having higher confidence in using a range of technological applications and tools;

- **Use of tablet for home:** teachers planning to use the tablet with the aim of continuing learning within the home environment showed increased psychological preparedness with regards to integrating the tablet in teaching and tackling any difficulties as they emerge;
- **Sufficient training;** considered as the most impacting factor, teachers who indicated that they had sufficient training indicated increased use of technology in the classroom and higher levels of psychological readiness to use said technology

The results of the qualitative data identified through a thematic analysis provided important information highly relevant to the topic of the research questions. The analysis provided a more in-depth understanding of the factors underlying teachers' readiness, which indicated other possible influencing factors such as parental support and cooperation. Participants also explained the diversity of student technological skills they are encountering in the classroom and how this influenced the classroom dynamics. Technical difficulties and a lack of infrastructure were defined as 'challenges'.

The tablet was generally considered as bringing about improved outcomes for both teachers and students. Teachers commented about facilitation in student monitoring and assessment, whilst creating a more interesting and modern learning environment, which relied less on traditional pencil and paper methods. Tablet devices in the classroom indicated increased student engagement and motivation, increased autonomous learning, and support for developing technological skills. Tablet devices provided opportunities for teachers to help reduce barriers for students with learning needs, such as attention-deficit and literacy difficulties.

Teacher pedagogy which utilised tablets promoted collaborative learning through increased group work or whole class activities. On the other hand, independent learning was supported through increased personalised learning through the use of Apps which were adapted to address diverse needs. Consequently, students placed less on the class teacher.

Despite the positive opportunities, challenges to these practices included lack of parent awareness and support from home, limited time for preparation and adaptations, increased teacher workload and technical difficulties.

Developing roles which effectively harness technology indicated a need for teachers to develop innovation and creativity skills, technological skills, time management and class management. In order to help such development, teachers believed that training is essential, in both formal and informal models, and should be targeted at particular schools, over a number of sessions. Training which is “hands-on” and provides opportunities for experimentation was considered to be most effective in building teacher confidence and a wider use of tablets in teaching. Moreover, collaboration and sharing of resources amongst teachers was seen as promoting positive practice, whilst also helping support teachers’ relationships with one another to help reduce territorialism.

## **Chapter 6: Discussion and conclusions**

### **6.1. Chapter overview**

This chapter focuses on discussing the results in the context of previous relevant research and theory, described in the Literature Review. Each research question will be addressed in order. The Eco-Systemic Theory conceptual framework will be used to provide a context for the main findings. The discussion of this research also seeks to critically analyse the methodology employed, its strengths and limitations and possible gaps. Areas for further research will be identified and the relevance of the current study and implications for practice will be considered. This thesis will culminate with a summary of the research and conclusions.

### **6.2. Research Question 1: Which factors are influencing Maltese teachers' readiness to integrate tablet computers into their pedagogy?**

Various factors underpinning teachers' readiness for technology were identified in the literature review, and these factors, namely technological readiness, confidence in using technology, pedagogical readiness, epistemological readiness and environmental readiness were investigated through an online questionnaire. The concept of readiness was also discussed during focus groups and interviews. This section will therefore combine the results obtained from the two methodologies, and form a discussion in order to answer the research question in as much detail as possible.

#### **6.2.2. Influence of teachers' age**

Younger teachers reported higher levels of confidence in using a range of technological tools and applications. This finding was also supported through interview and focus group data, as older teachers discussed feelings of scepticism and fear when using new technology in the classroom. Older teachers indicated that they avoid the use of technology in their everyday life, indicating that their use of technology in the classroom would be a very new concept for them to learn. Pullicino (2012) obtained similar results in her study amongst

secondary school teachers in Malta. This indicates that older teachers who have limited use of technology would require more support, training, and opportunities to practise using the technology in order to master their use of technology, to build their confidence and overcome feelings of fear or reluctance to use tablets in the classroom. It is interesting to note that teachers in this study were, with time, able to carry out class activities using the tablet. However, they were more easily discouraged when they experienced technical difficulties. Johannesen & Eide (2000) argue that technology which does not function often leads to dissatisfaction and frustration, and often becomes a barrier to further attempts.

### **6.2.3. Influence of years of teaching**

Similar to the previous finding, teachers who have less teaching experience, or rather have qualified more recently, showed increased confidence when using technology. This therefore indicates that teachers who underwent recent teacher training, entered schools with increased skills in using technology. Nowadays, most beginner teachers have grown up with digital technologies and typically enter the profession with a set of technical skills (Bate, 2011), through the use of a range of devices such as laptops and smartphones. Possibly a result of this technological leap, training at University is providing student-teachers with technological experiences that give them increased confidence when compared to teachers who qualified 10-20 years ago. Studies suggest that beginner teachers are leading the process of technology integration in their schools (Gao, Wong, Choy, & Wu, 2011), since many newly qualified teachers are considered to be motivated to exploit the potential of technology in education, while others do not share this affinity (Tondeur, Roblin, van Braak, Fisser, & Voogt, 2013).

Student-teachers' practice experiences at University provide an opportunity for teachers to experience the classroom dynamics when using technology, and for them to truly put into practice the innovative pedagogies that they are developing professionally. During this stage in their practice, teachers in this study highlighted the importance of having sufficient

scaffolding from a mentor or tutor to help them feel less overwhelmed in their new role, and to slowly begin building their practice under sufficient supervision.

#### **6.2.5. Use of tablet at school and home**

The majority of teachers agreed that the tablet should be used for both home and school activities, indicating that they believe that the tablet may support work carried out at home. In fact, teachers felt that the tablet can provide the student with more appealing and fun tasks, which are different from the usual pen and paper activities. Students may therefore be more motivated, and inclined to do homework or to engage in further learning at home prior or following the lessons at school. Teachers who are increasingly willing to engage in this practice may be more willing to engage in professional development that can help them develop a richer pedagogy within the classroom, and a school culture that supports the use of technology. This change in school culture may take the form of improved policies that for example, help bridge home and school use of tablets through positive collaborations with parents.

#### **6.2.6. Quality of prior training**

The quality of training that teachers attended prior to tablet implementation is considered to have a significant impact on their readiness to use the device in the classroom. This is in line with prior research which indicated that the quality and quantity of pre-service technology experience is a crucial factor that influences teachers' adoption of technology (Ottenbreit-Leftwich, Glazewski, Newby, & Ertmer, 2010).

Sufficient training has been found to influence teachers' technological readiness with regards to using a range of technological tools and applications in the classroom. Training courses are expected to provide new teachers with the necessary technological skills so they can then be transferred to their teacher practice. However, teachers in this study did not feel that they were adequately prepared to integrate technology effectively into their

classrooms: where their formal training was focused on the technological aspects alone. This offered them little guidance on how it can be applied to pedagogy. Koehler & Mishra (2010) recommended that pre-service teacher education should not only focus on how to use technology but also how technology intersects with pedagogical and content knowledge. In fact, Lambert's (2015) study showed that basic computer skills training was not found to provide results that are meaningful to technology integration in the classroom context.

Not surprisingly, sufficient training on tablets also indicated higher levels of psychological readiness and much more positive beliefs about their ability to take up the use of technology in the classroom. This could also be confirmed by teachers who had no prior training or exposure in relation to technology, especially those who had trained many years back who reported feeling fearful about learning new technological skills. Teachers believed that they require training that provides ample time for experimentation to gain basic skills, together with support from an expert that will scaffold their learning and help them bridge their technological skills into pedagogical aspects in their teaching. The more experience teachers have with technology, the more likely they will be to report positive attitudes (Rozell & Gardner III, 1999).

Teachers who were able to form collaborative working groups with other teachers commented about the benefits of problem solving and sharing resources with one another to improve practice and confidence in using the tablet in class. However, a few teachers still appear to prefer working independently, and to not have others interfere in their work. It is therefore important that training opportunities highlight the benefits of collaborative working which includes sharing of resources, leading to less time spent preparing new lessons, and opportunities for reflection and feedback from other experienced teachers.

### **6.2.7. Technological divide between students and teachers**

Although this factor was not found in literature as a distinct factor that influences teacher readiness, it became very pertinent in the qualitative phase of this research. Teachers believed that the majority of students in their class have spent their entire lives surrounded by and using computers, videogames, cell phones, and all the other toys and tools of the digital age. This is a population of children who Prensky (2010) termed ‘digital natives’. Digital Natives as described by Prensky (2010) are accustomed to receiving information really fast, they like to parallel process and multi-task and they prefer graphics to text. They function best when networked: they thrive on instant gratification and frequent rewards and they prefer games to “serious” work. There is therefore a clear divide between these students and their teachers who Prensky (2010) termed ‘Digital Immigrants’, who like immigrants would need to become accustomed to the seemingly new, technological-rich environment of today’s society.

While most teachers were not concerned about this divide, as they felt that students will be able to assist them when in difficulty, some teachers felt that their inferior technological skills would be picked up by their students, who would take advantage of the situation, and feel superior to the teacher. According to Prensky (2010), teachers tend to have very little appreciation for the new skills that the Natives have acquired and perfected through years of interaction and practice, although this may be a reflection of teachers’ lack of confidence as indicated in the findings of this research.

### **6.2.8. Parental cooperation and support**

Parents’ influence on teacher readiness was not cited in any literature on teacher readiness. However, teachers in this research believed that parental cooperation and support did influence their readiness for technology, especially since some parents held conservative opinions regarding technology, and believed that their children’s homework should not be

electronic or online. As a result, teachers try to balance, and control their use of technology based on parental comments or complaints.

The sudden surge of research positioning technological ‘screen time’ as unhealthy for children (Dunckley, 2014), may have caused parents to become hypervigilant on their children’s use of technology or attempt to minimise its use as much as possible. This may have caused some parents to hold ambivalent feelings about the national promotion of the use of tablets in primary schools in Malta. According to Donohue (2017), such beliefs surrounding screen time are outdated, and parents should expand their thinking to include more crucial aspects, other than time, namely the content that the child is learning from the device, the context in which they are using it, and whether they have the opportunity to interact with others. In providing a better understanding on the benefits and educational gains that tablets may bring to their children’s learning, parents can make better informed decisions, and may be more inclined to support the school’s vision for tablet use.

Teachers in this study reported that schools may be more proactive on the matter, and provide training and opportunities for parents to see tablets being used by their children, and to practise carrying out learning activities alongside them. These are both strong recommendations, which have been previously presented by Bannister & Wilden (2013) as ways of supporting parental involvement with regards to technology use in schools.

### **6.3. Research Question 2: How are Year 4 Maltese teachers using tablets to support the inclusion of students with SEN in their ‘inclusive’ mainstream classrooms?**

Research question two of this study is asked with the goal of exploring the pedagogy which through the use of the tablet, helps develop inclusion within mainstream classrooms.

#### **6.3.1. Increased personalised and differentiated learning**

In today’s mainstream classrooms, there are students who are academically, linguistically, and culturally diverse, including those who have been identified as having some type of

SEN. As classrooms continue to become more inclusive and diverse, the number of students needing differentiated and personalized attention increases, as do the pressures on teachers to meet these needs (Looi et al., 2009).

While “personalized learning” is defined differently by different researchers, many of the interpretations largely converge along the lines of empowering the learners with more autonomy in their learning. Learners are no longer viewed as passive recipients of knowledge as illustrated in traditional classrooms characterized by didactic teaching, but rather they are co-producers of knowledge who have gained sovereignty over what and how they want to learn (Looi et al., 2009).

Unfortunately, research shows that it has not always been possible to implement personalised learning in the majority of schools (Francis, 2017). When dealing with a Maltese class of an average of 20 students, the teacher tries to balance the needs of many, and it is common to experience a situation in which an activity is paced too quickly for some students or too slowly for others (Bannister & Wilden, 2013). Teachers in this study have considered the introduction of tablets into teaching as offering more opportunities to practise and develop personalised and differentiated teaching in their classrooms, and are therefore better equipped to meet the diverse needs.

The nature of personalised learning requires systematic monitoring and assessment on the part of the teacher in order to anticipate where intervention or guidance is needed. This has traditionally posed a challenge due to time-restrictions, especially when teachers hold responsibility for large groups of mixed-ability learners. However, with the emergence of new software and hardware such as those provided in the tablet, it is increasingly possible for teachers to enable a high degree of personalisation without the associated increase in workload (Francis, 2017). Moreover, teachers in this study have also reduced preparatory

work-load for differentiated teaching by sharing their resources amongst other teachers in their year group.

Another key method in which the tablet is promoting differentiated learning is through the learning management system. According to the teachers, platforms have evolved to become more sophisticated tools for stimulating, guiding and assessing learners individually. Teachers are able to present learners with a different set of activities depending on their current progress. This type of activity is considered to be well-suited for mixed ability groups, where a single teacher is required to give extra support to certain learners, while providing extended stimuli for others. This promotes the possibility for improved equality of opportunity for diverse students to access the curriculum (Florian, 2004). Moreover, teachers also felt that a positive aspect to such an online system is that those students needing additional work do not have to be identified explicitly, but rather they are able to carry out their adapted tasks without other students noticing, reducing any possible embarrassment or teasing.

Furthermore, communication tools within the platform allow teachers to intervene and give quick feedback more easily, as they are able to monitor students' work in real-time. Careful monitoring through the tablet can give teachers valuable insight into students' learning styles, and provides detailed information on what activities the learner undertook, what incorrect attempts were made in answering the question, and other key information which goes further than simply getting a correct answer. This information is vital for teachers adopting a system based on carefully defined goals, rather than simply comparing grades.

Another interesting finding in this research was that some teachers requested a learning management system in order to block and limit students' use of the tablet. This may be seen as going against the principle of personalised learning since students have interrupted access to resources, as they are unable to access resources or apps on the wider web, unless

approved or uploaded by their teacher. Although this creates a more controlled environment for the teacher, it is believed that it does not help foster important values such as responsibility, independence and student-led learning. Whilst precaution and safety surrounding access to harmful material online should always be adopted, there is a multitude of knowledge which students who do not afford their own devices in the home environment are missing out on.

### **6.3.2. Reduction of barriers to learning**

Teachers described a range of difficulties which they believed were present, and which hinder students' participation and inclusion in the classroom. As previously discussed, students are seen to become increasingly demotivated about learning, since the traditional ways of teaching are no longer meeting student's interests and this is considered by teachers to be a major barrier to learning. If students are demotivated to learn, they do not make an effort to try their best at school and will not be able to develop their true potential.

As Heafner (2015) advocates, teachers can increase student motivation by engaging students in the learning process with the use of a familiar instructional tool that improves students' self-efficacy and self-worth. Through the provision of tablets, students are provided with a familiar tool which they are confident using, apart from being highly engaging through increased visuals, sounds and exciting material.

Classroom teamwork and opportunities to work with other students have been found to be important motivational factors when using mobile devices (Ciampa, 2014). Indeed, it is through such activities that individuals can share thoughts and ideas and become active participants in a digital society and develop the skills of cooperation and collaboration. These findings are in line with the increased cooperative tasks and teamwork observed and discussed in this study. Through the use of competitive, whole-class activities, teachers in this study were able to structure a lesson in ways that increase

opportunities for students to work together, discuss, problem-solve and compete with one another. During such collaborative tasks, the more able students were observed to support and provide assistance to those students experienced difficulties.

The literature has put great emphasis on exploring the use of tablets amongst students on the Autistic spectrum: however less is known about how tablets help support students with attention difficulties, or Specific Learning Difficulty. In relation to students with attention deficits, teachers in this study discussed how visually structured mind maps used during creative writing help students with attention difficulties structure their work, and that the use of headphones helps them focus better when watching a video or reading a book. Moreover, for those students who have literacy difficulties, the tablet provides easy access to a dictionary, is able to suggest spelling errors in real-time and also helps by providing easier accessibility to written text. When comparing these findings to those of the preliminary study, there seems to be a great difference in how the tablets are being used to meet needs of students with SEN. While during the preliminary study, students were given individual tasks on the tablet with one-to-one support from a teacher, students with SEN in this study took part in the lesson with the rest of the children, and were given adapted work and support only when needed. This difference is believed to be mainly due to the severity of the needs children presented with, the setting which students attended, and the support made available. Although students with severe learning difficulties did not form part of the classrooms of teachers in this study, it is anticipated that a similar pedagogy to that adopted in the preliminary study could be adopted with such children in mainstream classrooms.

#### **6.4. Research Question 3: What kind of pedagogy enables teachers to integrate tablets effectively into their practice?**

Technology is considered by most Year 4 teachers to have greatly influenced and transformed their teaching practice. Some teachers described the tablet as a resource which supports and guides their work as they are continuously working to find innovative ways

of integrating tablets into their lessons to help meet their learning objectives. The four guiding pedagogical design principles that are considered to bring about effective teaching and learning through the use of technology include collaborative learning, promoting learner autonomy, use of a variety of technology and the construction of artefacts (Mellar et al., 2007). On a similar note, Partnership for 21<sup>st</sup> Century Skills (2011) advocate that tablets would also need to promote the development of 21<sup>st</sup> century skills which include critical thinking, communication, collaboration, and creativity. These tenets could be applied to any learning situation, and indicate how students should be using tablets in the classroom for teaching to be effective.

Increased collaborative learning was one of the major findings and changes that have been observed by both the teachers and the researcher since the introduction of tablets. Although through personal experience, collaborative learning and group work did occur through the use of traditional teaching methods, tablets have created increased opportunities for teachers to create such social learning environments through work in pairs or small groups using tablets. In line with the literature, new technological pedagogies provided students with opportunities to collaborate and communicate more with one another (Hutchison et al., 2012). Cooperative learning in this research was shown through supportiveness amongst student partners working together and increase in helping behaviours. Such practices may also have helped some students overcome their shyness, and be more willing to participate. Although Karsenti & Fievez (2013) also reported increased collaboration between students and teachers through emails, this does not seem to be the case in Maltese classrooms. This method of communication may be a development which Maltese teachers request in the future. However, for the time being, none of the teachers in this study reported that they currently carry out this form of collaboration, or that they believe it may be helpful.

Personal tablet devices used in class were equipped with various educational contents such as e-books, apps and videos, thereby providing students with a variety of resources which they can use. Although used for differing purposes, the class computer and interactive-whiteboard have also been used in conjunction with the tablet in order to create a centralised point of visual instruction for students to follow if they require. Through the provision of an individual device which provides immediate feedback on their work through sounds and corrections, students are better able to work independently on their task and at their own pace, or carry out additional work if they wish. These findings are in line with prior research which indicated the increase of independence learning through ICTs (Reeve, 2014).

Tablets also fostered student creativity in the classrooms. The device allowed students to be creative in how they demonstrate understanding of a concept through a range of expressive options such as power point presentations, pictures, videos etc. Tablets therefore allowed greater freedom of choice to students, for them to use whichever means best suits their own learning style. By using a range of resources and multimedia on the tablets, observations have shown that students are more engaged in their learning as participation is a crucial aspect within a teaching-learning environment.

Teachers commented on the well-known notion that students learn best when they are 'doing', when they are engaged in a hands-on task, and not simply following verbal instructions. Through the tablet, teachers believed that students become more involved in classwork as they are able to practice instantly on the tablet thereby further consolidating their learning. Some teachers also commented that with a hands-on device, students are becoming less reliant on teacher's instruction, and are more inclined to attempt tasks independently, especially when these are targeted at their performance level.

#### **6.5. Research Question 4: What forms of CPD and support do teachers perceive to fit with their pedagogical needs?**

The literature review and the researcher's preliminary study had indicated that teachers require continuous professional training to support their development of effective technological pedagogies, especially in light of the continuously evolving field of technology. This is also the case for Year 4 Maltese teachers and the use of tablets in their classrooms.

In preparation for the introduction of tablets in the classroom, teachers attended a three day compulsory in-service training course delivered by personnel from the eLearning Department. The majority of teachers reported positive experiences about their latest training, as it was considered to be more practical than previous training courses, and provided them with opportunities to attempt activities on their own tablet. However, they also believed that a three-day timeframe is too short a period to learn the necessary skills to effectively integrate the technology into their pedagogy, and further support within the school system is crucial, especially for those teachers who have very little experience of using technology. Teachers also commented about a lack of consultation, involvement or ownership over the development of their competency skills, factors which were identified by the European Commission (2013) as a crucial aspect of CPD, thus indicating possible improvements within the Maltese system of training. On the other hand, teachers spoke positively about the individual support they were given at school; those who described themselves as novices reported that without the additional support in school they would have easily given up, since changing long-existing pedagogies is described as a challenging experience for teachers.

To support this phase of development, the eLearning Department employed eLearning teachers, who are trained in education and technology, to support teachers in schools. The role of the eLearning teacher was to provide individual and group sessions for teachers to

revise material learnt during INSET, and also scaffold the teacher in further developing her skills and pedagogy, through a problem-solving and collaborative approach. This form of training is what Kennedy (2005) termed a Coaching-Mentoring model, in which the primary characteristic is the importance of a one-to-one relationship, generally between two teachers, which is designed to support CPD. What teachers in this study described appeared to corroborate more with the definition of mentoring, rather than coaching, since mentoring involves elements of equity, counselling and professional friendship (Rhodes & Beneicke in Kennedy, 2005, p.242), which teachers described as present in their training sessions with their eLearning teacher.

Younger teachers explained how their developing skills with regards to integrating the tablet in pedagogy can serve as a learning opportunity for other teachers in the school who are yet to introduce devices in their classroom. This therefore implies that by sufficiently training and mentoring teachers, they themselves may eventually practice peer-mentoring with other colleagues in the school. In fact, teachers who had the possibility of observing a more experienced colleague reported how they were able to take on, and model new pedagogies and skills from their peers.

Holding similar principles to the coaching-mentoring model, the communities of practice model (Wenger, 1998) also lays importance upon interpersonal relationships in the development of CPD, but in the latter, this would include more than two persons or teachers. Schools may benefit from performing both these practices, as through the coaching-mentoring model there is a lot of responsibility on a single relationship. This means that in the circumstance where the mentor is not well-trained or does not hold a positive interpersonal relationship with the teacher, professional development may not occur.

The communities of practice model is underpinned by a socio-cultural theory of learning which recognises that learning within a community of practice happens as a result of the community itself, and its interactions and mutual engagement of its participants who hold a shared enterprise (for example, use of tablets) which they aim to develop (Wenger, 1998).

In Maltese classrooms, some proactive teachers may benefit from communities of practice, however, some teachers still hold beliefs about working independently, and feel threatened by the introduction of other teachers' suggestions or practices. These beliefs would therefore need to be challenged, otherwise the community would be rather passive, and would not produce various developments.

Institutional support must be put in place for any form of school-based CPD to be most successful (Attard Tonna, 2012). Teachers in this study felt that although many of the discussed practices bring about positive developments in their pedagogy and lifelong learning as teachers, they also felt that other school demands provide very little time for them to take part in any CPD programme. It is therefore imperative that such programmes are formally organised by the senior management team, and embedded within policies so that they form part of the school culture. In doing so, it is hoped that teachers are given the time and opportunity to truly experience the positive results of such programmes.

#### **6.6. An Eco-Systemic perspective on the use of tablets in Maltese schools**

Educational Psychologists (EPs) tend to adopt a systemic approach when working with children, schools and families to address perceived problems (Norwich & Eaton, 2015). The merging of knowledge regarding tablet use in schools from an eco-systemic perspective offers a potentially new contribution to the literature in the fields of both educational technology, and psychology (Figure 4).

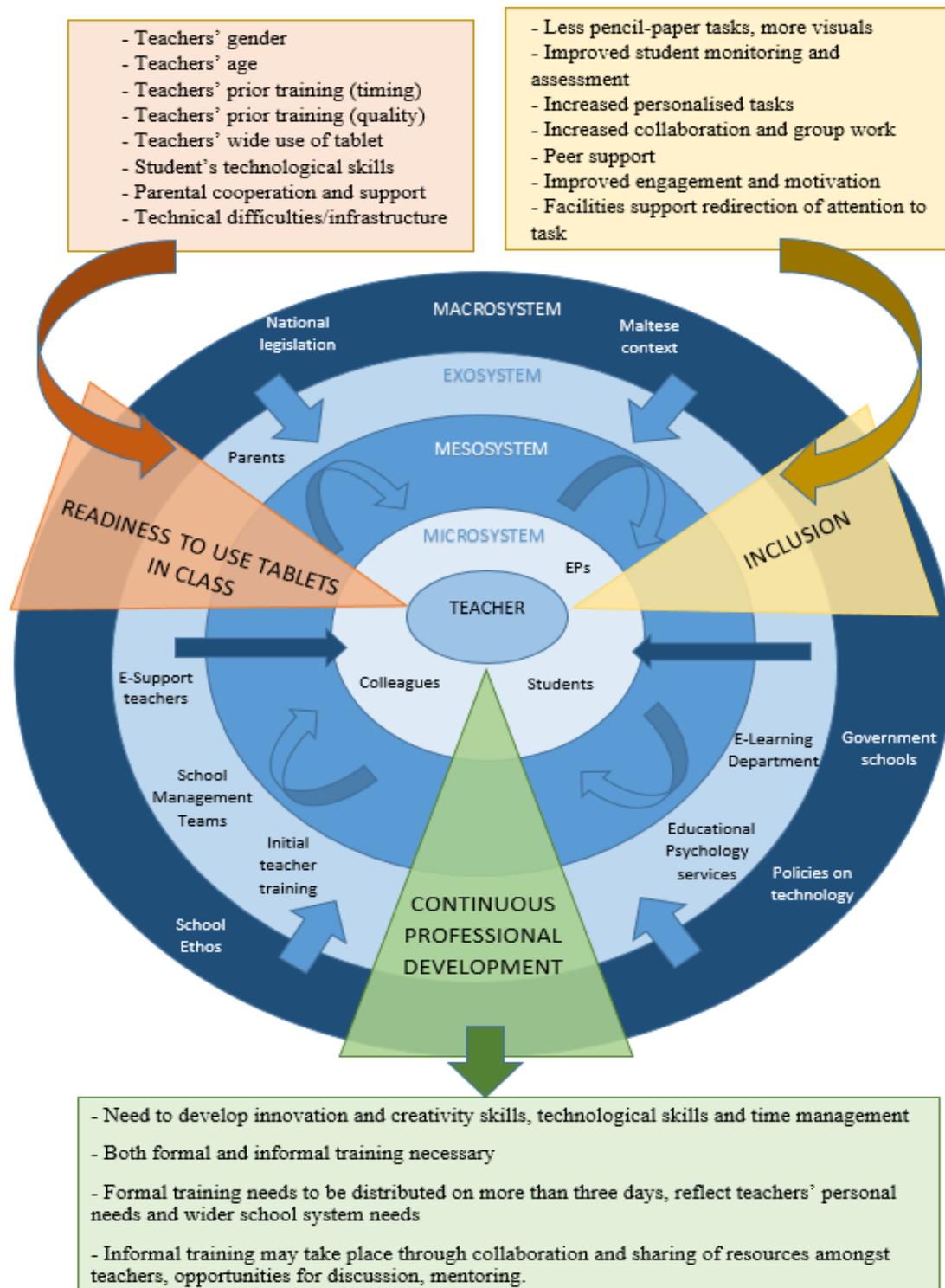


Figure 4 - Conceptual framework supported by evidence from current research

This research has confirmed that the most crucial aspect within the wide eco-system presented in this study is the teacher within the classroom, since effective use of tablets is not ensured by simply distributing individual tablets to students, but must also entail changes within the beliefs, competencies and pedagogy of the teacher.

This research has confirmed models outlined by Bonanno (2012), and has shown that a teacher's, age, years of experience, intended use for technology and training have an influence on teachers' readiness and preparedness to use tablets in the classroom. These factors are therefore shown to impact teachers' confidence, their pedagogy, and finally how they utilise tablets in the classroom to bring about positive change in teaching and learning.

Observations have shown that students' interaction also have great influence on the effective use of tablets in the classroom (microsystem). There appears to be increased positive interactions amongst students whilst using the device, especially amongst skilful students who support their less able peers, or amongst students and teachers who are slowly getting accustomed to using the device. Another important interaction brought forward by teachers is that between parents and their children, as an understanding of the educational potential of technology from parents may lead to increased support for students to use the device for homework and extended learning. Therefore, the relationship between the parents and teachers must be positive in such a way that both stakeholders wish to work effectively with the device in order to use it to bring about improved educational outcomes for students.

This research showed how the wider school system which includes Senior Management Teams and eLearning government departments need to support individual teachers in developing their pedagogy to incorporate tablets, but also with managing the consequent changes within the classroom. Support that may be provided by these contexts may include improved policies surrounding technology use at school and home, continuous professional

development programmes (for example, through mentoring by the eLearning teacher) that respond to the pedagogical and professional needs of teachers. It is also within the exosystem that the work and intervention of an Educational Psychologist may be of influence, with for example, observing classrooms and consulting with teachers about effective practice that is taking place through the use of technology, or by helping the school staff identify teachers' needs and co-create professional training to support teachers' practice in order to help bring about the changes that they anticipate and wish to see in their classrooms.

As part of the macrosystem, this research has also confirmed that National legislation surrounding the use of technology has influence on the resulting practice within the classroom with regards to tablet use. This is especially so with regards to the timing of implementation, as teachers who may be overwhelmed with work and other systemic changes (such as new syllabi) may be less willing or prepared to take on such a change. It is therefore imperative that teacher readiness for technology is taken into consideration promptly, in order to inform their CPD programmes, and support structures needed.

This research has shown how inclusion through a reduction of barriers for learning may take place through effective use of tablets in classrooms. As part of the microsystem, improved inclusion is being shown in the classroom through the facilitation of individualised tasks that are aimed to target students' needs and abilities. The classroom environment has also provided means for collaborative, group activities where the more-abled students show verbal support and assistance to their less able peers during such activities. Effective pedagogies and activities which support inclusion are shared amongst teacher colleagues, however, a limitation in this regard was found amongst schools who are yet unable to provide teachers with adequate time to collaborate and share inclusive practices. This further supports the notion that the wider school system and structure must not only be in favour of inclusive values and practices, but must also support teachers in

creating such inclusive environments through the necessary teacher development programmes and training.

Evidence gathered in this study supports principles outlined by the CAVA model (Mellar et al., 2007), which describes effective pedagogy as promoting collaboration, autonomy, the use of a variety of technology, and the creation of artefacts. These principles have been found to take place through the individual tablet and use of the class PC and interactive whiteboard. Training and CPD were very pertinent factors brought up by teachers, who believed that although training programmes in Malta have improved over the years and are increasingly meeting their needs and helping them to develop new technological and pedagogical skills, more progress needs to be made with regards to school-based training. This therefore necessitates more involvement within the exosystem, where School Management Teams and governmental organisations such as the ELearning department may support teacher communities within schools through dedicated consultation time with colleagues, along with opportunities for observations and mentoring.

### **6.7. Strengths of the current study**

There exists a paucity of research in Malta regarding teachers' readiness for technology, especially with regards to the newly introduced tablets in schools. The current study was therefore timely, and contributed significantly to the Maltese research base by gathering in-depth, context-specific information from a variety of sources.

This research has also continued to develop the work of Bonanno (2012), by adapting a questionnaire aimed at assessing teachers' readiness for tablets in mainstream classrooms, thereby providing further validation for the use of this instrument in school settings as a screening tool prior to integrating technology in order to target particular teacher needs.

Internationally, research on teachers' readiness for technology and teachers' pedagogy using technology has typically made use of quantitative methods, or qualitative methods

alone. The use of a mixed-method research process provided an in-depth understanding of the topic, and the use of a pragmatic approach has also led to the identification of future actions that may support the development of innovative technological pedagogies in schools. All instruments utilised in this study underwent a successful piloting process.

Finally, the researcher's eco-systemic perspective on the topic is believed to have led to new understandings surrounding a potential role of the EP with regards to working in consultation with teachers to support the development of good practices and strategies for students, which may include the use of technology. This research has also shed light on EPs' applied role (section 6.10) when working alongside technological experts to support the creation, or facilitation of staff development programmes or training in relation to the use of technology to support inclusion.

### **6.8. Weaknesses of the current study**

As with all research purposes and designs, a number of limitations exist in various sections of the research which need to be acknowledged. Firstly, despite having a good coverage of the total population of Year 4 teachers in state schools in Malta (n=81/230), it is generally agreed that the larger the sample and the coverage of the research, the greater the reliability of the data (Langdrige, 2005). A larger, more equally distributed sample, would have allowed for more valid generalisations to the population. Furthermore, an application of more advanced statistical analysis could have been conducted.

The qualitative data could have been made richer if more participants from systemic, governmental positions (for example, other eLearning teachers or ministerial professionals) and parents took part. Although such systemic views were captured to some extent, additional participants would have provided a wider perspective on tablet use, pedagogy and CPD. This research could have also been strengthened by including students' views, and for them to share their experiences of using individual tablets, and the pedagogies or

Apps which they believe meet their needs most. However, given the timeframe of this research project, they would have had very little time experiencing the device in class.

The results of the research can be generalised to the rest of Year 4 primary school teachers in Malta. It is important however to keep in mind that the purpose and the methodology of the research is an exploratory one and that results achieved are indications rather than precise measures. Moreover, the small sample used needs to be considered as well as the specific schools within which the sample was recruited. The research focus is on state schools in Malta and does not include establishments such as independent schools, church schools or special schools. Some may argue that teachers' pedagogy has common elements across different settings, and that similar practice will often recur in different settings. On this account, results can therefore be generalised with caution. Nonetheless caution is always advised, particularly in qualitative findings where the culture of a setting can shape and influence human constructs about the importance of technology, their beliefs and the training provided, so these differences may influence an individual person's views on the topic.

Finally, owing to the lack of EP involvement with regards to the use of technology in schools, information regarding the EP role in facilitating the integration or use of technology was limited. This aspect could have been strengthened by incorporating the views of EPs, and how they feel about technology as forming part of their role, or how they believe they may support schools on the matter.

## **6.9. Areas for further research**

Researchers could usefully continue establishing further validity and reliability regarding the questionnaire on teachers' use of technology within different settings, so that upon publication, this tool would provide an instrument which can be used in the evaluation of the readiness for tablet technology in mainstream schools. Its use would provide a measure

of pre-CPD readiness for schools wishing to introduce tablets in mainstream classrooms or other similar settings. The tool could be used both before and after any tablet training intervention, to support the measurement of implementation of new practices, both immediately following CPD and in the long-term.

Further exploration on the Maltese student population on students' educational outcomes, motivation towards learning and collaborative skills as a result of effective tablet implementation in the classroom is warranted. Future research in the area may also pilot a CPD programme for Maltese teachers based on the recommendations put forward by this research, followed by an evaluation of teachers' confidence and skills as a result of the programme.

With a view to further informing EP practice, it would be of great value to conduct a large-scale study, exploring the nature of EP involvement with schools on the topic of educational technology more widely. Where EPs have successfully contributed to the development of policies or training on the matter, an analysis of factors enabling this success would be valuable.

### **6.10. Implications for practice**

The findings from the present study have many practical implications for both psychology, education and educational psychology practice today.

As a trainee EP carrying out this research, it has become increasingly evident how technology such as tablets are increasingly forming part of today's classrooms. It is therefore imperative for EPs to hold awareness and knowledge on how tablets, and other educational technological devices can positively influence students' learning environment. Especially since numerous research studies, including this thesis, indicate that many students respond positively to such a familiar device which many are using on an everyday basis.

The implications for the EP role will be discussed with reference to the key functions identified in Chapter 1 (Scottish Executive, 2002). Consultation is a practice whereby the EP discusses any concerns or difficulties with the teacher. Through my experience as a TEP, frequent concerns are student lack of achievement, lack of attention, lack of motivation, behaviour difficulties, social and emotional difficulties. As applied professionals, EPs communicate with the teacher and discuss possible evidence-based practices and solutions that may be put in place to improve the situation presented. The findings presented in this research have provided increased evidence on how tablets can be utilised by the class teacher to improve general learning difficulties such as motivation and attention, and more specific difficulties related to literacy and under-achievement. It has also provided evidence that when used within a group context, the device helps promote collaboration and communication between students. Given this growing evidence, EPs are in a better position to begin promoting the use of technology amongst teachers during consultation, especially so when a tablet devices are already being used in the classroom.

During consultations, EPs may also help promote competency development by encouraging, or supporting staff to identify the areas of their profession they themselves wish to develop. This may be an effective starting point to creating observable change in practice. Helping teachers to identify and monitor changes and effective practice will also provide motivation to continue implementing new pedagogy and practices.

With regards to assessment and intervention with students, EPs may benefit from the use of tablets, especially when working with students who are difficult to engage with. By incorporating a tablet in our work with children and young people, they may be more likely to consider the EP as a relatable person who understands the ‘digital native’ generation, thereby supporting the formation of interpersonal relationships. The EP may also utilise educational Apps dynamically within their assessment, through for example Apps that provide literacy or mathematics activities to gain insight into students’ skills and abilities.

When being commissioned to run workshops or INSET training, EPs may work alongside eLearning or technical support from a school to manage and facilitate staff training development. This will serve to merge two areas of specialisation, learning and technology, which are increasingly shown to complement one another. The provision of short, one-off CPD training programmes has been shown to yield little long-term success in education (Cordingley et al., 2003). However, where the input is targeted, and the CPD has been identified as a response to a specific school training need, the impact it can have remains potentially strong (De Vera, 2015; Tonna & Shanks, 2017). As described by participants in this study, the professional carrying out training will more likely be successful if they initially elicit as much detail as possible from the participants in regards to their desired outcomes. Following the training, the EP can elicit participant feedback in which participants share the strengths and weaknesses they experienced. The EP can then work to review feedback in an effort to provide a higher quality programme. Management support and encouragement following the training will also increase the chance of continued professional development amongst teachers.

#### **6.11. Presentation of research project and feedback to participants**

A presentation is planned with managers of the Students Services Department and potentially the ELearning Department outlining the findings of this research project. The presentation will present both quantitative and qualitative data in summarised forms and findings and implications will be discussed. Allocated time will be set for questions, and feedback will be requested. The research project could potentially be used to guide the development of educational policies, further research and training of professionals within the schools and amongst EP services. Following schools' expression of interest in receiving information on the outcomes of the research, a summary of the findings of the research will also be presented to the schools via email once the research has been approved and accepted.

## **6.12. Summary and main conclusions**

The present study explored Maltese Year 4 teacher's readiness and use of tablets in their mainstream classrooms. By gaining information about the factors that are influencing teacher's readiness for technology, this study contributed towards an increased understanding of the aspects that would need to be addressed in order to bring about improved preparedness for technology integration in pedagogy. Findings also highlighted some key issues which EPs and other professions working in schools may utilise in order to continue striving for positive outcomes and teaching-learning experiences as a result of technology integration. Maltese classrooms showed a promising start with regards to tablet integration and findings show great potential in Maltese teachers and classrooms, so much so that they compare to those carried out in more developed countries such as the UK. Having said that, there is always scope for development, especially in the area of educational technology. It is hoped that the findings can be used to inform future development programmes and CPD initiatives within schools to help further improve teacher's pedagogy and student outcomes. In particular, it is hoped that information from this study highlights the contributions which professionals such as EPs, together with teachers and technology specialists can make to further improve the learning experience of 'digital natives' having various strengths and needs within the 21<sup>st</sup> century.

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## Appendix A - Online questionnaire

### Are you ready to integrate tablets in the teaching-learning process?

Thank you for your interest in taking part in this online questionnaire regarding teachers' readiness for tablets in mainstream classrooms. This online questionnaire forms part of a thesis, aimed at informing the development of innovative pedagogies, and professional development programmes. The questionnaire will take around 15-20 minutes to complete.

This online questionnaire aims to gather information regarding your current use of technology in classrooms, your beliefs about learning and on tablet use in classrooms. Taking part in this research will serve as an opportunity for you to reflect on your practice of teaching using technology, and your training needs. Moreover, your participation in this study will contribute to the currently limited research in the field.

Participation in this survey is voluntary. No risks or discomforts are anticipated in taking part, however, if you feel uncomfortable in any way during any part of the questionnaire, you have the right to decline continuation. Your participation and identity will stay anonymous.

Finally, I would like to thank you in advance for your time.

Your Sincerely,

Madeline Duca

You may contact me regarding any research queries on [mduca@ioe.ac.uk](mailto:mduca@ioe.ac.uk)

This survey is part of my thesis, in fulfilment of the requirements of my Doctorate in Professional Educational, Child and Adolescent Psychology, UCL Institute of Education, London.

## Introduction

### Q1. What is your gender? \*

- Male
- Female

### Q2. What is your age? \*

- 25 years and under
- 26-35 years
- 36-45 years
- 46-55 years
- over 55 years

### Q3. For how long have you been in this profession? \*

- 1-5 years
- 6-10 years
- 11-15 years
- 16-20 years
- 21-25 years
- Over 26 years

**Q4. In which College do you currently teach/support?**

- St. Margaret College
- Maria Regina College
- St. Benedict College
- St. Nicholas College
- St. Gorg Preca College
- St. Theresa College
- St. Ignatius College
- St. Thomas More College
- St. Clare College
- Gozo College
- Other:

**Q5. Plan for tablet use \***

- Class only
- Class and home
- Not Applicable (LSA)

**Q6. Plan for tablet use in class \***

- All subjects
- Core subjects
- Specific Subjects

**Q7. Planned activities for tablet use \***

- Individual learning
- Group work
- Searching information
- Gaming
- Social Networking
- Maths
- Maltese/literacy
- English/literacy
- Religion
- Science
- Social Studies
- Other:

## Experience in ICT

Technological readiness & Confidence in using technology

**Q8. Besides In-Service training courses, do you consider any of the following training possibilities? \***

- Basic course in ICT
- Diploma in Technology-Enhanced Learning
- Course on tablet use in a particular subject
- None
- Other:

**Q9. Describe the formal training you had, to help you use the tablet in class \***

- None
- Very Basic
- Sufficient

**Q10. To develop my professional teaching skills... \***

	Never	Seldom	Sometimes	Often	Always
I review my ICT skills	<input type="radio"/>				
I update myself about how to use tablets in learning, teaching and class management	<input type="radio"/>				
I use ICT to search for new information and explore complex ideas	<input type="radio"/>				
I use ICT to communicate information and concepts in lessons	<input type="radio"/>				
I use ICT to assess students and track their progress	<input type="radio"/>				
I use ICT to record and analyse students' data for assessment	<input type="radio"/>				
I use ICT to communicate and share skills with other teachers	<input type="radio"/>				

**Q11. How would you assess your confidence levels when using the following applications and tools in the classroom? \***

	Not confident	Slightly confident	Moderately confident	Highly confident
Learning Management System (e.g. MySchool, Fronter, Moodle)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
E-Portfolio (e.g. Mahara, Pebble Pad, Google sites)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social Media (e.g. YouTube, Flickr, Facebook)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Collaborative writing (e.g. Wiki)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Games (e.g. online gaming)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Digital resources (e.g. websites, dictionaries, encyclopedia)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Equipment tools (e.g. digital cameras, robots, gaming consoles)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Multimedia production tools (e.g. Media Capture & Editing equipment, Drawing programs)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mobile devices (e.g. smartphones, tablets)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Interactive Whiteboard	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

# Opinions about Teaching and Learning

Epistemological readiness & Pedagogical readiness

Q12. To what extent do you agree with the following statements? \*

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Face to face learning is the most effective method	<input type="radio"/>				
The teacher is the best information provider	<input type="radio"/>				
Discussions via the internet (using tablet) make learning more meaningful	<input type="radio"/>				
Tablet Management Systems provide an efficient means for managing student information	<input type="radio"/>				
Tablets can provide advanced forms of student-centred learning	<input type="radio"/>				
The tablet helps students SEN benefit from individualised, adapted learning	<input type="radio"/>				
Tablets can provide learning according to students' preferred mode and style	<input type="radio"/>				
Tablet-based digital games have very limited use in teaching and learning	<input type="radio"/>				
Students prefer to use tablets for entertainment, rather than for learning	<input type="radio"/>				
Teachers are always at a disadvantage with students regarding tablet-related skills	<input type="radio"/>				
Teachers should form part of a school-based learning community	<input type="radio"/>				
Tablets enhance opportunities for differentiated learning	<input type="radio"/>				
With the tablet, students with SEN will be increasingly able to follow the lesson	<input type="radio"/>				

**Q13. How many times have you used technology to execute each of the activities below? \***

	Almost never	Seldom	Sometimes	Often	Almost always
Teachers' lessons/presentation	<input type="radio"/>				
Practice exercises	<input type="radio"/>				
Practical hands-on activity (e.g. laboratory experiments)	<input type="radio"/>				
School projects	<input type="radio"/>				
Design activities (e.g. product creation)	<input type="radio"/>				
Field study	<input type="radio"/>				
Exploratory activities for discovering principles and concepts	<input type="radio"/>				
Provide feedback to individuals and/or small group of students	<input type="radio"/>				
Group work/collaborative activities	<input type="radio"/>				
Collaborate with parents/guardians in supporting/monitoring students' learning	<input type="radio"/>				
Students explain and discuss own ideas with teachers and peers	<input type="radio"/>				
Students reflect on own learning experience (e.g. writing a learning log)	<input type="radio"/>				

**Q14. Briefly describe how you plan to incorporate the tablet into your daily lessons (whole class level, individual learning, inclusion of SEN students etc...)\***

**Q15. Do you use ICT to carry out any of the following methods for assessing student performance? \***

	Yes	No
Written test/examination	<input type="radio"/>	<input type="radio"/>
Written task/exercise	<input type="radio"/>	<input type="radio"/>
Individual/oral presentation	<input type="radio"/>	<input type="radio"/>
Group presentation	<input type="radio"/>	<input type="radio"/>
Project report	<input type="radio"/>	<input type="radio"/>
Portfolio/learning log	<input type="radio"/>	<input type="radio"/>
Assessment of Group performance	<input type="radio"/>	<input type="radio"/>

## Feelings about technology

### Psychological readiness

#### Q16. How do you feel about tablets? \*

	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
If I get problems when using the tablet/App, I can find my way through	<input type="radio"/>				
Most things that a student can learn through tablets can be acquired from classroom lessons	<input type="radio"/>				
Tablets can provide more interesting and imaginative ways for learning	<input type="radio"/>				
I feel hesitant using tablets in teaching	<input type="radio"/>				
I feel prepared to integrate tablets in my class	<input type="radio"/>				
I regularly update my teaching activities for using the tablet	<input type="radio"/>				
The tablet will enable me to design activities that will increase my students' motivation	<input type="radio"/>				
The tablet setup will enable me to communicate more effectively with my students	<input type="radio"/>				
I feel uncomfortable with students' confidence in the use of tablets	<input type="radio"/>				
I am prepared to handle the various reactions triggered by technology in different students	<input type="radio"/>				

## Teachers' role in the school's teaching-learning environment

### Environmental readiness

#### Q17. Do you feel prepared to...? \*

	Not at all	Somewhat	Fairly well	Well	Very well
Contribute to a school vision that promotes tablet use both at school and at home	<input type="radio"/>				
Promote the use of tablets within the school's Continuous Professional Development plan	<input type="radio"/>				
Use ICT to communicate information with parents (homework, news, reports, events etc...)	<input type="radio"/>				
Share with students a vision for technology-enhanced learning in a knowledge society	<input type="radio"/>				
Use tablets to support and extend learning beyond school	<input type="radio"/>				
Help parents understand responsible use of tablets and the internet	<input type="radio"/>				
Collaborate with the school's administration in supporting and promoting effective tablet use	<input type="radio"/>				
Share your experience in using tablets with colleagues	<input type="radio"/>				
Participate in online teacher communities	<input type="radio"/>				
Share electronic content that I developed with other teachers	<input type="radio"/>				
Participate in research initiatives to enrich my practice	<input type="radio"/>				

Are there any additional comments you wish to share?

### Appendix B - Cronbach's Alpha tables

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.873	0.875	7

	q12a	q12b	q12c	q12d	q12e	q12f	q12g
q12a	1.000	.613	.493	.453	.342	.429	.420
q12b	.613	1.000	.605	.390	.223	.311	.454
q12c	.493	.605	1.000	.462	.360	.508	.528
q12d	.453	.390	.462	1.000	.667	.619	.629
q12e	.342	.223	.360	.667	1.000	.826	.529
q12f	.429	.311	.508	.619	.826	1.000	.633
q12g	.420	.454	.528	.629	.529	.633	1.000

Cronbach's Alpha for sub-scale titled "to develop my professional teaching skills" (Technological Readiness)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.809	0.810	10

	q13a	q13b	q13c	q13d	q13e	q13f	q13g	q13h	q13i	q13j
q13a	1.000	.324	.302	.269	.350	.280	.223	.117	.282	.458
q13b	.324	1.000	.335	.407	.273	.174	.157	.068	.332	.174
q13c	.302	.335	1.000	.331	.499	.456	.345	.173	.500	.162
q13d	.269	.407	.331	1.000	.367	.414	.383	.360	.205	.212
q13e	.350	.273	.499	.367	1.000	.489	.383	.280	.361	.255
q13f	.280	.174	.456	.414	.489	1.000	.413	.313	.420	.006
q13g	.223	.157	.345	.383	.383	.413	1.000	.563	.424	.114
q13h	.117	.068	.173	.360	.280	.313	.563	1.000	.419	.008
q13i	.282	.332	.500	.205	.361	.420	.424	.419	1.000	.088
q13j	.458	.174	.162	.212	.255	.006	.114	.008	.088	1.000

Cronbach's Alpha for sub-scale titled "How would you assess your confidence levels when using the following applications and tools in the classroom?" (Confidence using technology)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.706	0.726	13

	q14a	q14b	q14c	q14d	q14e	q14f	q14g	q14h	q14i	q14j	q14k	q14l	q14m
q14a	1.000	.277	-.086	-.078	.018	.026	-.016	.120	.175	.167	-.293	-.153	-.064
q14b	.277	1.000	-.050	.042	.061	.075	-.006	.102	.147	.288	-.292	-.024	.039
q14c	-.086	-.050	1.000	.433	.352	.407	.358	.109	.100	.234	.239	.332	.387
q14d	-.078	.042	.433	1.000	.339	.300	.301	-.222	.108	.173	.158	.195	.378
q14e	.018	.061	.352	.339	1.000	.694	.490	.258	.147	.319	-.030	.377	.504
q14f	.026	.075	.407	.300	.694	1.000	.606	.206	.036	.230	.096	.417	.566
q14g	-.016	-.006	.358	.301	.490	.606	1.000	-.064	.011	.143	.060	.556	.618
q14h	.120	.102	.109	-.222	.258	.206	-.064	1.000	.239	.144	.070	.038	.008
q14i	.175	.147	.100	.108	.147	.036	.011	.239	1.000	.298	-.021	-.011	.021
q14j	.167	.288	.234	.173	.319	.230	.143	.144	.298	1.000	-.158	.150	.106
q14k	-.293	-.292	.239	.158	-.030	.096	.060	.070	-.021	-.158	1.000	.199	.174
q14l	-.153	-.024	.332	.195	.377	.417	.556	.038	-.011	.150	.199	1.000	.542
q14m	-.064	.039	.387	.378	.504	.566	.618	.008	.021	.106	.174	.542	1.000

Cronbach's Alpha for sub-scale titled "to what extent do you agree with the following statements?" (Epistemological Readiness)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.839	0.842	12

	q15a	q15b	q15c	q15d	q15e	q15f	q15g	q15h	q15i	q15j	q15k	q15l
q15a	1.000	.607	.317	.434	.234	.136	.264	.135	.213	.073	.037	.137
q15b	.607	1.000	.405	.306	.238	.312	.359	.298	.243	.137	.201	.179
q15c	.317	.405	1.000	.415	.265	.370	.476	.383	.392	.107	.196	.236
q15d	.434	.306	.415	1.000	.564	.458	.452	.122	.255	.220	.223	.358
q15e	.234	.238	.265	.564	1.000	.402	.287	.131	.180	.142	.159	.176
q15f	.136	.312	.370	.458	.402	1.000	.583	.382	.175	.133	.300	.139
q15g	.264	.359	.476	.452	.287	.583	1.000	.426	.317	.305	.409	.371
q15h	.135	.298	.383	.122	.131	.382	.426	1.000	.464	.405	.559	.383
q15i	.213	.243	.392	.255	.180	.175	.317	.464	1.000	.256	.372	.371
q15j	.073	.137	.107	.220	.142	.133	.305	.405	.256	1.000	.528	.419
q15k	.037	.201	.196	.223	.159	.300	.409	.559	.372	.528	1.000	.733
q15l	.137	.179	.236	.358	.176	.139	.371	.383	.371	.419	.733	1.000

Cronbach's Alpha for sub-scale titled "How many times have you used technology to execute each of the activities below?" (Pedagogical Readiness)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.752	0.750	10

	q18a	q18b	q18c	q18d	q18e	q18f	q18g	q18h	q18i	q18j
q18a	1.000	.157	.238	.260	.409	.288	.309	.069	.349	.474
q18b	.157	1.000	.040	-.218	.071	.104	-.101	.055	-.011	.168
q18c	.238	.040	1.000	.117	.007	.108	.434	.305	.168	.073
q18d	.260	-.218	.117	1.000	.465	.279	.363	.285	.485	.214
q18e	.409	.071	.007	.465	1.000	.589	.320	.121	.155	.455
q18f	.288	.104	.108	.279	.589	1.000	.225	.400	.091	.401
q18g	.309	-.101	.434	.363	.320	.225	1.000	.523	.220	.275
q18h	.069	.055	.305	.285	.121	.400	.523	1.000	.197	.284
q18i	.349	-.011	.168	.485	.155	.091	.220	.197	1.000	.167
q18j	.474	.168	.073	.214	.455	.401	.275	.284	.167	1.000

Cronbach's Alpha for sub-scale titled "How do you feel about ICT and tablets?"  
(Psychological Readiness)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.923	0.925	11

	q19a	q19b	q19c	q19d	q19e	q19f	q19g	q19h	q19i	q19j	q19k
q19a	1.000	.860	.567	.615	.618	.430	.563	.495	.372	.446	.428
q19b	.860	1.000	.577	.597	.538	.484	.586	.446	.374	.376	.417
q19c	.567	.577	1.000	.697	.499	.473	.453	.451	.239	.322	.298
q19d	.615	.597	.697	1.000	.697	.551	.611	.551	.370	.453	.529
q19e	.618	.538	.499	.697	1.000	.595	.718	.603	.484	.619	.619
q19f	.430	.484	.473	.551	.595	1.000	.730	.492	.324	.362	.418
q19g	.563	.586	.453	.611	.718	.730	1.000	.663	.536	.586	.574
q19h	.495	.446	.451	.551	.603	.492	.663	1.000	.521	.721	.471
q19i	.372	.374	.239	.370	.484	.324	.536	.521	1.000	.665	.700
q19j	.446	.376	.322	.453	.619	.362	.586	.721	.665	1.000	.676
q19k	.428	.417	.298	.529	.619	.418	.574	.471	.700	.676	1.000

Cronbach's Alpha for sub-scale titled "Teacher's role in the school's teaching-learning environment' (Environmental Readiness)

## Appendix C- Focus group & interview schedule

### Teachers' readiness to use computer tablets in inclusive classrooms; Implications for developing innovative pedagogies and professional-development programmes

Introduction to research, review of ethical rights and considerations.

#### Warm Up

- What are your expectations of technology in the classroom?
- What forms of technology do you use?
  - P – What do you wish to achieve through the use of technology?
- Do you consider the tablet as an effective tool within the 21<sup>st</sup> Century classroom?
  - P - Can you tell me more about that? In what ways?

#### Tablet integration

- Has the tablet made an effect on your teaching or your students' learning?
  - P - Can you share some examples of practice where you feel that the tablet made a positive impact on the students/lesson?

#### Inclusion of SEN students

- What kind of needs hinder your students' inclusion in the classroom? Thinking of these students with SEN in your classroom, do you envisage tablets might help you to meet their needs?
  - P – How do you think the tablet can help you to include students with SEN in your lessons?

#### Previous training

- Looking back at your Teaching training at University. How did the training influence your ability to integrate technology in your teaching?
  - Do you feel that you were trained to address the needs of ALL your learners, including students with SEN?
  - P – Have you had experience of training in relation to technology use with students with SEN?
- Thinking about your previous training in relation to tablets, what did the training involve?
  - P – What were your expectations of the training? Were these expectations met?
  - P - What did you find helpful?
  - P - Could the training be more effective? In what ways?

#### Personal Development (PD)

- What kind of teaching approaches/skills are you applying to support your use of tablets?
  - P - Have these been helpful?
  - P - What could be more effective? In what ways?
- What kind of school support are you accessing to use the tablets?
  - P- Have these been helpful?
  - P - How could school support be more effective? In what ways?

#### Conclusions

- What do you consider to be the strengths of the tablet programme?
- Do you think that your approach towards tablets would have been different, had it happened at a different time/year?
- Is there anything else you'd like to share or add to our discussion?

## **Appendix D - Interview schedule (EO participant)**

### **Introduction**

- Can you briefly explain your role within the E-Learning Department?
- Can you briefly explain your involvement in the OTPC Programme?
- What were the outcomes of the OTPC Pilot?
- What was the motive behind the OTPC Programme?
- What are your expectations of the OTPC Programme?

### **21<sup>st</sup> Century Pedagogy**

- The teacher plays a fundamental role in this implementation, and their pedagogy needs to develop and adapt to the 21<sup>st</sup> century classroom. What professional skills do you believe that teachers need to possess to effectively integrate this new technology?
- In your opinion, how can the OTPC help teachers address the varying needs of students in mainstream classes, if at all?

### **Professional Development and Training**

- How were teachers helped to develop professional and pedagogical skills during INSET?
- How did theory of CPD models help you formulate the training provided?
- Which model do you believe are most effective to meet the needs and expectations of teachers? Why?
- Are there any support systems or methods of CPD that you believe could have provided an improved outcome?
- How could teachers further develop their skills as they continue to engage in increased use of the tablet?

## Appendix E - Example of interview transcript

Participant: Year 4 teacher [T4]

Transcript
M: can you give me some background about yourself, how long you've been teaching and such...
T4: I am currently teaching Year 4... I've just come to the school after two years of parental leave... before that I... taught Year 5 for about a year and a half... after graduating
M: all right so it's basically, your second year of teaching
T4: Second, or third more like...
M: Ok, good. So what are your expectations of technology in the classroom?
T4: um... I expect it to help the children... if it's used probably... by us the teachers and the children but if... they... consider it as a toy then it wouldn't be successful... but if I manage to convey the idea that they're there to use to learn... I think it should be very helpful...
M: aha...and how would you see it being successful? If it had to work out well...
T4: Um... if I see improvement in writing for example... ah, especially spelling because I know it can help... when there are... there is a word written wrongly it can give suggestions to the children so it will help them... kind of a personal dictionary on hand... and... the fact that they can insert pictures from the encyclopaedia, from google if I let them... it will help make learning more creative, rather than just... cause normally when you ask them to stick a picture to their writing they go 'mum can you print me a picture and we stick it', they don't do it themselves... and this will be them looking for the picture and actually doing it.
M: aha, so having that added creativity will get them to be more...
T4: independent... yes...
M: Okay... what forms of technology do you currently use in the classroom?
T4: ah, the interactive whiteboard... the all in one... mmm technology... I think that's about it... because I rarely have time to use the PCs at the back cause I'm not of the idea to send them there for extra time cause they will play with every they want, and time especially during this term is very restricted with very activities... the play, activities, people coming to the school so it's very difficult to include it in the lesson like I usually did... so I'll be trying to do that term two... *laughing*
M: do you consider the tablet as an effective tool within the classrooms nowadays?
T4: if it's used properly yes... it could be very beneficial because even with the class com online, the fact that you can see a student doing really well and you can show it there and then to the other children and they participate more actively
M: What is this class com exactly?
T4: class connect sorry... it's an online system whereby the teacher can view all the tablets that the children have and even the LSAs cause its one class... and if I...
M: in real time...
T4: yes in real time, I can see the actually working on it... the pictures change and they have their names underneath so I know who is doing what... because they log in through ilearn... then if I see a child doing something really well and I want to show it to the others I just press a button and it goes on the interactive and everyone can see it
M: okay...
T4: I can also... put it on THEIR tablets... so they can see it really close cause you know sometimes the focus on the interactive when it goes bigger... it's not...
M: Looses focus
T4: Exactly... so on the tablet... they can't change but the person who is controlling it can... I CAN... because the teacher has certain priorities but... also if you see they're fiddling around and not paying attention I can mute it... sort of switch it off and they won't be able to power it on.. I can switch off their volume and they won't be able to put it back up unless I let them... so it has VERY good functions, yes... its very good if used well...

M: so it kind of... the limitations we were thinking of before the tablet actually started have been.... Maybe addressed through these you know, control options
T4: Probably because I don't know what the limitations the research showed... but probably that's why they did this... there were already some modifications to it... form when we did the in-service we were told about something for example and now that the IT teachers are coming to continue helping us learn... ah, she said this... to remove it because it was complicating everything... so they are adapting and amending all the time...
M: ok, good, good... how do you think that this additional tool in the classroom has effected your own teaching?
T4: Uh, considering that it's not in the class yet, I can't answer very well... but I did the actual accreditation assignment after the in-service and I had to... ah... put up a lesson plan ... not actually doing in class obviously cause they don't have but having to show the use of tablets... and sometimes its v... really easier than others to include it in the lesson and I think it will help them ... for example if normally I would put a vin diagram on the interactive and have children come out and do it, I could do it more personally, have the vin diagram on the tablet and they fill it out and see what they're doing, if I see something.... It will help them learn much easier than with the interactive
M: yes, and it will provide personalised like you said, environment...
T4: yes... yes...
M: um...if we had to focus a bit on children who are statemented in the classroom, what kind of difficulties do they have that maybe hinder their inclusion in the classroom?
T4: they are quite included... because... their disability isn't... too major... ah... one is just a... hand problems and because of that she fell back in school and the other one is autistic so its... and it's not too bad... just that... he needs to catch up...
M: does he follow the same curriculum?
T4: he follows kind of the same but adapted... for example if I'm doing hundreds tens and units, he's doing tens and units... and even the other one at first we thought they were concurrent but then we found out through different lessons that no, they aren't concurrent and we need to adapt a bit... but with respect to topics they are quite the same...
M: and in relation to these two students... um, do you envisage that the tablet might help meet their needs better?
T4: Um... I think so yes... because on the tablet you can provide links to websites like for example to BBC website where there are different activities and you can let them play because they learn most these children through play... so if they are doing the same lesson as the teacher BUT as a game... they'll consolidate more... In fact even the LSA, when she's doing the lesson and doing a bit of an explanation after mine to simplify his... then she gives him kinds of... kind of games... which consolidate what he learnt... then he writes something so that we practice his writing... because we don't want him to lose that...
M: Okay, so in a way it will provide opportunities to help these students more... part of the lesson
T4: yes, yes, yes.... They do feel part because even when I bring children out to write an answer or to work out a sum, I sometimes call them when I know it's an easy one... or if it's not an easy one, I make an easy one... and I help them through it if they get stuck so they don't get demotivated... so I try to include them as much as possible... sometimes it's difficult and I skip it but... when I can I do it...
M: Okay... all right...
T4: even answering questions... even if it's nothing to do with the question I asked *laughing* but at least he's had time...
M: he's had his turn...
T4: exactly...
M: aha... mmm... looking back at your training... um, was the training you had influence your ability to integrate technology or did you... go on to ... um, follow training by yourself?

T4: training for the tablet you mean?
M: in general, for example your teacher training at university, did it prepare you for these... um, new pedagogies in the classroom?
T4: not completely... when I was in University the interactive whiteboard had just started so they were trying to train us on it... but ... during the course we didn't pay too much attention unless you were already mature enough mentally ... that you're going to realise ... you need to pay attention... so... you really get the hang of it when you're actually using it in class... at university they couldn't give us their experience... there was only one... and the teacher showed us 'you can do this, you can do this, you can do this'... it's like we do in the class... you can't tell them you do this and that, they need to do it themselves... so then we go out for teaching practice ,we're faced with the reality and you ask WHAT IM GOING TO DO?! And in a split second you need to learn it because the next day the tutor might come in and you might be examined on it and they expect brilliant stuff...
M: so what did you do in response to that experience after university?
T4: I just stumbled through *laughing*... I used to ask the class teacher what she does and points that she could give me, and I used to ask my colleagues in university... help with what they are finding... because even the fact that there are smart board and star board... some even have promethean when they're in private schools and such... they are different...
M: yes, different software
T4: even here, I had to remember how a Star Board works because in the other school I had the Smart Board so... *laughing* at the beginning even the children noticed me doing this, oops, I forgot this isn't a touch board, it's with the pen, oh my!!! So yes, until you get used to it... it's...
M: and in relation to tablets, how did that training um...
T4: that was...
M: so you had training...
T4: yes, my first training was in last September, so we had three days of uh, training... they gave us the tablet and we... had to write up different stuff... but now every week the IT teacher comes... and she kind of, consolidates what we did during the in-service because it was SO QUICK and SO VAST... that it was difficult for them to fit... in three days... so they're extending it about ten lessons I believe she said... I'm not sure between ten lessons or the whole term... so that they're sure that we know what we can do and how to...
M: and what were your expectations of the training before you went in September?
T4: I didn't have any expectations... just ... I just expected that they're going to give us the tablet and we're going to learn different functions...
M: and did they give it to you during the in-set?
T4: Yes, they did the first day... because we needed it to practice at first... because it would have been useless... they gave us... other stuff which are helpful like ah... pen drive which you need... a power bank for it... they gave us a lot of things... the only thing they haven't give us yet is the case but that's coming we know it's on the way, and it will be here in time for the children get theirs, or at the same time so.... I expected to have to learn about different tools, which are completely different from the interactive cause otherwise it would have been useless to have a tablet which is the identical of an interactive and I... it was fulfilled because it is very different...
M: can you give me some examples?
T4: Um... the fact that it's handy... it's light and the children can literally go around, take a photo if a shape if we're doing maths for example... find a 3D shape... cube for example.. and they look around the room, they can take photos and show them... or they can make a document and put all the shapes they find... so it's very handy... very... um... how do you say... um... constructive... they're learning through ... play... kind of...
M: aha... and from what you described it kind of also gives them a different ah... modality of learning... that they are not usually...

T4: yes, exactly... and they do anything on it, they can take a photo, they can create a video, they can create a creative writing... so there are lots of things they can use... they can look up on the encyclopaedia... there are lots of things they can use...
M: and do you, from these different ways of working, you're expecting to be more...?
T4: enthusiastic! Yes...
M: Maybe more motivated?
T4: yes, that's what I expect and I hope... that it's fulfilled! Because it will help them... if they use it how they should... it should help them improve
M: Aha... definitely... um... going back to the training... um... focused on the tablet so your first...experience of training was in September... if you had to look back on that training and the support you're being given right now... um... during the individual sessions... um, which aspects did you find most helpful?
T4: Mm.... what was most helpful... it was quite straight forward because we just went in...got the tablet out... and saw what we're going to do today... I think the fact ah yes... one time when I said they can create a video, they let us experience it in trying to do it ourselves... we got playmobil toys, we did an advert here *laughing* ... and the... we had to place them in a way, take a photo, then move them slightly, take another photo and build it like... a video...
M: wow...
T4: like professionals do... slide by slide and then you can change the speed if you want it to be longer... then you repeat that same photo... yes, and you can really move them about... change whatever you need and it was fun... because that way we experienced what we can do with the children...
M: aha...
T4: I think that was the most...
M: Ok, so having kind of worked examples of...
T4: yes ,exactly, even when we do other stuff... for example if he's showing us... the... word space... word something it was... um... it's... a kind of like the interactive whiteboard that bit because you can... draw and colour and write in any size, any shape... insert pictures that's kind of the imitation... and the fact that they can do it... like the teacher just on the board but on them on their tablet it helps... I need to experience more because when you're talking to others explaining something, you're then trying to find something else on my own, so I delve deeper... *laughing*...
M: good, okay... could you think of ways um... in which the training could have been more effective or more helpful for you?
T4: Longer... either longer... not three days... or less stuff to learn... cause if three days and focused on less things AND THEN do this continuous learning throughout the weeks on the other stuff... I think it would have been better because some of the things she's telling us, I remember from the in-service so I don't really need her to repeat but the LSAs is with me as well, and some of them she doesn't remember... but if they had done them... not properly... because they did them good... but sometimes you need repetition to consolidate so if during those three days they focused on ... you know, six aspects in a day, we would have been really good in those... and then during these ten weekly we focus on the rest... cause they can't increase from three days of in-service but ... she's still coming to help because she still comes to school like if there's a lesson of literature, then for us... instead of repeating what others have said... she could do new stuff... she does insert here and there new stuff which... either the teacher in the in-service forgot to address briefly went over... but... it would be more focused I think that... that would benefit
M: aha, and you mentioned that the LSAs are also present during those sessions?
T4: yes because they've got the tablet as well, they did the in-service as well... and when it's possible... she stays with ah... with the IT teacher so she can consolidate her own... but some students don't permit it... like... the peripatetic teacher needs her with them, then

she has to skip it... cause I know certain classes that's what they have to do, they can't stay...
M: Okay... um... and if you had to think of support maybe provided within the school... what can help you improve your pedagogy?
T4: mmm, within the school... maybe more of PD sessions... it would be focused on the tablets... considering that next year if the children go up to year 5, they're going to have the tablets, the year 5 teachers will be needing it too... so it's helpful for them to know them a year before because the children will know about them already and they'll only have the in-service at the end of the year... so the children will know more than them, and you never want that ... *laughing* so I think that...
M: do you think that it might be a problem?
T4: it might, because they'll feel empowered more than the teacher... cause... even when like I said... I was getting mixed up between star board and smart board at the beginning, sometimes the children told me miss not like that, you do that... and they feel... good that they know better... but when they get older then can take.... A different ... view of it... that they know more than the teacher so it's more problematic...
M: Hmm...
T4: in fact I was thinking of suggesting it to the head because he's doing all these CD sessions in-house so... we could easily ask the peripatetic to do us... a general for the year 5 and 6 especially... a PD sessions about it...
M: what is the CD?
T4: Curriculum Development...
M: ah, okay... all right... and during that time you meet between yourselves?
T4: yes, sometimes it's after the... the school hours after 2:30 till about 4:30 or... the children finish at 12 and we're here till 2:30 so... there is one and one in each term... and then there's another one a full day...
M: Ok, so you do have quite.... Ok, so what you're suggesting is having um... a slot where you meet with the rest of the year 4 teachers to discuss...
T4: yes even between us, It would be really helpful... for example, certain... during certain CD sessions we split up in groups, and discuss whatever they ask us to discuss... in this case we could talk with our friends and say 'look I'm finding this difficult... do you have any help...?' not only the IT support teacher helps us, we can help each other after all... the class connect is linked all the school... so we'll be able to see the Year 5's lessons when they upload them, even the Year 6s...so if we all...we're all on one page, might as well even.... Even the experience, we share our experience
M: aha, and you share also good...
T4; especially if it's done... the CD session is done in the third term where we would have a whole term experience with the tablet and we can give tips...
M: aha...
T4: I need to find the Head and talk about it!!
M: aha, it's a good idea... it's what we call communities of practice
T4: exactly!
M: um... so it is a CPD kind of model... that I think nowadays had not yet started in relation to tablets...
T4: no it hasn't
M: but I think it would be a good way forward, especially because um... even though we're getting tablets this year... there will definitely be advancements as the years go by...
T4: yes, different
M: Apps keep developing
T4: and the IT support teacher can help, but she's not experiencing the class... so we'll be able to help the others more... and she's helping... she can help us with new developments and teach us how to use them, but then we'll be implementing them and trying everything out so...

M: exactly, you'll be the ones who will be incorporating it in your lesson plan... and finding the time...
T4: exactly... and finding out the best way whether to use it in the beginning, the middle, the end of a lesson... whether the whole day or not... if it's really beneficial... cause... it's probably impossible to use it the whole day... because they can't... even for the eyes it's not good... but maybe we'll find that look, if we use it in the first lesson, the third lesson and the fifth it's ok, you don't get too tired, or no forget it after the second break... so... we'll be able to discuss those issues hands-on
M: aha... and also, now what's coming to my mind... I remember that at the beginning of this programme, there were mentioned that the tablet will be taken home...
T4: yes..
M: is it still the same?
T4: yes, they will be given a hard case not like the one we had for the laptop... and if you throw it, it won't break... inside it is a special slot, padded where you put the tablet faced down with the screen with the padding so it's really safe... and the other side they have where to put stuff.. flat stuff I believe not the charger for example... after all, they won't be charging it at school so it's best if they leave it at home... they can put it in their bag so they won't have two bags to carry or three if they have a lunch bag... and it will be quite easy... and it's not heavy...
M: will it still be controlled?
T4; yes, yes... in itself it's controlled, even for us teachers... as teachers to be able to access like internet, google open... we need to have a password, the teacher password... the children won't have that... if they can only that if they link it to the wi-fi at their home... but it's still things are restricted so... because it's meant for learning...
M: do you think that you know, they're... some teachers are mentioning that... you know, they've been some...as you said, many children are experienced with using the tablet... um... some of them may relate it to play... rather than to learning
T4: they might... they had a lesson recently with the IT support in fact and she told them this is not a toy, it's a learning tablet... even how you work with it, it's different... when you open a normal tablet, you open it and there are several icons... and you can go anywhere you want.. in this there are only the icons which the teacher puts... and they only... within those icons... only the resources that the teacher puts... so unless she tells ... she wants you to use that you won't be able to use it or anything else... there are open boxes... like the encyclopaedia I don't need to put it in every lesson, they can still access it... or if they need to... their ilearn...
M: but always purely education
T4: yes, purely education... only educational games or applications. Even if you want to give them a link to a site, it might not work because it's not in the... white list...
M: ah...
T4: so if we find it good and it's not in the white list, when we access it, you can send them an email and they'll check it out... and they'll ... make it available.
M: that's good...
T4: yes, very controlled... much more than the computers in the class...
M: aha... I think with the tablet there was a lot of... kind of...
T4: preventative...
M: aha... because it could have gone bad if these things weren't thought through carefully...
T4: yes, definitely *laughing*...
M: yes, and I know many teachers were concerned... and afraid of having this new technology...
T4: yes... aha... even if they're not experienced themselves in using a tablet... the underdog... versus the children but I read a... research written which was done in the pilot sessions... sorry... in the pilot study... I had read this in fact... that some teachers hadn't

experienced and their students had... but it still went on well, because the students were told that it's for education only and they managed to control it...
M: aha... aha...
T4: depends how they approach it...
M: aha... and I think it gives the teacher most of the control, even if the children are experienced in using it...
T4: yes, yes, because if I still see them, for example going to an application which I don't want them to go in, I will switch it off and they won't do the rest of the lesson, they will do it manually for example... so if I give the others a creative writing using the author app... writing a book... he'll have to do it on a piece of paper or a copy book...
M: exactly, so there might be consequences related...
T4: yes, but it's... it's helpful that it's controlling...you just don't need to abuse it too much... there are also things not so drastic for example, there's a bell... if you notice he's not focusing, it rings... you press it... first it's up on the panel... or I can send them a message pay attention, continue your work... yes, I can send it to one, I can send it to five, I can send it to all... so it's very, very *inaudible*
M: so it may also be used as a reinforcement, as you said...
T4: and even not to point him out in front of everyone, unless they hear the noise... but it's not very loud, it's just a ring and that's it... and he'll notice it...
M: aha, that's... quite a... useful function
T4: yes, imagine right now, if I want to point out him, I say 'Paul.... Shhh!' and everyone will know... but this way I can just click... *gesturing* and that's it nobody will know why... or what is it he did... then they won't be distracted, they'll be able to continue their own work...
M: exactly...
T4: it's really helpful...
M: and sometimes even calling them out... in front of the whole class it might you know... for that split second he might look at you, but then psychologically he might still be worried about, it might have effected him... so you might think that your prompt was positive, whereas in fact...
T4:Yes, Yes... he might have taken it negatively... because he'd have... he might have felt embarrassed... yes, you're right.. .and all students are like that... In fact I am very careful how I correct them when I correct them cause... they shrink...
M: aha, exactly... but this kind of more...
T4: subtle...
M: aha... *laughing* ... Um... Ok, so the bell might be ringing soon... what do you consider to be the strengths of this programme?
T4: strengths of the tablet... um... I think more focus and motivation for the children... because like when you get an activity in class and tell them you're going to come out and use the interactive... aaaaah, yeeeee, wiiii, yes! So if we're going to use the same thing for the tablet, we're going to use the tablets today 'yeeeees', they're going to ... hah, maybe at the beginning... but still it's still motivation, it's still different, its not pen and paper... it's a tablet, I can use my finger, I can use the pen... so... I think that's the main strength... a big motivation for the children...
M; do you think that your approach towards tablets, you have a very positive approach... but do you think it would have been different had it happened at a different time of the year, or...
T4: not very exciting that they're coming next January, I would have rather it came later, but at the same time later would mean closer to annual exams... so... there isn't quite a happy-medium unless at the middle, after second term so we get used to the children enough and half-yearlies are passed so we've got less to worry and can relax a bit and... explore the tablet a bit together... as it is it would be coming ah... in the next few months... before the half-yearlies... they will be excited about it and to help them focus for the

exams it's going to be difficult... so... THAT mainly... even if it would have come during my first year then I would have gone CRAZY! *laughing* so the fact that this kind of second of a half year... its... I'm more settled so I know what to expect even during exams... although it's my first year for Year 4 but... I know what to expect because of Year 5s so... but...
M: what are the school's expectations when the tablet comes in January?
T4: in terms of learning? Or...
M: will be you be given time to see how it works out, or do you need to immediately start?
T4: no, no, no, everyone has been notified, the parents, the children ,the staff... everyone... that we decide when we're going to use it, when we're ready... we might use it today, we might not use it today... we might use it just for 5 minutes and then leave it there in the bag and not use it at all... we might use it all day if we feel like it, so we're not pressured to use it a lot...
M: mm...
T4: in fact, personally... at the beginning of the year we had the Religion syllabus new... and no books... and they said I had heard...that they hadn't provided the books because they had expected that the Year 4s will have the tablet and they put it on the tablet... but that's forcing us to use the tablet during the religion lessons and that's not fair because we would have that experience... we might have had experience using it but controlling a class is very different... it's like when the interactive whiteboard came in, you were kind of expected to use it but there's still the normal whiteboard in class even to this day... because it's helpful... for example I use them both... so I write and one and continue on the other while the others are working... so... you have to be a bit lenient... you can't force someone to do something otherwise they'll put up a ball and not want to use it...
M: mm...and you also mentioned being versatile... can you think of other skills which teachers need to be able to use the tablet as an effective way as you mentioned at the beginning?
T4: innovative and creative, so that you can... imagine how you can make it fun. It's already difficult in real-life but with the tablet it'll become a bit easier like I mentioned in the previous example, instead of just they draw or writing what the item is, they can take a photo... now... or for example making a graph... they can actually create it like we do on word cause they've got an office in it so ... they can actually not draw 'miss did I do this correctly?
M: it puts less pressure in a way...
T4: less pressure, and they know if they draw a line not straight the tablet will probably fix it so... less monitoring... the only monitoring via the class connect and it's almost enough so... it's still good to go round even if you want to say something and they feel your presence but not too much that they feel... you're overlooking their work all the time... in fact even during normal lessons I go round but not regularly so that they feel that their work is less pressured especially during creative writing
M: Ok, I think we covered everything, is there anything else you'd like to share?
T4: I've got a question, whether you know or maybe you can find out through the research, when the tablets come in... what happens to the PCs at the back? Whether it will... diminish their use cause like I said I barely find time to use them... and I'm going to try them... then second term but in the second term they're going to have the tablets so I'll probably give more importance to the tablets than the computer because the tablet is personal, computers they need to share...
M: exactly...
T4: so I don't know if they're... if they would be thinking of removing them, I would suggest a computer lab... so that lessons per se on the computer, it could have them...
M: would be during...
T4: exactly, even if you want to do an activity just so they used to a computer, because not everyone has a computer at home, everyone almost has a tablet... a tablet in class a tablet

at home...If they get used to using a game on the computer... maybe a maths lesson in a computer lab for example... so...
M: yes, but you are already foreseeing that its use might diminish
T4: yes, it's already diminishing cause with the interactive as well... they were excited... my class mentioned the computer, miss we never use it, we don't have time you take too long and.... *laughing* I plan activity, you take too long and then time's up so... I try to make them aware even on the interactive... I usually plan an activity at the end to consolidate and not just end with writing... but... sometimes it takes really long and you can't control how long they take unless you tell them last 5 don't do them and then some say iss but we already did them, so you have to be really subtle how to reduce
M: and I think nowadays they might ask to use it because they don't have something... um... because they need that time using some sort of technology... whereas if they have the tablet, they might not want...
T4: they might... but that's less... they will have less time to use it... in the sense, like they want to use the computer... like using it just to play a game so... if that was in their mind, they're in the wrong... they've got it the wrong way *laughing*
M: Okay, thanks a lot... thank you...
T4: I hope I was helpful...
M: Yes a lot, you had a lot of great ideas... and it seems that things are progressing well...
T4: yes, our year fours there were some who we were doubting that some of our teachers would find it difficult but from feedback we're getting from IT teacher, it seems they also are moving forward... they are getting used to the idea that they need to learn about it so they need to fix things... and that's a good sign... you need to learn to move on...
M: yes and certain pedagogy is not student friendly...
T4: even the interactive isn't fun per se but there is a limit of how much you lower it... and it's not really, look at the pen at the star board.. Bulky... cumbersome... I prefer using the other one, its thinner, easier you write with and doesn't go crazy on you when you don't write properly... depends on how quickly I write
M: but yes, seems things so be progressing now let's hope students have a positive approach but I know that some teachers were concerned that students might get too excited, they might not be following the lesson
T4: you start with small stuff and they won't get too excited, start with fun staff and then do the serious staff, that's what I plan to do...
M: but yes, maybe in January February I might come by to see what the students' reactions are... hopefully...

## Appendix F - Example of focus group coding

Participants T1, T2, T3, ET

T2: One of them in particular is quite shy... so I think using the tablet as Ms @@ said, at her own pace, maybe... that sort of... um... not knowing what to do... would be a little bit mitigated.	Overcoming barriers Working at own pace
M: aha.. mm..	
T2: when she is doing for example, an exercise and... during her classwork and we have to hurry up to finish you know... um... doing it on the tablet will diminish that... that feeling... that she did not manage to finish you know...	Reduced feelings of being unsuccessful
M: Mhm.... Mhm...	
ET: even for example when they have a video... they're watching a video on the tablet...sometimes when they are watching as a whole class... there are students who are not following... not paying attention to what they're seeing since it's a whole class... when you have it on the tablet and you have headphones, trying to listen on what's on the tablet it's different... I mean you're watching, you can watch it all without interruptions... if you want to... re-watch it...	Attention difficulties  Supporting sustained attention on task
T2: yes you can stop it, watch it again whenever you want... some children need more than... more than once you know... to listen or to watch something more than once so that is an advantage	Repeated instructions/explanation
M: Mhm... so if I'm understanding correctly... It can provide ways of... Kind of meeting the needs of the students individually... rather than... mhm...	
T3: it's a totally different experience in my opinion	Different modality for learning
M: Mhm... and what are the benefits of that you think?	
T3: it's more of a personalised task... it's something personal... even for example my case... the ones who are statemented they are quite outspoken.... They always bring things to show us in the classroom and they like to do show and tell. The same can be done as they wish...they can take pictures and show us with the tablet. It's a different experience but the same concept...	Personalised learning  Different modality for learning
M: Aha...and in terms of inclusion within the classroom... um do you think that having this piece of technology can help that aspect? Rather than you know, having something that is excluding them because it is not meeting their needs or um... they can't understand what is being said... and they have something personalised at the moment, do you think that, you know you can address that barrier through technology?	
T3: I think yes...	
ET: it is something which we have to... you know... see once the tablets is in the class and eventually....um...	Need for more experience
T2: it depends on what kind of cases you have in the classroom	
ET: what I can say is that from the pilot project we spent a year with the... with the tablet two years ago... I mean we had children who for example... we had a study um... a literacy software... and we spoke... we mentioned it last year... um... eventually the children managed to improve their reading skills from the beginning of the start of the programme until the end ot... so ... it did make a difference and the child who was statemented... um... really paid	Improved reading skills  Improved attention skills

more attention when he was working on the tablet rather than when he was on the copy book... but in class... when these are coming I mean when the tablets are distributed we have to eventually see the outcome... of...	
T1: and the software isn't available you said eq..	
ET: No...	
T1: it would have been ideal...	
ET: but they're trying to find something similar...	
T1: a substitute...	
ET: yes, a substitute... because there were tablets... different tablets...	
M: Okay... so when it comes to um... I believe someone mentioned training... training that you had... um... can you give me a bit of an idea of how the training you had influenced your ability to use the tablet?	
ET: Don't be shy...	
T2: so we had an in-service course in September... speaking for myself, I'm not very confident in technology but I think the fact that we have Ms @@ support (ET) is very... extremely important for us at this stage because... if not... I think I won't manage *laughing^	Prior training Support of e-learning teacher
T1: for example in my case I had technological issues... with my tablet... if she wasn't with us again I would have been totally lost ah... because those three days were not only a crash course... for me they were a zero course... cause I had to look at the others...	Prior training – technical issues Support of e-learning teacher
ET: yes...	
T1: and I have to do hands on or else I don't understand so... it was really short and sweet but in my case it was... not exactly valid... not because of her obviously... because... but thank god we have her...	Need for hands on training Support of e-learning teacher Positive relationship with e-learning teacher
M: Okay... so having a person in the school after being the three days training is...	
T1: yes... god sent...	Positive support from e-learning teacher
M: essential...	
T1: yes, very essential in my case...	Positive support from e-learning teacher
M: ... aha...	
T2: and we need to continue having the support...	Request for further training
ET: I probably...	
T2: it doesn't depend on her... I mean... I think for this to be successful you have to be confident to ...to... to do these things because it really entails a lot of work... from our part... to ... to be able to shift your way of thinking	Teachers' beliefs on technology
ET: Mind-set	
T2: you know, I've been teaching for sixteen years... sixteen years in the same system... it's difficult from one day to another to change your teaching strategies	Difficulties with changes in pedagogy
M: aha...	
T2: so I think we need support... a lot of support for it to be successful... if we are left on our own, like we did with the interactive whiteboard... were introduced... we were completely left	Continued support needed Prior training with IWB

on our own... um... people like me who are not very confident at technology would give up...	
M: aha... and can you give me some brief idea of what took place during the INSET, what the teachers were exposed?	
ET: teachers were shown... we showed them the tablet... that will soon be distributed to the children, how it works and then we mainly focused on the Apps that are going to be available on the... permanently available on the tablet... because not all Apps will be permanently available on the tablet... the Apps that will be available are those chosen by the teacher... we showed them also how to add websites... because even the websites are going to be whitelisted... children cannot open any website they want... this is going to be an educational tablet, specifically... um... what the teacher decides the children open...	INSET training provided  Teacher control on tablet
M: is available...	
ET: Yes... aha... and um... we also showed them how to use teachers' controls... how they view what the students are doing... how they can send messages for example... um... notify those students who are not...paying attention... its not going to be something you know, we just give them a tablet and they do whatever they want with it... that's what we're trying to... so we had some problems ... on the day we had some problems like what Ms @@ said, teachers did not enrol in the school, because all the school are going to be enrolled in our particular school... in this case they are going to be enrolled at (SCHOOL) and the teacher had problem... the tablet did not enrol with the organisation so she couldn't follow...	INSET training provided  INSET training provided – technical difficulties
M: couldn't follow	
ET: yes, what we were saying...	
M: yes, and they had hands-on...	INSET training provided
ET: yes yes...	
M: during training to actually do...	
T1: Yes what she was teaching us, I needed to do not look at other people's tablets... so that will help the pupils... the fact that they will be hands-on... not just the teacher talking and they're listening and looking whatever.. hands-on helps the majority of them do better..	Practicing what is being said by teacher
M: Um... so if we had to think about um... your expectations during training... were these met? You know, at the beginning of the year you had expectations of going on training... you had certain expectations on what you're going to do... or I don't know you had in mind that you're going to be given a tablet... do you feel that... you know after the training you were able to actually meet those expectations?	
T2: I think... I mean for a general overview those three days... were sort of ... were really a crash-course... we had lots of information... bombarded...	Too much information during short INSET
ET: on the third day... we were supposed to do different things but we insisted with the... with the senior management team who was organising the inset that we have to repeat day two on day three.. because it's going to be too much... on the teacher... if you do something different on day three... so we repeated what was done on day one and day two on day three	Too much information during short INSET
M: and the material of day three, will it be provided at a later point?	

ET: Um, day three it was ... how to... we are doing something similar at the moment now... creating lesson profiles... we're adding files... we're whitelisting websites...adding videos...	In school support
M: Okay... so it's being done kind of at a...	
ET: yes, we're trying... we're doing sessions every... weekly sessions of 45 minutes... with each and trying to repeat what was done during those three days... we have been doing this for eight weeks now...	In school support
M: and what aspects of the training and these sessions that you're having during the week, what do you find most helpful?	
T1: the training was just an introduction, that is what I expected and that's what I got. And these sessions are helpful as to get used to the tablet, without these lessons we wouldn't manage...and I'm still quite green eh in my case	In school support
T2: let alone mine...	
M: and what are you finding most helpful out of these helpful? What is helping you the most in...?	
T1: I'm doing individual sessions with her cause um... in a group I don't exactly follow... I like to... I don't like to bother others so if I have to ask her to repeat over and over again... the fact that she has time for me and that she can repeat...	Preference for individual sessions in school Needing repeated instructions
ET in fact we were given the option of either together or as individual... and there were teachers who chosen who prefer... ah... in a group others chose to prefer individual, depend on the teacher...	In school support options
M: Okay... so with you it was the individual one to one...	
T1: yes... yes...	
ET: and mostly...two of them were... because Ms @@ I had to give Ms @@ individual lesson as well because she didn't ...she wasn't present for the INSET... so for her it was totally ... without... ah... the tablet	
T2: actually for me it didn't make any difference... what was an individual session or a group because we were only two teachers so it wasn't a large group... it was quite... quite ok...	No preference for in-school support
T3: and we still get individual attention even though it's in a group	Individual attention given in groups
T2: exactly...	
M: and what do you find most helpful out of your sessions?	
T3: the fact that its hands on... whatever she is telling us... I can do it at that time	Hands on practice
T2: we try it... at that time	Hands on practice
T3: and then I go home, I test it out again...	Independent practice
ET: they can contact me too, listen I found this problem... can you just try to... explain sometimes... *laughing* when you write it down ... it's not 100% like when you... show it	Online communication and support
T3: yes... *laughing*	
M: definitely... and I think I carried out discussions with teachers before the support from the E-learning department started and one of their difficulties was... you know, having ideas and then not having an actual device to practice... these strategies so I think having the support from the E-learning department and having the actual tablet earlier than the students um...	

ET: it was a good idea... and listen, it happened because the... the INSET... they had to have the INSET last June... and it was postponed... even the tablets for the children got postponed... that's why...	Other national changes
M: Yes...	
ET: Now we'll see with Year 5... *laughing* because that's going to be a different story	
M: but do you think was helpful, you know being given a tablet before?	
T1, T2: Yes...	
T3: we are testing out each application, think how you can create lessons... not ... the tablets are with us and then you had to do the thinking...	Prior practice needed
T2: because you have a lot of Apps and you don't know when... where to apply them...or where best to use them so if you don't know ... how can you make best use of them... you know, you have to make the most of it	Application of Apps in practice
ET: and not even test.... Many of them... we only touched... ah... 4,5.... Of them so... we still have ah... and all those Apps that are .... That we are looking at... they have to be... a demo has to be given to the children as well...	Application of Apps in practice Technological skills need to be taught
M: of course... and if they had to come across another App, which was not covered during the training, but they wish to use it during the lesson... um... do you know how to go about doing that?	
ET: in fact, this morning I spoke to Ms @@ about this thing, I told her... from now on it could be a good idea, we gave them a book about Apps during the INSET, it would be a good idea if they bring it over with them... if for example we are doing a lesson about I don't know, listening comprehension and we see that particular App relate to that particular lesson, we add it as a resource on our lesson and I'll give them some... brief... um... demo how it works... so we can use it with the children	Support through a book about Apps
M: aha...	
T1: but we can use only the Apps in the book, if we find another app?	
ET: those apps on the book, and those that are going to be added to the store because after the book was published, we found other Apps that were added in the store... all the Apps that are in the store can be used...	
T1: alright...	
ET: they can be added in the... lesson profile	
T1: but they have to be in that book...	
ET: not only in the book, but the store of the Class Connect... those that the resources that are found in the Class Connect	
T1: so if we find... any one	
ET; if it's a good App, we would have to contact... the Avantis section... of Learn Pad and they have to you know...	Adding on new Apps
T1: approve it...	
ET: yes... etc etc etc... and then add it... in fact Simple Minds wasn't immediately in your... in your tablets... it's a... a mind mapping App...	Adding on new Apps
M: so in a way it does provide teachers with some form of... let's say flexibility into adapting to what... what they would like to do...	

T1: yes...	
T2: they are adding enough Apps for now...at least...	Adding on new Apps
ET: of course!! On that book there are around 38 Apps so... in fact we are trying... we emphasised on the fact that we try at least those Apps which are permanently found on the... on the tablet because there are Apps which the children can find... sorry, can find... always there... there are Apps that we have to add... discussions between each other we decided that at the beginning we'll focus on those Apps which are prevent like Office week, like Alter...	Focus on particular Apps
T2: I mean it's better using...	
ET: for the children to practice	
T2: exactly, it's better using 5 and using well than rather... I mean that's how I think... than having 10 and not knowing what you're doing so...	Quality over quantity of Apps
M: all right... if you had to think of your own professional development.... Um...what kind of teaching skills do you think are essential to be able to.... Um... use the tablet effectively? .....so as a teacher what skills do you think are necessary for you to have to be able to use the tablet? ..... To give na example, one teacher in the past mentioned	
ET: I think confidence is the most... being confident with the... tablet	Confidence using tablet
M: what do you think?	
T1: computer literate for sure... ah... um.... Um... an android device would help at home so that you can practice ... ah... I'm confident with that but maybe.... Some teacher would like something else in order to be confident... I'm quite all right with technology... in my case I would need more practice	Technological skills Practicing in own time Practicing in own time
ET: in fact, most children when we show them the tablet, when we did the session... the buttons that were present on the tablet... they knew what they did... most of them that had an android tablet they knew that the button in the middle is the home button....	Student technological skills
T2: it's true!!	
ET: That's the back button, the reset Apps button... they knew it! There was no need for us to tell them...	Student technological skills
M: so it's important for the teacher to be able to be well versed in technology because the students may actually know more...	
T1, T2: Yes!!!	
M: aha, you don't want them controlling it...	Need for teacher control
ET: yes, but it won't matter... it happened to me two years ago, during the pilot project I had children 'listen miss why are you doing this, why aren't you doing this, you can do this...' Oh my, I didn't realise... so...	Student technological skills seen as positive
T2: and you are an IT teacher!!!	
ET: and I am... *laughing* so... even at home... even at home... my children they know for example certain features which I don't know... and my son always... helps me out in the end	Student may support class teacher with tech skills
M: so you don't think that would be a problem	
T2: I don't think so, because children... even when we had the interactive whiteboard, I mean I used to do the lesson and I don't know where to click and the children would tell me 'miss there, there!!' you know, but I mean... children... I think got used to that... that you know, I mean they are BORN in this era, you know... and I think you're younger than me ... the teacher is another story!!!	Student may support class teacher with tech skills Born in technology

*laughing* ... but some people are really, you know... confident and know... more knowledgeable, I'm not that knowledgeable but I try my best...	Influence on older generation
ET: I don't bother	
T2: I don't think it's a problem having the children be knowledgeable... I mean we're always learning and we learn from the children as well so...	Student may support class teacher with tech skills
Assistant Head: I think we have to stop now....	
M: I think we basically went through everything, I don't know if there is anything else you'd like to add before we finish, anything you feel may help you further or...?	
T1: don't take away the support from us *laughing*	Needing more support

## Appendix G - Observation schedule

### Semi-Structured Observation schedule

<p><b>Curriculum Focus</b> <i>Nature of activity</i></p>	
<p><b>Activity Planning / Structure</b> <i>Is the activity being done individually, in pairs, in groups?</i> <i>How is the activity organised?</i> <i>Who is taking part?</i> <i>Number of participants</i> <i>What resources are being used to help them do the activity?</i></p>	
<p><b>Use of tablets</b> <i>How are students introduced to the tablet activity?</i> <i>How are students using it?</i> <i>Did students encounter any difficulties carrying out the activity?</i> <i>Did students comment about anything in particular which they found good/helpful in the activity?</i></p>	
<p><b>Student engagement and participation</b> <i>How are students undertaking the activity?</i> <i>How are students interacting with the learning environment?</i> <i>Do students appear motivated or engaged?</i></p>	
<p><b>SEN students</b> <i>How are SEN students accessing the activity through technology?</i> <i>Are they working independently?</i> <i>What kind of support is being provided?</i> <i>Where the students able to complete the task?</i></p>	

## Appendix H - Example of observation narrative with coding

Semi-Structured Observation schedule	
<p><b>Description Section</b></p> <p>The class consisted of 17 students in total. One student has a statement of SEN (ASD) and is provided with one to one support by an LSA. Class is divided into pairs of desks, with the statemented child sitting at the back of the class, next to his LSA. Teacher has access to her own computer and the use of the interactive whiteboard. PC is available at the back of the class. All students had their own tablet computer.</p>	<ul style="list-style-type: none"> <li> <b>Madeline</b> Class population</li> <li> <b>Madeline</b> SEN population and needs</li> <li> <b>Madeline</b> Class layout</li> <li> <b>Madeline</b> Access to technology</li> </ul>
<p><b>Nature of Activity</b></p> <p>The tablet was used during a Maths lesson. Students were guided to connect their tablets to the class wireless internet. The teacher monitored each student on the IWB in order to see that they were all able to connect and their tablet is shown on the IWB. Based on this information, the teacher could see who required individual help to connect.</p>	<ul style="list-style-type: none"> <li> <b>Madeline</b> Lesson delivered</li> <li> <b>Madeline</b> Building technological skills</li> <li> <b>Madeline</b> Student monitoring</li> </ul>
<p><b>Description of Activity</b></p> <p><i>Is the activity being done individually, in pairs, in groups?</i>  <i>How is the activity organised?</i>  <i>Who is taking part?</i>  <i>What resources are being used to help them do the activity?</i></p> <p>The lesson consisted of the following activities:</p> <p>20 minutes: <u>Pictographs power point and Word Space</u></p> <p>All students, apart from SEN student participated in this activity. The SEN student was sent a handout on the tablet, which the LSA located. He was required to count and add pictures, and write his answers on the tablet using his finger.</p> <p>The remaining 16 students were divided into pairs. Half of the students were guided to locate a power-point that was sent to them by the teacher. Students had no difficulties locating the document, although the teacher rotated around the class to support any arising difficulties. A few examples were worked out collaboratively as a whole class, and the teacher made use of the whiteboard to provide an explanation.</p> <p>Following the examples, students were guided by the teacher to locate the App that will be used for this activity. This was done by verbal instructions and by showing the students visually step by step on the teacher's tablet which was being displayed on the IWB for all students to see. This App allowed students to insert typed text in a numbered manner.</p> <p>Students were instructed that one student takes responsibility of reading out the questions found on the power-point which had multiple pictures, while the other student will type their answer after an answer was discussed and agreed. Students were then left to work on their own, and the teacher moved from one pair to another to help with any difficulties. All groups seemed eager to show the teacher their work. Although students were paired, some moved around the class to support other students, especially those who were finding difficulties locating the App.</p> <p>Finally, the class engaged in a whole-class correction. All the tablets were displayed on the IWB, and the teacher took turns by choosing a different group for each question. The teacher also discussed certain vocabulary in particular questions (e.g.</p>	<ul style="list-style-type: none"> <li> <b>Madeline</b> Work adaptation / Differentiated learning</li> <li> <b>Madeline</b> Encouraging collaborative skills</li> <li> <b>Madeline</b> Student tech skills</li> <li> <b>Madeline</b> Modelling using verbal instructions and step by step visual support using the tablet</li> <li> <b>Madeline</b> Work presented with multiple visuals</li> <li> <b>Madeline</b> Teacher helping to structure collaborative work to encourage turn taking</li> <li> <b>Madeline</b> Independent learning</li> <li> <b>Madeline</b> Students supporting one another</li> <li> <b>Madeline</b> Assessment of student work</li> </ul>

## Appendix I - Feedback sheet on pilot questionnaire

### Would you kindly answer some questions about your experience of completing the survey?

1. Are instructions for completing the survey clearly written?

Yes

No, which questions?

---

2. Are questions easy to understand?

Yes

No, which questions?

---

3. Were there any questions that confused you?

No

Yes, which questions?

---

4. Are the response choices exhaustive?

Yes

No, which questions?

---

5. Were there any questions you skipped?

No

Yes, why?

---

6. Do you feel the questionnaire was of suitable length for you to fill out?

Yes

No, why?

---

7. Do you feel that your privacy was respected and protected?

Yes

No, why?

---

8. Do you have any other suggestions regarding any improvements that can be made?

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Thank you for your time

## Appendix J - Example of email notification

Dear Sir/Madam,

As you know, the introduction of tablet computers, through the One Tablet Per Child Programme, will commence as from next scholastic year, Our school will be taking part in a research project titled ‘Teachers’ readiness for computer tablets in inclusive classrooms; Implications for developing innovative pedagogies and professional-development programmes’, carried out by a research student from UCL IOE, Madeline Duca.

The aims of this project are to investigate teacher’s tablet use within their inclusive classrooms, and to gain a deeper understanding of teachers’ professional development training, and the CPD that will support teachers in successfully incorporating the new technology in their teaching.

Your participation in this study is voluntary, however, you are highly encouraged to take part. The questionnaire will not ask you sensitive questions, however, if you feel uncomfortable in any way during any part of the research you may discontinue.

Please find attached a link to an online questionnaire. The questionnaire asks questions related to your experience in using ICT and previous training. It also presents items related to your views on tablets and your current use of technology within the classroom. Moreover, some items will ask you to rate your confidence in using a range of technologies, and how the school system is supporting the use of tablets. Filling out the questionnaire will take around 20 minutes of your time.

Taking part in this research will serve as an opportunity for you to reflect on your practice of using technology and your plans for using tablet computers in the near future. It will also help you reflect on your training needs and how these are being met.

The results of this project will be utilised to inform future professional development programmes. Once the study is complete, the researcher will present the school with a summary of the findings. Moreover, your participation in this project will contribute to the currently limited research in the field.

Link to questionnaire: -----

Thank you for your time.

Yours sincerely,

Head of School

On behalf of,

Miss Madeline Duca

## **Appendix K- Information and consent sheet**

### **Teachers' readiness for computer tablets in inclusive classrooms; Implications for developing innovative pedagogies and professional-development programmes**

Miss Madeline Duca

January 2016 - July 2017

This research project is in part fulfilment of my Doctoral thesis within the Doctorate in Professional Educational, Child & Adolescent Psychology at UCL, Institute of Education, London. Kindly consider this information carefully before deciding whether or not to participate in this research.

#### **Purpose of the research:**

The aims of this project are to investigate teacher's tablet use within their inclusive classrooms, and to gain a deeper understanding of teachers' professional development training, and the pedagogies that will support teachers in successfully incorporating the new technology in their teaching.

#### **Your role in this research:**

With your agreement, I wish to observe you within a teaching session whilst making use of the tablet. You will also be invited to take part in a 40 minute focus group with other Year 4 teachers. The focus group aims at providing insight into how teachers can be supported to utilise the technology more effectively in their classrooms. The group will discuss your experience of the professional development training you attended prior to incorporating the tablet into your teaching, what you felt was effective and helpful, and how the training may be improved. The discussion will also ask you to reflect on your current practice when using the tablet with typically-developing students and students with Special Educational Needs in your classroom.

Participation in this project is completely voluntary. No risks or discomforts are anticipated in taking part in this project. However, if you feel uncomfortable in any way during any part of the research, you have the right to decline continuation without giving any reason.

#### **Benefits:**

Taking part in this research will serve as an opportunity for you to reflect on your practice of teaching using the tablet, and on your training needs and how these are being met. The results of this project will be utilised to inform future professional development programmes. Once the study is complete, the researcher will be able to provide you with a summary of the findings. Moreover, your participation in this project will contribute to the currently limited research in the field.

#### **Confidentiality:**

The researcher will record and transcribe information gathered during the observation and focus group. Your responses will be kept completely confidential. Your participation in this study and your identity will stay anonymous except to the researcher. All data will be stored in an encrypted USB stick and will be disposed of once the study is complete.

This research study has been reviewed and approved by the Research Ethics Committee at UCL, Institute of Education, London. It has also been approved by the Directorate for Quality and Standards in Education, Ministry of Education and Employment, Malta.

#### **Contact information:**

If you have questions about this research, please contact Madeline Duca on [mduca@ioe.ac.uk](mailto:mduca@ioe.ac.uk)

## Agreement

**Please Circle**

I have read the information about the research	<b>YES / NO</b>
I understand that participation is voluntary, and I am free to withdraw at any time without giving reason	<b>YES / NO</b>
I allow the researcher to observe me during a teaching session	<b>YES / NO</b>
I agree to be part of an audio recorded focus group	<b>YES / NO</b>

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Signed: \_\_\_\_\_

Researcher's name: \_\_\_\_\_

Date: \_\_\_\_\_

Signed: \_\_\_\_\_

## Appendix L - Additional quotes

Theme	Sub-theme	Illustrative quotes
Teachers' Readiness for tablets	Prior training	"It was like twelve years ago, so obviously it was not as much as it is today... I can see that new teachers are coming at our school newly qualified...the come to school with eh... aspects they learnt at University... which were not present at the time I was there..." -T2
		"We are talking about eight years back... we didn't have teaching on the interactive whiteboard back then..." - T14
		"For me it has been a while...we used to...we used to do our assignments by hand or on the type writer...that was quite a long time ago" -T7
		"We had a credit at University, but I don't think we got into practice to really understand" - T7
		"it was more theory rather than practice and we were doing things that in reality don't apply much" - T10
		"and many times... like this project we once had...it was more theoretical...we were speaking rather than hands-on... in fact robotics I remember... we tried it out with the teacher and we saw how we could take learning from it because the rest, it was more theoretical rather than practical" - T15
	Teacher's outlook on technology	"My husband was going to buy me a smartphone but I don't want one, cause I'm afraid of them" - T7
		"It [technology] get me nervous!" – T6
		"I wanted to use 'simple minds' [App] on the...in the English lesson, but I couldn't find it...by myself I couldn't" – T6
		"It was a bit of a shock...I didn't know what to do with it at first, now I'm getting the hang of it but at first I was like aaah" – T14
		"you don't want to scare them...you need to help them build confidence...that's the starting point" - EO
		"we are a bit younger, but there are some teachers who are in their 50s and they have to adapt to a completely new way of teaching" –T15
		"I've been teaching for sixteen years... sixteen years in the same system... it's difficult from one day to another to change your teaching strategies" – T2
		"if you're not sure about something, you will get more insecure about it...when you overcome insecurity and gain confidence, you will be able to experiment more" - EO
"We were doubting that some of our teachers would find it difficult but from feedback we're getting from IT teachers, it seems they are also moving forward...they are getting used to the idea that they need to learn about it so they need to fix things...and that's' a good sign...you need to learn to move on" – T14		

	Students' technological skills	Sometimes I give them the iPad and they don't know how to use it...some of them switch it off or get into a different App..." – T14
		"We have to teach them how to go about the application ourselves"- T14
		"we would first need to teach them skills on how to simply switch it on and off...how to take care of it, and these are all time consuming" - T11
		"Even when children learn how to switch on, how to... they are small things that children...,not everyone is able to pick them up quickly... there will be those who know and who end up teaching you, but there are some who don't" – T12
		"it might [be a problem], because they'll [students] feel empowered more than the teachers... cause even when I said like... I was getting mixed up on the star board and smart board at the beginning, sometimes the children told me miss not like that, you do that...and they feel... good that they know better but when they get older they can take... a different... view of it...that they know more than the teacher so its problematic" – T4
		"most children, when we showed them the tablet, when we did the first session...the buttons that were present on the tablet...they knew what they did...most of them that had an android tablet they knew that the button in the middle is the home button" - ET
		"but even sometimes, like two years ago we had the pilot project with the children... we had children who used to come forward with ideas we didn't even think of... so they say 'listen miss, instead of doing this, you could do this' and sometimes there were features that I didn't see before so... *laughing*" - ET
		"So although they know how to use technology...kids also know how to use 'Photoshop' which isn't easy...but you then need to teach them...if you change a photo without permission...is it good that you find a book, a game you shared with friends and broken copyright...or a picture and you didn't say where it's from or a teacher said I need to do research and I copy pasted from 'Wikipedia'" - EO
	"so although some children know how to use technology you need to add on... the citizenship aspect... the WAY they use it" – EO	
	Parental involvement and support	"I've been at this job for sixteen years now...we still need to change... the idea that [T3] is saying, they parents...they still want to see hand written work at home" - ET
		"we need to get their [parents] cooperation from the beginning...and sometimes we do not get cooperation, we get children without homework...so they need to go home and know where to find what" – T10
		"they need support...with also with simple accessing...and also to use the codes" – T11
		"and also...that parents are with their children when they see how it is used in the class, even using the codes...I think you have to, ideally

		that they are with their children and they practice a reading exercise, for example” – T10
		“At home they don’t use it for this purpose, at home they use it to play” – T15
		“They [students] think they’re going to do what they want, they are yet to understand that it’s an educational tool and it will only be used for educational goals” – T12
	Perceived challenges	“Last year I had a sever autistic boy... very severely autistic...I wouldn’t imagine him...he is now in year 5 so he won’t have a tablet but I can’t imagine him having a tablet eh...the interactive whiteboard suffered damage...suffered damage with him” – T7
		“We are also anticipating breakages...they are babyish eh... they kick each other’s school bags...” – T6
		“If she loses her temper...she even lashes out at us...or bites us or pushes us... let alone the tablet!” – T6
Value for students	Motivation and engagement	“some students are more motivated when they use the tablet instead of the usual pencil and copy book” - T10
		“they involve themselves, they engage themselves in learning more, than if, there is no technology” – T5
		“I believe that the tablet will make it [learning] more interesting...more appealing...and for example, if it’s a comprehension and it’s on the tablet, they can do what they do usually on the paper too but I’m saying it’s more interesting... they can highlight answers on the text using the tablet, they can insert pictures” – T5
	Student-led learning	“they have their individual task, working at their own pace and nobody interfering or expecting anything special from them” – T1
		“I think for those students who typically stay away from participation, they now know that with the tablet they know that nobody will see their work, it’s just them” – T9
		“You give them a task and they have to get the lesson going” – T10
		“you can stop it, watch it again whatever you want...some children need more than... more than you know... to listen or to watch something more than once so that is an advantage” – T2
	Reducing barriers for learning and SEN	“When they come to writing, their handwriting is almost illegible...now I’m used to it, but their writing is almost unrecognisable...so when it comes to writing that will definitely help... that it is recognisable for them even when they get to study for the exams” - T10
		““I have a particular child...it’s amasing, that noting gets him that attention...and the same effect [as the tablet]...because his attention span is very short” – T10

		<p>““even students who are given a different kind of work, they are scared to participated because the others will find out...so with the tablet nobody will know what work they’re doing” – T9</p> <p>““What I can say is that from the pilot project we spent a year with the...with the tablet two years ago... I mean we had children who for example...we had a study um... a literacy software... and we spoke...we mentioned it last year... eventually the children managed to improve their reading skills from the beginning of the start of the programme until the end of it... so it did make a difference and the child who was statemented...um... really paid attention when he was working on the tablet rather than when he was on the copy book” - ET</p> <p>“I can see improvement in writing for example... ah, especially spelling because I know it can help...when there is a word written wrongly, it can give suggestions to the children so it will help them... a kind of a personal dictionary on hand” – T4</p>
Value for teachers	Improved teaching and pedagogy	“for example we’ll do them in the form of quizzes so that for children they wouldn’t be study as usual... it would be something nice and they learn too” – T10
	Monitoring and assessment	“most of my lessons are based on games...because pupils have become bored of the pencil and the copybooks now... I use them minimally” – T1
		“like yesterday I gave them a comprehension and I asked them to list some things that you find at a grocer’s shop and they wrote on the whiteboard, but from there I got to know who knows what a grocer is, but some confused it with a green grocer... that sells veg...there would have been an application where instead of the whiteboard they use the tablet, where I can see quickly” – T11
		“so even if it’s a games you can still get information that students know from them” – T2
		“even not to point him out in front of everyone, unless they hear the noise... but it’s not very loud, it’s just a ring and that’s it...and he’ll notice it” – T4
		“I can see them actually working on it...the pictures change and they have their names underneath so I know who is doing what...because they log in through their ILEARN, then if I see a child doing something really well and I want to show it to the others I just press a button and it goes on the interactive and everyone can see it”- T4
Nature of tablet use	“you can use it [the tablet] to conclude a lesson or it can be the main task for example...you can use like websites, we do use whitelisted websites and children can access them and later at home too...or for other tasks, there are various ways...and as I said, not...it will not be for the whole lesson sort of, but I can	

Characteristics of tablet-enhanced classrooms		then decide whether to use it to start the lesson, to conclude or to use it as the main task” – T5
		“I use it only to reinforce what we’re doing, like mathematical concepts” – T15
		“it can be used in all subjects as well... it can be used with literacy, it can be used with numeracy... and there are even with the book that is available on tablets...we have lessons, resources um...even drama lessons are stated, physical education, science” – T4
	Independent learning	“if the child has...um.. access then at home...he will continue using it at home...that is a strength...because it is a tool that can be used as class for school as classwork, for homework...as follow up... aha you can um, re use the lesson again...sort of, you can go back to the lesson and revise or add to it” – T5
		“giving them links...links or education videos to watch at home for homework...an extended...as an extension to the homework if we show them an educational video at school we can put it... we can put it on the tablet...we can share it on the tablet...and they can watch it again at home...to revise... to revise what they learnt” – T7
	Personalised learning	“if they are doing the same lesson as the teacher but as a game...they’ll consolidate more...in fact even the LSA, when she’s doing the lesson and doing a bit of an explanation after mine to simplify...then she gives him kind of...games...which consolidate what he learnt” – T4
		“the LSA and the teacher need to make adapted work to even for example, so he doesn’t lose his attention, he doesn’t get too fidgety...he doesn’t get a long task as the others so he manages to do it” – T12
	Challenges and fears	“In fact there is a problem that flash games cannot be played on it [the tablet] at the moment and I base many of my lessons on flash games, so this is a drawback for me...” – T1
		“the font does not enlarge on the [Apps] tablet, certain children will struggle... I don’t know, even visually impaired children...even those who are not at a certain level sometimes we increase fonts for them” – T11
		“the infrastructure needs to be put in place...but it can’t be done in the last month!” – T14
	Class management	“obviously this tablet cannot... it doesn’t give access to all Apps and to everything you know...so it’s the teacher who decides because in the lesson you upload um... you choose even the

21 <sup>st</sup> Century professional skills		Apps that go with that lesson...so they [students] will work this way” – T5
		“they [the students] can’t change it but the person who is controlling it can...I CAN... because the teacher has certain priorities” – T4
		“classroom management is a bit of a problem... if it [the tablet] is given for the whole day” – T14
CPD and lifelong learning	Formal training	“I mean for a general overview, those three days were sort of...were really a crash course...we had lots of information...bombarde” – T2
		“I mean if it didn’t happen in three block days it would have been better...but then you need to distinguish between what you want, and what the reality is...” - EO
		“but even comparing us to foreign countries, we don’t have the same kids, the same environment, the same levels... it’s nice obviously but who isn’t yet so well-versed, how can we do this?” – T14
	Informal training	“having someone who you can ask and she reminds you or shows you other things... it’s always better” – T3
		“the support teacher is coming in and giving us individual attention...we’re benefitting more from that... and she supervises us while we’re giving lessons... that’s better... because there’s something I can actually do” – T7
		“I had observed REAL lessons...that is how you learn the most...seeing someone doing the actual lesson, and not someone shows you how to prepare the activities or shows you how the App words...but you see someone actually DOING a lesson...that is how I think you learn best” – T15
		“and we even discuss our experiences between ourselves...we say you know what we they [students] enjoyed, or worked well...this.” – T9
		“[sharing of good practice] is good especially if it’s done...the PD session is done in the third term where we would have a whole term experience with the tablet and we can give tips” – T4
		“whatever you upload then is available for the others, to the other tear 4 teachers within the organisation” – T5
		“I evaluate myself whenever I have a tablet lesson...so more like personal evaluation of what went well, what went wrong during a lesson...if I t went well I do it again, if it went wrong, I don’t repeat it or try to fix it” – T15
	Barriers to PD	“he [support teacher] sometimes came to do some activity during a peripatetic time but something always comes up and we have to do t next time or see where we can fit it in, if at all” – T11
		“I didn’t have time to practice with her...I missed a lot...because there wasn’t any peripatetic teacher to replace me... it’s a hassle

		for us because if we don't have peripatetic teachers to replace us...we have... we have to send children to other classes" – T8
		"the problem is that we don't have much time to meet...I don't know how we'd manage if we didn't speak from home, cause otherwise we won't communicate" – T10
		"time management for training doesn't depend on us... the school has other activities" – T8