

Exploring the Impact of Introducing Tablets in Omani Primary Schools

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Declaration

The candidate confirms that the work submitted is his own and that appropriate credit has been given where reference has been made to the work of others.

Dedication

I would like to dedicate this work to those who have supported me in getting it finished: My god, country, family and supervisors.

Acknowledgements

First, I would like to express my gratitude and thankfulness to god, whose blessings I have witnessed throughout the period of my study. His blessings gave me hope and strength to overcome every challenge and obstacle I faced.

I would also like to express my thanks to my parents who prayed for me, my wife who supported me and my children who had to tolerate my absence. I must extend my thanks to my brothers, sisters, extended family and to everyone who wished me success during this learning journey.

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Abstract

The success of any project to introduce new technological devices in schools requires the identification of all influencing factors, from the quality of the infrastructure to the readiness of teachers and administrators to plan and implement the project. It also depends on partnerships with all agents directly or indirectly involved beyond the school's teaching and administrative staff.

This thesis reports a qualitative case study conducted to explore the introduction of tablet computers into the Cycle 1 classrooms of a state-run Basic Education school in Oman. Three participant teachers were overwhelmed to be among the first to give their pupils the opportunity to incorporate tablets into their learning activities. Their experience was not as easy and straightforward as they thought it would be. They found themselves in the challenging situation of being asked to use tablets with no specific training and without the requisite software or a reliable internet connection.

The findings indicate that using tablets for teaching in a classroom is more difficult and more complex than doing so for personal purposes, because of contextual factors affecting their use, such as geographical location, teachers' experience and internet connectivity. The progress of the project was also affected by the school administration's criteria for selecting participants and by its failure to inform pupils' parents, who remained unaware of the project's existence and aims, so that their conservative attitudes to tablets tended to discourage rather than support the pupils' engagement with the devices.

Teachers had initial concerns about technical problems they might face when using tablets in the classroom; however, the study findings show that their greatest need was for a vision to guide them in doing so. As the teachers themselves were unclear as to the purpose for which tablets were being introduced, they perceived them as time-consuming devices.

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List of Abbreviations

3G:	Third-generation which is a system for mobile devices that provides fast internet access
Apps :	Applications
AT:	Activity Theory
B1, B2, B3,B4	Boy1, Boy2, Boy3, Boy4
G1,G2,G3,G4	Girl1, Girl2, Girl3, Girl4
GB:	Gigabyte
ICT:	Information Communications Technology
IT:	Information Technology
L1,L2,L3,L4:	Lady 1 , Lady 2, Lady 3, Lady4
M1, M2 ,M3:	Man1, Man2, Man3
SIM Card:	Subscriber Identity Module
MOE:	Ministry of Education
TOSD	Technical Office for Studies and Development
Wi-Fi:	Wireless Internet for Frequent Interface
ZPD	Zone of Proximal Development

Chapter 1: Introduction and Context

1.1 Introduction

The introduction of iPad tablets in 2010 offered teachers a new mobile device with the potential to enhance their own experience and that of their learners (Benton, 2012; Keengwe et al., 2009). When mobile technology was first introduced into education, the focus of research was limited to the impact of the hardware and associated software on learners' attainment (Hargis et al., 2014; Jahnke and Kumar, 2014; Falloon, 2013). Later, however, the focus shifted to investigating how teachers utilised these mobile devices to enhance their pupils' learning (Erbes et al., 2017; Mouza and Barrett-Greenly, 2015; Ruggiero and Mong, 2015). In order to understand how teachers can make the most of such devices it is necessary to consider certain aspects of their introduction, because their value lies not only in the devices themselves but also in the way that they are used (Clark, W. and Luckin, 2013).

1.2 Motive for the study

My interest in the potential value of smart devices in primary school classrooms began in 2011 when I saw my son, who was then under two years old, using my smartphone to play a game requiring him to arrange coloured bubbles by colour, which prompted me to recall a discussion between schools in Oman and the Ministry of Education (MOE) concerning the ministry's decision in 2008 to allow pupils to take mobile phones to school. Thousands of teachers had resisted this policy, believing that mobile phones had overwhelming disadvantages in the school context. Watching my son as he tried to identify colours and learn the differences between them caused me to wonder whether there were in fact ways of using such smart devices in our schools which would outweigh these perceived disadvantages. With my support and by practising for less than 20 minutes a day, my son was able within a few weeks to name the colours used in the game in both Arabic and English. I observed that he was also able to explore other games on my smartphone and discover how to play them. Indeed, on several occasions he showed me what I should do and not do to win. This suggested that when

given the space and freedom to explore the environment and potential of such devices, with the necessary guidance and support, even very young children could learn on their own and discover things of which their adult carers were unaware.

1.3 Political context

An important element of the background to this study lies in a period of time following the upheavals and demonstrations known as the Arab Spring, which affected many Arab countries including Oman (Campante and Chor, 2012; Worrall, 2012). In Oman, protests erupted in January 2011 and lasted for five weeks (Al-Rawi, 2016), marking a significant level of unrest and momentum for change not only in the political sphere but also in the broader social and cultural domains, as people began to state their demands more forcefully than had traditionally been possible. This created tension in schools as teachers went further than merely criticising the projects emanating from the MOE, demonstrating a collective readiness to reject imposed ideas. In fact, teachers all over Oman went on open strike for over two weeks in 2011 and again for over a month in 2014 (Al Zidjaly, 2014). On both occasions, teachers made demands and the ministry reacted. The way in which projects were implemented in schools had to change, as the teachers and administrators in the schools found a voice to which the authorities had to listen, so that the MOE became accountable in some sense to teachers and school leaders.

1.4 The structure of education in Oman

The present structure of the Omani education system began to take formal shape only in 1970, when the main aim was to expand the number of schools in order to make education as accessible as possible to young Omanis. Before 1970, there were only three government schools in the whole country, providing literacy and elementary education to only 900 boys (Unesco, 1972). As the system expanded, all public schools continued to teach to a single curriculum specified by the MOE and any changes had to be made in accordance with decisions circulated by the ministry to all directorates and thence to schools. In 1975, the

government of Oman adopted a five-year planning system and during the periods of the first three plans, the MOE continued to follow the same aim of expanding educational provision in order to reach all citizens, wherever they were. The fourth plan focused on the Omanisation of teaching staff and the continued provision of the same quality of education, then the fifth five-year plan (1995-99) marked a shift, its main aim being to develop quality programmes in order to prepare citizens for the 21st century (MOE, 2008). This was a turning point in the education system in Oman in many different ways.

1.4.1 Basic education

In 1995 the Omani government launched a conference to consider the future direction of the country's economic and social development, resulting in a report entitled Oman's Vision 2020, whose recommendations recognised that the world was changing more quickly and more fundamentally than ever before. Knowledge acquisition, information technology and the development of advanced human skills had become important elements of progress (The Ministry of National Economy, 2008). This was seen to require an education system that could incorporate each relevant technological advance and prepare the younger generation for the future (Education, 2004). The Basic Education system was introduced in 1997 with a promise to be responsive to new technologies in order to prepare learners to work collaboratively with others and communicate through video conferencing and other communication technologies (MOE, 2009).

Oman's Vision 2020 established the basic framework that the Ministry of Education had to work towards. Within its guidelines and recommendations, the MOE embarked on a number of initiatives that fundamentally changed the structure of education and its delivery methods, in the belief that a set of personal and intellectual skills was required to prepare young people to be productive contributors to the future economy of the country. ICT was to be introduced and incorporated with other subjects, while English language was to be taught from grade one and to be given more emphasis in other grades (MOE, 2009). The reform of Basic Education began gradually in 1997 with a plan to replace the existing public education system with a unified system covering the first ten years,

to be followed by two years of post-basic education (Education, 2004). The ministry also developed a new curriculum following international best practice and aiming to provide students with learning experiences relevant to the rapidly changing world of the 21st century (Education, 2004).

The centralised control of education in Oman is justified by the MOE as a way to guarantee that standards are sustained in all schools in the country while allowing better deployment of accountability procedures. Within this centralised system, the ministry requires schools to implement its policies by doing the following (MOE, 2006; MOE, 2015):

- Delivering the curriculum within the scheduled teaching plan;
- Using textbooks written and provided by the Ministry of Education;
- Adopting the assessment procedures and tools provided by the ministry;
- Implementing centrally determined staffing levels and working rules;
- Delivering lessons of 40 minutes duration for grades 1-7;
- Assigning an individual teacher to teach a given subject to each class;
- Maintaining a weekly teaching load of 16-22 lessons per teacher.

Regional educational offices, intermediate between the MOE and schools, are responsible for supervising schools to ensure that they work according to the above policies. At the school level, head teachers are the chief administrators who supervise and enforce rules and regulations (MOE, 2015; The New Zealand Education Consortium). However, official documents refer to giving schools a space for autonomy and encouraging them to initiate their own projects. Teachers are also to be granted a degree of flexibility in following the ministry's schedules and guidelines and in using its textbooks. These documents declare the MOE's determination to provide teachers with professional development support and training (MOE, 2014; MOE, 2015).

The MOE documents also discuss the involvement of civil society and partnerships with national and international organisations. In 2002, the involvement of parents was extended from school councils to the regional level, to encourage greater participation by parents and to ensure that their ideas would be heard (MOE, 2014). This reform can be seen as a response to community

dissatisfaction with the introduction of Basic Education in 1997. In particular, parents had opposed the MOE's plans to introduce coeducation in cycle 1 (grades 1-4), to the teaching of English at grade one and to the teaching of science and maths through the medium of English, which they perceived as westernising their culture and driving their children away from their local language and culture (MOE, 2006).

In a study of the development of parents' councils, Al-Sadi (2013) states that those in Oman are not granted the degree of authority that such bodies have in other countries to participate in taking major decisions on selecting and appointing employees, making policy or determining accountability. He also asserts that members of parents' councils are not provided with the training given to their counterparts in other countries and explains these differences by noting that the structure of these councils in Oman is limited to the local and regional levels, whereas the education system is managed centrally.

The school year begins in Oman in early September, lasts about nine months and comprises two semesters with a midyear break between them. The implementation of the Basic Education structure involved plans to increase the annual number of school days from 160 days to 180 and the length of the school day from four to more than six hours (MOE, 2006; MOE, 2015). There are five school days per week and eight teaching periods per day, with the length of each period varying between about 40 minutes for grades 1-9 and 45 minutes for grades 10-12. Some schools, however, operate a double shift, with two schools sharing a single building, one attending in the morning and the other in the evening; in such cases, each period lasts only 35 minutes (MOE, 2015; The New Zealand Education Consortium). The MOE reports that the target of 180 days of schooling per year has not in fact been met, because schools are used as examination centres for grade 12 final exams twice during the school year (MOE, 2015; The New Zealand Education Consortium).

It is MOE policy that mixed-gender cycle 1 classes are to be taken by female teaching staff because the local culture approves teaching as an acceptable profession for Omani women (MOE, 2006). For this reason, about two-thirds of

the teaching workforce is female (MOE, 2015) and this proportion has sometimes been as high as 70% (MOE, 2006). The World Bank (World Bank, 2013) reports that Omani teachers are unusually young, 40% being under 30 years old and 89% under 40. Teachers are supported in their work by senior teachers at their own schools and by regional supervisors, but the latter are responsible for both mentoring and evaluating them, which constitutes a conflict of interest, making teachers unwilling to admit any weakness that might count against their professional advancement (MOE, 2006).

The MOE operates a cascading model of in-service teacher training, whereby trainers appointed by the regional education offices receive training at the central premises of the ministry and in turn deliver training to teachers at the regional offices (MOE, 2006; The New Zealand Education Consortium; World Bank, 2013). However, the World Bank found that the impact of this training on classroom practices was uncertain, as insufficient data was available. In addition, when the Bank surveyed teachers, they criticised three important aspects of the training regime, complaining that the selection of teachers for training was unreliable because it was done by supervisors, that the theoretical content of the training materials was poor and that the trainers themselves had insufficient expertise (World Bank, 2013).

With the introduction of Basic Education, schools have been provided with computer laboratories and learning resource centres equipped with computers, allowing pupils to be introduced to such technology from grade one, while grades three and above receive lessons in Information and Communication Technology (ICT) (MOE, 2009). The purchase of digital devices is centrally managed by the MOE on a six-year replacement plan. There are more than 450 technicians to provide schools with technical support. Only one-third of schools have an internet connection good enough to allow pupils to search the web. The remainder depend on slower options such as mobile phone internet and are therefore unlikely to be able to offer independent learner-centred internet use. Indeed, some schools are still not connected to the internet at all (World Bank, 2013).

1.5 Technology in Omani schools

In September 2008 the Ministry of Education announced new regulations to allow students to use mobile phones in schools. Introducing new technology into schools is often problematic (Pelgrum, 2001). These new regulations controlled when students could carry or use their mobile phones and specified what school administrations should do if students violated the regulations. As noted in Section 1.2, this innovation was resisted by many school administrators and teachers. After two months of discussion and disagreement, the ministry responded to these objections by amending the policy to empower governing bodies and schools to decide for themselves whether students should be allowed to use mobile phones in school. An MOE leaflet set out the regulations and gave guidance to schools on dealing with pupils bringing mobiles to school.

However, the MOE did not provide a pedagogical justification for its decision. This was surprising, because when the Basic Education system was introduced in 1997, it had established a clear set of pedagogic principles to guide education policy, including the following (Education, 2004; MOE, 2012):

1. Adopting student-centred learning approaches;
2. Reducing rote learning and expanding experiential learning;
3. Applying a system of cooperative education;
4. Encouraging a shift from using textbooks as the main source of knowledge.

Alongside these four principles that inform the existing Omani Basic Education curriculum, the MOE has endeavoured to encourage the adoption of ICT as an integral component of learner-centred and collaborative learning in schools. While ICT is considered a curriculum subject to be taught, pedagogically it is also treated as a medium for the teaching and learning of other curriculum subjects. This view is reflected in seven of the ten general learning outcomes for ICT in Omani Basic Education, which might be thought of as particularly relevant to the introduction of mobile devices into schools (MOE, 2009):

1. Incorporate the use of technology in different parts of their studies;
2. Access knowledge through the use of ICT systems;
3. Validate and interpret data with ICT systems;

4. Edit, process and add to data in ICT systems;
5. Analyse knowledge and learn through using information provided via ICT;
6. Communicate ideas with others using ICT systems;
7. Present knowledge using ICT systems.

The above list of ICT learning outcomes clearly reflects the learner-centredness and collaborative learning that inform Omani Basic Education. Specifically, outcomes 1-5 clearly relate to a learner-centred view of using ICT to search and work on information in order to develop an understanding of the subject contents, while the last two outcomes relate to the view of learner collaboration where learners are expected to use ICT to cooperate to search, work on subjects and demonstrate their understanding.

In respect of the pedagogical potential of ICT, the government of Oman and the Ministry of Education in particular have systematically introduced various forms of ICT for teaching and learning because these technologies are to be used in teaching different school subjects (MOE, 2009; Issan and Gomaa, 2010). Thus, Basic Education came with a commitment to consider different technologies: "The education system has to prepare learners to work collaboratively with others and communicate through video conferencing and other communication technologies" (MOE, 2009 p.13).

In addition, education policymakers have sought to take educational practices forward by integrating various technological advances (MOE, 2009). As technological products undergo rapid change and new devices are introduced from time to time, this raises the questions of how policymakers should go about this integration, who should be involved in making such decisions and why the introduction of mobile phones was so problematic.

One important factor was that the MOE had not provided a pedagogic argument for the introduction of mobile phones. Teachers' online discussion forums (Teachers forum, 2011) and various public forums reveal comments made by teachers about the regulations, many of them unfavourable and concerned with the negative impact of mobile phones on pupils' learning. Table 1 shows some examples of such comments.

Table 1 Examples of teachers' comments on mobile phone introduction

Teachers' comments	Translation	My interpretation
كملت واستكملت ياوزارة التربية والتعليم	<i>Now things are complete, this is the only thing that was missing. [Sarcastically addressed to the MOE]</i>	Totally against the introduction of mobiles in schools
شر البلية ما يضحك أتخيل نتنتشر مقاطع فيديو للمعلمين والمعلمات لما يشرحو	<i>This is so funny, I imagine videos of teachers in classes being shared.</i>	Fear of misuse of classroom video clips
حزني كبير على وزارة التربية والتعليم الى أين ياوزارتنا الموقرة في هذه القرارات الغير مدروسة.. حزني كبير على التعليم وحزني الأكبر على بلادي عمان	<i>I am so sad for the Ministry of Education for a decision not based on research. I'm sad for education and for my country, Oman.</i>	Research has not been used to consider the introduction of mobiles in schools in the country
لا نرى في استخدام الطالب لهاتفه أدني فائدة داخل المدرسة	<i>We don't see any benefit for pupils in using mobiles in schools.</i>	Doesn't see any usefulness of mobile phones to learners
قرار جدا مفاجيء وصدمة لي شخصيا	<i>For me it's a sudden and a shocking decision. I hope it's not true.</i>	Lack of involvement of teachers
ليش؟ هل هذا بعد من أجل تطوير التعليم والرقي بمستوى الطلاب ولا من أجل الانفتاح وتبادل الصور المخلة بالادب بين الطلاب	<i>Why have they allowed mobiles? Is it to improve education? Or just to get students to exchange pornography? God be with school administrations.</i>	Doesn't see any usefulness of mobile phones to learners and fears misuse and undesirable behaviour

Source: <http://forum.moe.gov.om/showthread.php?t=124639>

Teachers were concerned about the misuse of these devices in classes, such as the pupils using the camera recording feature to bully each other, as well as mobiles ringing during lessons, creating distractions and wasting time. They also addressed the problems which might arise in a school environment such as lost, broken or stolen mobiles, as well as the sharing of pornographic video clips. Another concern was the impact on pupils who were not allowed to bring mobiles to school because their families were not convinced of their usefulness or because they could not afford to buy them. Teachers complained that they had enough issues to tackle and that this decision would add to their workload.

Teachers have also expressed their concerns as parents, but while there has been resistance from parents themselves, their voices have not been clearly heard or represented, because the only formal channel for their involvement in the making of school-related decisions is that of the parent-school councils, which do not operate effectively (Al-Sadi, 2013). Indeed, there appears to have been no formal involvement of parents in the debate about allowing pupils to bring mobiles to school. Furthermore, the main areas of conflict between the MOE and teachers have been the introduction of coeducation and of continuous assessment, which was criticised for reducing the weighting of summative assessment, while there has been no real parental or community involvement in taking decisions affecting pupils' performance and progress. Some parents, however, supported teachers who were against the introduction of coeducation and many wrote letters to the MOE.

Following this controversy, the leadership of the school which is the subject of the case study reported in this thesis decided to take the initiative of experimenting with the introduction of mobile devices into its classrooms. In light of the problems that arose from the change in policy on mobile phones, especially the attitudes expressed by teachers, the school decided to introduce tablet computers as learning tools, rather than smartphones. It paid for an initial four tablets, then with the ministry's support, the school was provided with fifteen more devices, so parents were not asked to contribute to the cost of the experiment.

As it is possible that this initiative will serve as a model for other schools, it is important to develop a clear understanding of the pedagogical benefits of the introduction of tablets and the barriers to their effective use. Bearing this in mind, questions arise concerning the introduction of tablets and their impact on Oman's Basic Education principles, in particular whether or not they are in line with the MOE's requirement for schools to embrace technological advances in their employment of collaborative and learner-centred teaching methods.

1.6 School context

Any project to be conducted in an Omani school must follow one of two approaches: it must be either a top-down proposal of the MOE or a bottom-up

initiative originating in the school itself. The latter approach normally involves a long process of obtaining approvals from different ministerial offices and this process is all the more complex if central funding is to be provided. Public schooling is totally free of cost to parents, state schools being funded by the government and not allowed to take decisions that would impose any financial burden on parents.

The education system in Oman, as noted in Section 1.4.1, is centrally managed (The New Zealand Education Consortium; MOE, 2006); most important decisions are made by the Ministry of Education and implemented at the regional and school levels by the eleven educational directorates throughout the country. While the MOE imposes a nationwide curriculum and decides on any changes to it, the regional directorates are able to suggest projects and to initiate experimental piloting of them. However, no project can be started without approval from the ministry. All projects must also be carried out within a pilot or experimental timeframe and evaluation reports must be sent to the MOE for a final decision, either to approve the project and extend it to all other regions if it is feasible to do so, or to abandon it. Therefore, any change made to an aspect of the education system is likely to have major financial and practical implications.

The project whose implementation and consequences are investigated in this study was the first attempt at introducing tablet computers into the classrooms of Omani public schools. Pedagogical research elsewhere has shown the use of tablets to be a promising element of ICT initiatives to enhance teaching and learning (Milman et al., 2012; Clarke and Svanaes, 2014; Clark, W. and Luckin, 2013), but as reported in Section 1.5, teachers and others had offered some resistance to previous attempts to introduce mobile digital devices, i.e. mobile phones, into Omani schools. Against this background, the present study was designed to explore what happened when tablets were introduced into an Omani school and to survey the views of the agents involved.

The process of introducing a new device into the classroom context will be subject to influence by people, practices and decisions taken before the device arrives in the classroom. Therefore, any study of the introduction of tablets must consider

various aspects of the teaching and learning environment, while acknowledging that not all of them will necessarily be present in the classroom. It is important to consider teachers' willingness, ability, skills and training, and to determine how these influence the implementation process. Pupils' exposure to the devices and the time allocated for practice inside and outside the classroom will also be crucial. Other factors which cannot be ignored are the planning of the project and the decisions taken by both parents and administrators on what applications are to be used and on when pupils are to be able to use the devices.

In Oman, teachers of grades one to four are usually called to invigilate the exams which grade twelve pupils sit and this tends to disturb their teaching schedules for over a month each year (The New Zealand Education Consortium). The use of cycle 1 teachers as invigilators at the higher level is intended to ensure the fairness of a form of assessment whose results are decisive for the candidates and their families. Cycle 1 schools are expected to run normally during these exams, however, as not all teachers are called for invigilation and none are involved in marking. Thus, the schools are not officially closed during exams, but they tend to suffer a degree of disruption, depending on how many teachers from any given school are called for invigilation. A major difficulty arises in the case of remote rural locations, where rather than cycle one pupils attending a separate school, which would be too small to be efficient, grades one to ten are combined in a single establishment. In such schools, including the case study reported here, teachers at a number of levels are involved in the grade twelve examinations, some in invigilating and others in marking.

1.6.1 School location

Oman is located in the east of the Arabian Peninsula. It has a land area of about 309,500 km² and a coastline of 3165 km. The great majority of the terrain (82%) is desert and 15% is mountainous, while flat fertile land constitutes only 3% of the total area (MOE, 2015). Within the mountain ranges there are many large wadis, which are valleys in which water flows intermittently. As water resources are scarce in Oman, villages and towns tend to be built close to wadis, exposing them to the risk of flash floods during heavy rain. However, people are happy to

welcome the rain, as it refills the underground water resources which are essential to agriculture and to prolonging the time during which the population can survive between periods of drought (Kwarteng et al., 2009).

The school which was selected as the setting for this study (by a process detailed in Chapter 3, Section 3.3.1) has pupils in grades one to nine and is located in a mountainous village, serving the population of scattered smaller villages in the surrounding mountains. The village where the school is situated has only one unpaved main road, which passes through a wadi and is often closed by flash flooding during the rains (ABDEL-FATTAH et al., 2016). The result is that the village and the smaller ones in the surrounding area are isolated until the rain stops, the floods subside and the roads can be repaired and reopened. Apart from schools and a medical centre, there are no other official institutions in the village, many of whose inhabitants travel elsewhere to work. It is a common situation for men to be absent from the home on weekdays, leaving their wives to shoulder all of the domestic responsibilities including the monitoring of their children's schooling. Until 2004, some parents forbade their daughters to continue their education beyond grade 10, as there was no post-basic school to which they could travel daily, meaning that they would have had to attend a school in the nearest town and live in its hostel during the week, an arrangement that not all parents were willing to accept (World Bank, 2013; Education, 2004; MOE, 2008). This situation, combined with the relative immobility of the population, has resulted in current pupils at the village school having mothers who were not educated beyond grade ten.

At the time of the study, a government initiative had been underway for five years to build a new road with bridges that would keep the main access to the village above flood level. However, progress was very slow because the road passes through a narrow valley which cannot be completely closed at any point during the construction works, there being no alternative route into the village. The aforementioned flash flooding was also found to interrupt the work for several weeks at a time, often burying the work already done or the construction equipment. This situation was found to affect the functioning of the school in two related ways. First, those pupils and teachers who lived in the surrounding

villages were often unable to access the school for the three to five days that it would take to reopen the road after flooding. Secondly, to avoid the risk of pupils and staff being unable to return to their homes if flooding cut them off at school, the administration would often close the school and dismiss the children early when rain was forecast.

Although statistics are not available for specific towns or villages (The New Zealand Education Consortium; MOE, 2015), being generally collated by the education offices at regional level, it appears that relatively few graduate teachers live in or originate from villages such as the one in question. This means that the teachers at such schools are mostly appointed from further afield than the immediately surrounding villages. Having worked for some time in a remote rural location, non-local teachers are likely to apply for transfer to another school that is closer to the town where they or their families live (Al-Habsi, 2009; The New Zealand Education Consortium). Teachers and administrators who are not from the local area are thus often either relatively newly appointed or waiting for a transfer to another school (The New Zealand Education Consortium). In such situations there is an unwritten practice whereby, to entice people to continue working at a remote school, they will be offered rapid promotion so that they climb the administrative ladder within a relatively short time. A teacher who has served for two years is likely to be offered a post as assistant head teacher and within one or two more years he or she may well be promoted to the school headship.

1.7 Study aim and research questions

In light of the background set out above, this study aims to explore what happened when tablets were introduced into an Omani primary school for the pupils' use and in particular to determine the effects of their introduction and of various mediating factors on teaching practice in the classroom. In pursuit of this aim, it addresses the following three research questions:

- 1- What are the contextual factors mediating the use of tablets in the classroom?

- 2- What are the impacts in terms of the roles and responsibilities of the agents involved in using tablets in the classroom?
- 3- In what way does the use of tablets affect teaching practice in the classroom?

1.8 Organisation of thesis

The remainder of this thesis is organised as follows. Chapter 2 reviews the relevant literature, Chapter 3 sets out the research methodology, Chapter 4 reports and analyses the data collected in the course of the case study and Chapter 5 presents the findings derived from this analysis, then Chapter 6 offers a discussion of the findings, draws conclusions and considers the limitations and contributions of the study.

Chapter 2: Literature Review

2.1 Introduction

In the previous chapter I presented the context in which the study was conducted as well as the historical background of the education system governing the hosting school. The aim of this study, as stated there (Section 1.7) is to explore what happened when tablets were introduced into the classrooms of an Omani primary school. This chapter reviews the literature on tablet implementation in schools and published research on using tablets in educational contexts. The introduction of tablets into schools goes beyond the involvement of a teacher with her pupils, as it also involves the school support staff, the management of the school, the parents and the authorities concerned, which in the case of Oman are the Ministry of Education and the regional education directorates. I will review the pedagogical and administrative requirements for introducing technological innovation into schools, then I will discuss the potential role of tablets in schools and the challenges arising from the use of tablets in classrooms. The chapter also includes sections on technology and children, and on the skills associated with using tablets in schools.

The literature on the introduction of tablets indicates that they are perceived as unique products with particular features (Section 2.3) which distinguish them from computers, laptops and other technological products. Indeed, different brands of tablets or different generations within the same brand have different features intended to make them more useful. Here, to study the impact of tablets, it is important for the framework to enable the identification of each devices' features and what these bring to the classroom setting. For example, the selection and changing of software applications (apps) used in classrooms can make a difference, as some studies have looked into the roles that tablets and their apps play in engaging children when used in the classroom (Kucirkova et al., 2014). The features of tablets, their deployment and the management of apps are all crucial in deciding how tablets are used in the classroom and in determining the success of their implementation (Henderson and Yeow, 2012).

The successful introduction of technological devices into the classroom relies on how teachers view them and their understanding of what the devices bring to their classes (Venkatesh et al., 2003). It is thus necessary to explore their introduction from the teachers' perspective, because teachers have a vital role in the process. Their views must be taken into account, since they will be the ones planning and guiding the implementation of lessons with tablets. Cviko et al. (2014) studied the views and roles of teachers in leading technology-rich classroom activities, concluding that differences among teachers in length of teaching experience can be used to explain their differing understandings of their roles. Others have found that teachers' acceptance of the technology to be introduced into their classrooms depends on many factors and affects the introduction process (Venkatesh et al., 2003; Beauchamp and Hillier, 2014; Ifenthaler and Schweinbenz, 2013). This emphasises the value of exploring the introduction of tablets from the teachers' perspective.

On the other hand, the learners' perspective is equally important. Young pupils' views of changes taking place in the classroom are important and many research projects have accepted that children are competent social actors who can discuss their experiences (Barker and Weller, 2003; Christensen and James, 2008). This approach emphasises the importance of listening to children, allowing them to express themselves, hearing what they want to say and considering their points of view (Hartas, 2010). When it comes to the introduction of tablets, outlining the learners' relationships with these devices paves the way for discussing how they use them in educational settings (Dhir et al., 2013). In fact, the learners' perspective on tablets will be more complex than this, since the presence of new devices will also modify the pupils' relations with one another, with their teachers and with their learning environment.

Finally, it is important to consider the views held by pupils' parents concerning the introduction of tablets, because these will affect the extent to which they support the use of tablets to enhance pupils' classroom learning. A study set in Scottish schools found that parents were becoming increasingly involved with the use of tablets and engaged with the school in following their children's learning (Burden et al., 2012). However, home support may vary, as not all parents have

the same exposure to technology use, especially in rural areas, and such differences may affect parents' understanding of how tablets are to be used in classrooms.

From the above, it is clear that a wide range of factors must be considered when studying the introduction of tablets into classrooms. This study adopts activity theory (AT) as its conceptual framework in recognition of its value in covering all of the areas outlined above. Indeed, it goes further, expanding the parents' perspective, for example, to a wider one which includes other members of the community and incorporating the consideration of rules and the division of labour. Section 2.3 discusses these and other aspects and components of AT in detail. Meanwhile, the remainder of this introductory section sets out the reasons for adopting it as the research framework.

This study requires a theoretical framework which provides a "systematic means" of analysing and describing the interactions associated with the introduction of a particular technology within a social context (Stevenson, 2008). A series of material and cultural changes are associated with the introduction of tablets into classrooms (Meyer, 2014), as they confront teachers with the need to make new choices about approaching their professional development and the way they view themselves (Beauchamp and Hillier, 2014). In choosing a theoretical framework for the study it is important first to recognise that introducing tablets into classrooms is a complex process involving many factors; Pelgrum (2001) asserts that the use of technology in education is a potentially confusing phenomenon that involves the contribution of many participants within the classroom, elsewhere in school and beyond, including individuals or organisations outside the control of the education authority but influential in producing change. All of these contributions need to be explored to understand what happens when tablets are introduced. After considering a number of theories, such as grounded theory (Charmaz, 2006) and the unified theory of acceptance and use of technology (Venkatesh et al., 2003), I concluded that activity theory should be adopted here because it provides a framework that focuses not only on the learners and the teacher but also on the forms and developmental processes of individuals' practices in the educational context, including the use of tools, the

social relations between individuals and their environment (Kuutti, 1996). In other words, the focus of AT is on the activity system and it uses activity as its unit of analysis.

2.2 Why ICT in Education?

A gradual increase in the use of ICT in schools has been driven by expectations that schools will perform better when such technology is used. People's positive views of ICT in education have spread until "it is often perceived that learning in 21st century classrooms will involve extensive use of digital technologies" (Abbott, 2016). This agrees with the example given Wedell (2009), who states that high expectations were behind the massive investment in deploying ICT in schools, on the assumption that technology will bring change to teaching and learning practices. Investment in ICT has been driven by interactive multimedia technology that enables learners to interact using computers with talking stories and animation which are highly attractive to children and present information in different ways that engage the learners and assist information recall (Smith, H., 1999).

Therefore, the use of digital technologies in classrooms has spread around the world as people understand that it has the potential to support learners' attainment, as shown by a report on the impact of ICT on learning, which reviews forty two research studies from the USA and UK, concluding that learners' attainment improved when technology was used (Eng, 2005). In particular, the studies presented evidence of pupils' improvement in English and mathematics when technology was used to deliver the curriculum. Further studies have confirmed that the use of ICT helps young learners to expand their learning zone as they creatively use technology to mediate their own learning outside school (Balanskat et al., 2006). A study of social interactions and communication shows that teachers found a marked increase in learners' motivation when they worked in virtual environments that supported interaction through synchronous communication (De Lucia et al., 2009).

Technology is also becoming more widely used for enhancing the social, linguistic and cognitive development of young children (Gimbert and Cristol, 2004); indeed,

its role in enhancing pupil attainment has created a perception that classroom learning environments in the 21st century require the heavy use of ICT (Abbott, 2016).

Integrating technology into education has been linked to cognitive development theory. The learning theory of cognitive development (Vygotsky, 1980) proposes that children's accomplishment is bounded by the things they can do on their own and those that they can do with the support of others who have more knowledge, which Vygotsky calls the Zone of Proximal Development (ZPD). Vygotsky explains that the ZPD in problem-solving ability is the scope for development between a child's level of ability when working on his own and the possible development level when the child is working with adult support (Vygotskiĭ and Cole, 1978). However, with technology, such support is not limited to more knowledgeable adults but is extended to all possible forms of support, including the use of ICT, which Luckin and Du Boulay (1999) call the Zone of Available Assistance. Adults' support for children's learning has been extended with technology, which has also contributed to the environmental context of learning (Vygotskiĭ and Cole, 1978).

Emphasis on the communication and collaboration that technology provides when used for teaching and learning is what makes the difference between educational ICT and IT (Dwyer, 1995). Various studies have examined how technology enhances collaboration in teaching and learning. For example, it was found through the use of scripted collaboration that educational computer games significantly enhanced the quality of learning outcomes (Manouselis et al., 2011).

Many studies have found that the use of ICT has a positive impact on the classroom environment, reporting the following benefits (Osborne and Hennessy, 2003):

- ICT provides opportunities for learners to think, discuss and interpret learning materials, which enhances their productivity.
- It supports the extension of learning beyond the classroom by linking lesson materials to real-life situations.
- It increases engagement and motivation, as well as improving collaborative learning and learner autonomy.

- It helps teachers to explain abstract concepts.

Promoting learning interactivity is one of the main reasons for using ICT in teaching and learning contexts (Beauchamp and Kennewell, 2010). This applies to technologies that are able to respond to learners' actions and to those that support or enhance teacher-learner interaction. Therefore, there has been an emphasis on so-called interactive technologies, i.e. those that are thought to support interactivity, such as interactive boards, which were found to increase the level of teacher-to-pupil interaction (Beauchamp and Kennewell, 2008). However, while Smith et al. (Smith et al., 2006) agree that the level of interaction between teacher and learners tends to increase when interactive boards are used, they warn that this does not necessarily mean an improvement in achieving learning goals. They criticise the interaction that takes place when using interactive boards as superficial, because it encourages whole-class teaching and interaction rather than grouping learners into smaller groups, which would allow more meaningful and authentic interactions.

It is also assumed that learning activities in a rich technological environment will be characterised by better engagement and collaboration among learners than those involving less use of technology (West, 2013). West believes that technology allows pupils to take learning beyond the confines of the classroom walls and of school time, since they can use online services to access learning content, communicate with their teachers and collaborate with their peers.

It has also been argued that it is reasonable to question the amount of technology used in the classroom and more importantly, to consider how it should be used (Clements and Sarama, 2005). One of its early uses was to deliver interactive stories to stimulate speaking and listening skills. Multimedia stories with sound and animation are highly attractive to children and present information in different ways that engage the reader and assist subsequent recall (Smith, H., 1999). As educational research progressed, the integration of technology into language learning took a variety of forms. Computer-mediated communication is believed to support language teaching in two ways. First, it serves as an environment in which teaching may happen; second, it can engage learners with communicative skills by which they exchange language online rather than being confined to

classroom conversations (Lamy and Hampel, 2007). More recently, technology-enhanced language learning (TELL) has been introduced to guide the integration of interactive, collaborative games and devices. TELL represents technology not as assisting language learning, but as part of the environment in which language exists and is used. Technology provides new contexts as well as new tools for communication. TELL includes a wider range of devices such as smartphones, game consoles and tablets (Walker and White, 2013). Handheld technology changes traditional roles, as learners no longer receive knowledge passively, but participate actively in constructing their learning, while the teacher facilitates the learning process (Lutz and Huitt, 2004). Working together does not merely mean getting learners physically into a group to work together on one task; it also means creating collaborative opportunities where learners are required to interact and to work together in order to achieve personal success by pursuing shared goals (Doolittle, 1995). Learners' roles include searching for and selecting the learning content and deciding on learning strategies, which involves taking the acquired knowledge beyond its reproduction to apply it, using problem-solving skills, to new situations in the real world (Ng and Nicolas, 2012).

Finally, an important dimension of ICT in education lies on maintain the continuity of the roles of teachers and learners in using technology to facilitate learning, which includes the preparation and practice required to ensure the best formal and informal ways of achieving pedagogical benefits (Traxler, 2012). These practices are based on the interpersonal relationships between teachers and learners and on their views of teaching and learning (Nicholas, 2010).

2.3 Activity theory

This section explains the main principles and components of activity theory. Here and elsewhere in this thesis, initial capitals are used to indicate that a term has a specific meaning within AT. Activity theory has been through generations of development since it was initiated in the 1920s by Vygotsky, who was particularly concerned with the use of mediating tools and the study of environment in learning (Vygotskiĭ and Cole, 1978; Engestrom, Yrjö et al., 2007). The theory is used to explain the meaning that Tools carry in social Activities, which indicates

the importance of considering the social context in understanding the meaning given to the tool within that specific context. External Tools are used to enhance pupils' learning in many teaching contexts therefore technological devices such as computers are integrated (Kaptelinin, 1996; Nardi, 1996). However, not all teaching contexts are the same, because pupils, teachers and schools are not the same and people will associate different understandings and meanings with the used tools. Thus, AT is a way of analysing the complex context of an Activity, providing the researcher with concepts for developing an understanding of the Activity System. It has been used to study the conflicts arising from the implementation of new technologies, where teachers' beliefs clash with their actual practices (Russell and Schneiderheinze, 2005). Therefore, in order to investigate how people understand the technology they use, it is important to relate their use of it to the context in which they use it. It is equally important to view their histories, which Blin (2004) did to understand students' resistance to the introduction of computer-assisted language learning into their learning context, as he examined learners' educational histories and their history of technology use.

For this study, it is necessary to form a wider understanding of the context and of all the components that might impact the use of tablets in the classroom. These include the teachers and pupils who are the subjects of the Activity System and their understanding of tablet use, as well as their understanding of their roles in using the technology in question. It also means exploring teacher-to-pupil relationships and their understanding of classroom norms in order to determine what tablets might bring to these relationships in terms of division of labour. Finally, all of this is to be viewed within the context of the classroom Activity System, as classes may differ both between and within schools.

However, I would agree with Kuutti (1996) that the words 'activity' and 'theory' are both misleading, referring as they do to the Soviet-originated cultural-historical tradition in research. This is because the tradition is not interested in activities and the word 'theory' gives it a fixed meaning which is not appropriate. The basic idea of activity theory is to view all related aspects of an Activity such as the introduction of tablets into a classroom setting. AT conceptualises human

Activities as being interlinked, with each being connected to or leading to another. It is often difficult to separate them or to isolate their impacts (Engestrom, Yrjo, 2000); therefore, understanding any single Activity involves exploring its relationship with other Activities. Thus, when studying tablet use in schools, it is important not to limit the investigation to how individual teachers or pupils use the devices from a single perspective while ignoring the wider context. Instead, the understanding of participants' Activities should take account of their aims and values, of social and cultural factors and of the mental processes involved (Kaptelinin, 1996). Before discussing AT further, it will be useful to unpack its structure and to discuss the terminology associated with the theory, beginning with Activity itself.

2.3.1 Terminology

The use of the word Activity in the context of activity theory is problematic, as it has a special meaning which differs from its general use to denote everyday actions such as classroom activities. This confusion arises from the origins of AT in Russia, as there are two words in Russian with slightly different meanings, both of which are normally translated into English as 'activity' (Roth et al., 2009; Kuutti, 1996). Within AT, an Activity is a complex set of social interactions between the component elements of an act that is performed by one or more humans. The following subsection explains the components and terms associated with AT. This explanation, in common with the rest of this study, adopts the model of Engeström (2001) in which the basic idea of activity theory is that the Subject(s) of an Activity perform Action(s) mediated by Tool(s) towards an Object (**Figure 1**).

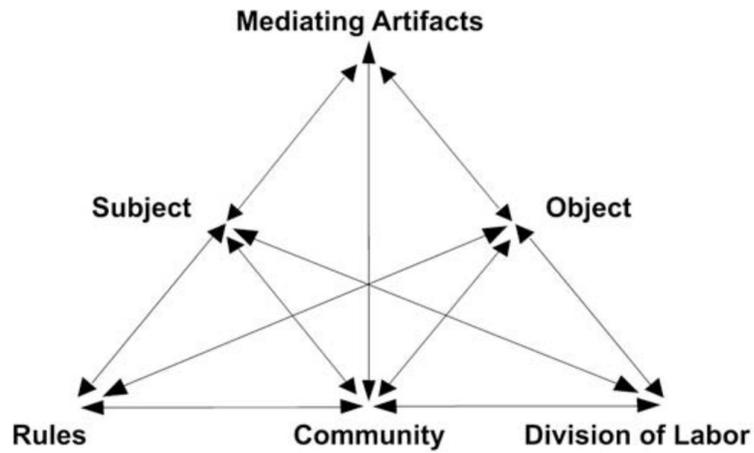


Figure 1: Activity System (Engeström, 2001)

2.3.2 Components of Activity

As AT has evolved, the structure and definition of an Activity has also developed. Basically, an Activity is a system with seven components, as listed and explained in Table 2.

Table 2: Terms associated with activity theory

Term	Meaning
Subject	An individual or group of people who are the main actors of the Activity or whose viewpoints are adopted. Many people may be present in the Activity as part of the community. Activities do not exist in isolation and can be interlinked, so the main actor of one Activity may at the same time be a member of the community for another Activity and vice versa.
Object	What the people involved in the Activity want to achieve by it. It creates a Motive and a driving force for Subjects' actions. However, as there can be more than one Subject in an Activity, different Subjects may have different driving forces.
Tool	What the Subjects use to mediate their interaction within the Activity towards its Object. Subjects may use material Tools such as books, computers or machines (Blin and Munro, 2008), or can use spoken language as a Tool.
Rules	Regulations and norms that the Subjects are bound by and which govern Actions and relations within and between Activities.
Community	People involved in the Activity or individuals sharing the Object of the Activity with the Subjects.
Division of Labour	The organisation by which individual Subjects share different duties and tasks in working towards their Object as well as sharing status, control and power among Subjects and members of the Community participating in the Activity.
Outcome	The final result of the Activity, which can be a situational status that comes as an idea or an emotional response (Bodker, 1989).

The Activity is started and oriented by the Motives which the Subject of the Activity attempts to realise by working within the Activity. However, having joint Subjects of Activity with the same Motive may lead to variations, depending on how each Subject tries to realise the Motive; consequently, their experiences and learning may differ (Roth et al., 2009). An example is when a group of pupils are each holding a camera and are asked to take photos of the same tree. Even though they all use the same Tool (a camera) and have the same Motive (taking a photo of the tree), the quality and clarity of the results may vary, depending on how individual pupils work on controlling factors such as the angle, the focus of the lens, the lighting and their distance from the tree. The consequences of

differing individual experiences are differences in how individual Subjects realise and hold to the initial Motive or work towards a new Motive within the Activity.

Secondly, the Motive changes how individual Subjects decide how much effort to put into their participation in the Activity (Roth et al., 2009). For example, a teacher takes her class to a computer cluster to design a Mother's Day card to be emailed to their mothers at the end of the lesson. However, on arrival at the cluster, before they start designing, the teacher informs them that the internet is not working and they will be unable to send the cards to their mothers. Although the pupils may perform the same action (designing), this change of Motive may change the effort they decide to put into their actions. Finally, how individual Subjects understand the Motive as the effort the children put into designing a card may vary between those pupils who expect to send it to their mothers at the end of the day and those who do not, because they are motherless, for example.

An Activity is made of one or more Actions performed by a Subject, which is an individual or a group of people (e.g. a teacher or pupils) driven by a Motive or a need (Stevenson, 2008). These Actions are mediated by Tools and carried out until the initial Motive or need is satisfied (Engeström, 1987). It is important to distinguish between three levels of Activity, which are Activity, Action and Operation.

Actions are what the Subject of the Activity does to fulfil the Motive of the Activity. They are the main constitutive units of the Activity which the subject performs and they make sense only when seen in their context. Allen et al. (2011) explain that while working on an Activity, Subjects engage in goal-oriented Actions that do not all necessarily serve the fulfilment of the Object of the Activity, even though they are part of the Activity and are mediated by the Tools of that Activity. The collective Actions will eventually lead to the fulfilment of the need or Motive of the Activity.

Actions are composed of a number of **Operations**, which are the smallest units of an Activity. Operations can be explained using the earlier example of a child using a camera to take a photo. Pressing the shutter button does not constitute the entire Action of taking the photo but is just one Operation. The Action itself is

composed of several such Operations, some of which the child may be unaware of, such as checking distance and lighting, adjusting the focus and orienting the camera.

These levels (Activity, Action and Operations) are not fixed, in the sense that Activities can become Actions within another Activity, while Actions can become Operations within another Action (Bodker, 1989; Karanasios et al., 2013). As Operations become Actions and Actions become Activities (Bodker, 1989), this development of Activity makes it a unit within a network of Activity Systems, where the outcomes of one Activity may enhance the fulfilment of another Activity Object within the Activity System, even if this was not intended (Korpela et al., 2000). In addition, the Outcome, which is the final product of the Activity, may match the needs and expectations of the original Motive of the Activity or it may be a new and unplanned product. Again taking the photography example, the final product may be a clear photo of the tree as intended, or a hazy, unclear picture. In the school context, Outcomes can be factual knowledge or the development of conceptual understanding or skills through the Activity, as formally stated in the curriculum. Alternatively, they can be goals set by individual pupils or teachers with no formal or set statement. "There is no activity without a motive" (Roth et al., 2009). However, the structure of an Activity System comprises various levels of Activities, and human Activities serve the collective needs which represent "the true motive" of the Activity system (ibid).

This study uses activity theory to explore two Activities: the process of introducing tablets into schools and the complex set of classroom interactions with devices. The Subjects of the Activity are the pupils and teachers, who are part of a wider community that includes administrators, parents and policymakers. As to the rules, those set by the Ministry of Education and the school will be the same, while classroom norms will be unchanged; however, when tablets are used for the first time this may also have implications for the rules.

Having dealt with the theoretical framework of the study, I now turn to the features of tablets and their use in education.

2.4 Why tablets?

The first iPad tablet was introduced in January 2010 and since then tablet computers have gained popularity. Among the different brands of such devices, which are sometimes called post-PC tablets, are the iPad and various Google Android models. These are different from the first generation of tablet PCs which appeared in the early 1990s. The new generation of tablets have benefited from the fast development of mobile technology. They have capacitive high-resolution touch screens with a multi-touch finger-driven interface and a wide range of applications are available (Johnson, L.F. et al., 2012; Montrieux et al., 2014). There are also a range of connectivity options from Wi-Fi (wireless) to 3G and 4G networks. With all of their enhanced features, the introduction of tablets to schools has stimulated a new educational debate, while their use in school is expanding. Tablets are rapidly gaining customer trust as tools of general media consumption and informal learning, and are increasingly being adopted for use in more formal teaching and learning (Clark, W. and Luckin, 2013).

However, the way that schools rushed to embrace tablet use has been criticised on the grounds that tablets were a novelty whose attraction would soon fade. Critics asserted that the positive results of many studies were valid only in the short term, the researchers having been influenced by the novelty of the devices to conduct their studies soon after the introduction of tablets into schools; longer-term work was therefore needed to investigate how learners interact with tablets and to identify factors affecting this interaction and thus the learning value of the devices and their use (Falloon, 2014). In addition, even people who usually viewed ICT in education positively, such as Traxler (2010), arguing that ICT devices provide confidence and familiarity because they exist in learners' everyday lives, formed a sceptical view of tablets in education. This negative assessment was that tablet devices are ill-suited for education because the replacement cycle imposed by manufacturers is shorter than the time needed for such devices to prove their capability in education. Murray and Olcese (2011) also questioned their effectiveness as educational tools. After analysing the hardware and software environment provided by 315 apps, they concluded that tablets were not a tool for transformative teaching and learning, lacking the

capability for collaboration because most of the apps focused on providing knowledge and delivering content using drills and practice, without opportunities for creativity and reuse. However, this criticism fails to acknowledge the pace of development in the production and pedagogical use of apps.

This may explain how it is that a year later, Heinrich (2012) reported a qualitative study in which 43 of a sample of 71 teachers were cited as finding tablets apps to be useful additions to traditional teaching methods. Johnson, L. et al. (2012) also disagreed with Murray and Olcese (2011), asserting that tablets enable learners to produce content rather than simply consuming it passively. Newly emerging apps such as Interactive Text and Life on Earth (McWilliam, 2012) allowed learners at different levels to easily design and produce their own projects in 3D shapes. The emergence of such apps represents ongoing development and innovation, exploiting the features available on tablets and challenging the idea that they are only to be used for delivering content. Further, an evaluation of iPad use in Scotland (Burden et al., 2012) reported that some apps enabled teachers to personalise their advice and feedback, transforming the learning environment by centring it more than ever on the individual learner.

Tablets have potential educational advantages, as pupils can be in full control of their devices, which can support activities including those involving apps or online communication and downloaded files (Valstad and Rydland, 2010; Beauchamp et al., 2015). Mouza (2005) reports that research has shown positive results in that technology can contribute to children's development in three ways: a) by allowing teachers to create an environment that allows pupils to learn by doing; b) by helping children to understand difficult concepts through visualisation and c) by reinforcing activities appropriate for development. Learning with technology can engage children in hands-on activities which may vary from simple games to interactive discussions, guiding and supporting pupils' engagement in activities planned or facilitated by a teacher. A study of iPad use in a school in New Zealand found that the multi-touch rotatable screen with a range of apps gave pupils enhanced opportunities for collaboration by keeping them interested in the content for longer, allowing them to interact with each other through the device and providing opportunities for face-to-face interaction (Henderson and Yeow,

2012). Williams and Easingwood (2007) argue that children's control of the technology should not be constrained by the teacher or the software. Pupils should interact with devices and use them as tools to advance their own learning and enquiry, rather than being controlled by the technology. Fear of depending on technology is an outdated concern, as the whole world is moving towards integrating it in every aspect of life, and a positive attitude towards educational technology is now prevalent. Whether they like it or not, educators are faced with a constantly changing technological world that people expect to be reflected in what schools do (Selwyn et al., 2010).

A study of the use of iPads in eight primary and secondary schools in Scotland has reported an unspecified increase in the use of technology in the classroom (Burden et al., 2012). Tablets were also found to provide wider access to knowledge and resources, with many teachers noting that their internet use had increased after iPads were integrated into their teaching. Earlier researchers noted that the features and designs of tablets made them easily accessible and useable by even the youngest school pupils with minimal exposure (Melhuish and Falloon, 2010), which created an expectation that teachers could integrate tablets into their classrooms without training (Smith and Santori, 2015). The implication was that tablets required little or no investment in training for either teachers or pupils. However, later studies considered the need to train teachers (Karsenti and Fievez, 2013; Burden et al., 2012; Heinrich, 2012), as classroom use of tablets was found not to be as easy as had been presumed. Henderson and Yeow (2012) report that teachers found it easy to use tablets but difficult to create content appropriate to their lessons. Before discussing the reasons for this difficulty, it is necessary to outline some of the main features of tablets.

2.4.1 Mobility

Tablets are fully mobile, as they require no connecting cables except when charging. Therefore, with well charged batteries they give learners freedom of movement, allowing them better control over their learning space (Clark and Luckin, 2013). This mobility constitutes an important element of the educational value associated with such technological devices, which are uniquely powerful in

making learning mobile (Heinrich, 2012; Miller, 2012; Schuck et al., 2013). The use of mobile technology allows learners to extend their knowledge and discussions beyond the classroom walls (Rossing et al., 2012; Benton, 2012). Even in the classroom, pupils are not confined to a specific desk or group but can switch from one group to another, taking their tablets with them and sharing their learning. Mobility combined with the touch-screen feature enables learners to engage longer with the lesson content as well as with the devices themselves (Clark and Luckin, 2013).

2.4.2 Apps

One important feature of tablets is the variety of software available in the form of apps, which are programs downloadable from the internet and designed for use on mobile devices (Neumann, 2014). There are thousands of apps available for download, either free or paid for. Among these are many educational apps to suit different customers (Henderson and Yeow, 2012). However, not all available apps will necessarily be appropriate for every lesson, as account must be taken of factors including suitability for the age range, the subject being taught, the language of instruction and the aim of the lesson. There are apps that provide interactive learning materials, such as electronic books with a built-in narrator (Neumann, 2014). In addition, there is a range of apps specifically designed in child-friendly mode to help children learn, such as those in the form of matching or sorting games to teach children about letters, sounds, colours and shapes (McManis and Gunnewig, 2012). A study in the United Arab Emirates identified a major challenge in the fact that all apps were in English, which made their use difficult not only for pupils but for many teachers, who spoke only Arabic (Ali, 2013). The author recommends that schools should seek to overcome this problem by developing their own software. In general, teachers need to look for apps that best serve their lessons and their pupils' needs, which requires them to collaborate with the school administration and devote time to app selection.

2.4.3 Time saving

Researchers have reported varied results regarding the time saved by using tablets in the classroom. In a study of the benefits and drawbacks of introducing

tablets to classrooms in the American International School in Dubai, Ali (2013) found that teachers became more efficient with time. He explains that lesson time was saved by teachers using the school's facilities to access the Web in order to prepare for lessons before assigning work to learners. On the other hand, if teachers need to prepare digital content in advance in order for the use of tablets to save time within the lesson, Young (2016) warns of an overlap between this preparation time and the time teachers need for their professional development. He therefore urges school administrators to allocate time for teachers to prepare digital material for lessons. Indeed, if teachers are to use tablets in the classroom, they require the support and understanding not only of the school but of the community beyond the school gates.

2.5 Tablets and innovation in education

This section considers the impact of introducing tablets to the classroom on the wider education field. Wedell (2009) asserts that policymakers need to consider at the planning stage of such a complex educational change the importance for local leaders to fully understand both the specific change itself and the nature of the educational change process in general, so that they are able to appropriately plan, monitor and support implementation over time. It is also important to provide appropriate information and support to help local leaders, head teachers, teachers, learners, parents and administrators to understand the 'what' and the 'how' of the change, in order to enable them to begin implementing it. They will surely be affected by the implementation of the change, so it is important to take account of what they currently know and think and of how they behave towards the change (Wedell, 2009).

The introduction of tablets brings about a change to schools, but it may well not be the only change affecting the school setting. Schools suffer the problem of being overwhelmed with a flood of scattered reforms and changes (Fullan, 2008). Educational projects are introduced as a result of the technological and economic effects of globalization, which direct governments to move towards developing policies to maintain or improve their competitiveness in a changing global market (Wedell, 2009). Therefore, stakeholders tend to think that introducing the most

recent technological innovations to the school curriculum will bring a major improvement in the quality of teaching and learning (ibid). However, it is important for people working on innovations to be aware of the implications of their projects and to try to improve teaching and learning standards. Wedell (2009) believes that innovation and change, whether imposed on schools or coming from within, should be designed to serve the ultimate aims of the educational system. Therefore, schools should not allow their enthusiasm for introducing tablets into their classrooms to lead them to forget their existing teaching and learning goals.

For example, a questionnaire-based study was conducted at Longfield Academy in Kent (UK) in September 2011 to investigate the impact of iPads on teaching and learning (Heinrich, 2012). Of the school's 960 students, aged 11-18 years, 320 completed the questionnaire, as did 71 teachers and 28 parents. The study found a significant positive impact of iPad use on the quality and standard of students' work and on their level of motivation. Students reported using iPads in all subjects to search for topics online, to prepare presentations and to brainstorm ideas. They indicated that they wanted iPads to replace paper and books, to take notes, to make music and to do online research and homework. They said that iPads made it easier to use eBooks, to access translation tools and to access educational games and apps in support of their learning, especially in English, maths and science. Most students believed that iPads enabled better collaboration through sharing online resources and doing group work in class. The study uses technical and other factors to explain why teachers' responses to the use of tablets for collaborative tasks differed from those of their students. This study recognises the many challenges that faced the researchers and the project implementation team, such as providing sufficient staff training, technical issues related to the licensing of apps and other constraints related to educational management. Some of these factors may have affected pupils and teachers when responding to the questionnaire and interviews.

The Longfield study examined how students used their iPads, in which subjects and in which activities, but evidence of a positive impact is limited to questionnaire responses, where students are reported to have "overwhelmingly" expressed their enthusiasm (Heinrich, 2012) for using iPads. However, if given the chance,

they might have expressed their worry that they would not be allowed to use iPads if they had not been used effectively in class. Students may not have been able to notice or been willing to report the distraction of access to games and online content, leading them to engage in off-task activity when using their tablets in class. The study should have been taken further to investigate how and how effectively they actually used their tablets in class, using data collection methods other than surveys.

In a review of research on iPads in schools, much of which had not yet been published, Clark, W. and Luckin (2013) note many important 'guiding' ideas. They report that iPads have been found to support learners beyond simple drills and practice games and that there is evidence that iPad use supports collaborative learning and provides a personal learning experience. According to Clark, W. and Luckin (2013), research also suggests that the adoption and use of tablets in and beyond the classroom allows students to expand and enhance their learning in ways that were previously not possible or not easy. Finally, from a teaching perspective, they assert that knowing what learners know about their learning is a key issue in teaching and learning. Learners need to be able to work with devices such as tablets on tasks at an appropriate level of challenge. It is therefore important to understand that learners' ease of use is a key factor in their engagement with learning. The review cites examples showing that iPad use plays a role in learning activities that enhance and support deeper learning in science education and authentic learning in language learning (Clark, W. and Luckin, 2013).

An earlier study explored the practicality of using tablet PCs (an early generation of handheld computers with a stylus interface) for children in early education to draw portraits (Couse and Chen, 2010). The study addressed two questions: 1) Is stylus-interfaced technology a suitable tool for early education? 2) How can stylus-interfaced technology align with technology curriculum standards for early education? The researchers used mixed methods to gather qualitative and quantitative data on participants' use of tablets. A total of 41 three- to six-year-old children were videotaped while working with their tablets in the classroom. They were examined individually as they interacted with the tablets during class

teaching and after the class. Pupils and teachers also participated in focus group interviews. Grounded theory was used to analyse the qualitative data. Different age groups were compared to determine whether pupils' age was correlated with differences in their work. It was found that preschool pupils were quickly able to learn to use the tablets as a medium to express their ideas and show learning. With adult instruction and peer modelling, they became comfortable in using the devices for drawing and were able to select a pen colour from available options. It was found that children preferred to use these tablets (with stylus) over traditional drawing media. The more they worked with tablets they more independent they became and the less teacher support they required (Couse and Chen, 2010). Although this study recognises that its data was limited to the children sampled in the study, it uses empirical means to address the question of the practicality of tablet PCs for preschool children in a natural setting. The relationship between children's age and the practicality of technology has been a topic for discussion among educators.

Finally, no technology has an impact on learning in its own right; rather its impact depends upon how it is used (Clark, W. and Luckin, 2013) and research indicates that the introduction of ICT does not simply bring the desired change, as it is a complex and difficult process which affects and is affected by many factors in the field (Demetriadis et al., 2005). Adopting the use of tablets in schools is no exception; although there is evidence that they can help teachers, learners and parents in multiple ways to be more effective, such outcomes cannot be guaranteed by the introduction itself. To enhance these learning benefits, tablets should play a supporting role to the actual learning activity. The question that should be asked is not whether tablets can support learning, but rather how they can be used to support collaborative or exploratory learning (Clark+ and Luckin, 2013).

2.6 Tablets as innovation

The introduction of tablets or any other educational technology cannot be realised in a single step. The important questions are not about the bringing of tablets into the classroom, but about when and how to use them. This again raises the

importance of considering the context in which technology is introduced, as the complexity of introducing tablets can differ from one school and one class to another, depending on factors such as teachers' and school leaders' interest in technology and general experience, which might facilitate tablet use in the classroom and help to overcome any challenges that arise. To achieve the purpose for which such devices are introduced, Ruggiero and Mong (2015) argue that the introduction of technology is to be viewed as an extended process requiring time, effort, planning and ongoing reflection. Above all, the introduction of tablets must be understood as a process that needs detailed planning.

A vital aspect of the introduction process is to ensure that teachers understand how to use the tablets and that they recognise what tablets will bring to their classes, to their pupils and to them as lesson planners. If tablets are introduced without such planning, teachers will be confronted with challenges when they are already in the situation, such as losing control of the class as pupils play games instead of doing the lesson task (Isici and Demir, 2015). Teachers are expected to be prepared to use any new devices introduced to the teaching context (Keengwe et al., 2009). This means preparing them for the technical use of such devices, as well as informing them about related considerations.

It is also necessary to address the process from the perspective of parents in order to appreciate their views on the introduction of tablets and to understand how they will support their use to enhance their children's classroom learning. A study conducted in Scotland found that parents were increasingly involved with tablet use and engaged with the school in following their children's learning (Burden et al., 2012). However, home support may vary, as not all parents have the same exposure to technology use, especially in rural contexts, and such differences may affect parents' understanding of how tablets are to be used in the classroom. Parents have a role to play in providing opportunities for their children to access digital devices, which will influence their learning (Stephen et al., 2013; Plowman et al., 2010). Parents also have their own concerns, with many being worried about the dangers of internet use (Ey and Glenn Cupit, 2011). This leads many parents not merely to place restrictions on their children's

use of internet-enabled devices but even to refuse to allow them to use tablets altogether.

Understanding the whole introduction process from the beginning will enable the school leadership to clarify the benefits and challenges to teachers, thus helping them to best plan and use tablets with their pupils. It is important to identify the learning opportunities best suited to tablet use, because in any classroom there are multiple learning opportunities where technological devices can be used in different ways. In addition, for each opportunity there can also be more than one way in which technology can be used in a classroom (Ruggiero and Mong, 2015). Thus, whether and how teachers use tablets in their classes, with which pupils and with materials provided for them or prepared by the teachers themselves are not the only concerns. An important consideration is the need for leadership and guidance; thus, Ghavifekr and Hussin (2011) discuss the need for what they call “e-leadership” when technology is introduced into an educational institution. They specify the roles of e-leadership in tasks related to preparing the whole institution for the introduction of electronic devices, managing the project and arranging for training and the provision of materials.

Finally, the introduction of tablets should be understood and planned at both classroom and school levels. Before presenting tablets to teachers and their pupils, school administrators need to take decisions that will shape the process of using them in the school. Without proper planning, the use of tablets would be just another classroom activity, whereas their effective incorporation into lessons should be decided well in advance, because teachers need to prepare differently for those lessons in which tablets are used (Frey et al., 2013). First, the school must decide who will be using tablets and how often (Burden et al., 2012). Considering the number of devices available, the school will have to decide on the ratio between pupils and devices, the venues in which tablets are to be used, which teachers are to be involved, in what subjects, for how many classes of pupils and at what levels. These initial decisions can then be used as the basis on which to plan the possible frequency of tablet use in lessons, the topics to be covered and the software needed (Psiropoulos et al., 2016).

2.7 Leadership and administration

There are indications that tablets are not well utilised as learning tools, since teachers tend to use them in simple ways, such as downloading apps that do not engage learners in meaningful learning activities, according to a study of iPad use in Danish schools (Khalid et al., 2013). One of the participating teachers complained that not enough guidance was given on apps, but Khalid et al. (2013) reject this criticism, arguing that having been sent on a training course, teachers are responsible for seeking new knowledge in the field. However, while it is true that teachers have a responsibility to expand their knowledge of teaching tools, this does not diminish the responsibility of the administration for guiding them and providing the necessary resources. Such responsibilities are shared in a teaching institution, as both guidance and resources must be provided if teachers are to search effectively for suitable apps and use them well. School leaders should therefore provide clear guidance to teachers both on tablet use, including specific guidelines concerning the apps to be used, and on the training and professional development that teachers should undertake. The leadership and its beliefs about technology influence the effectiveness of the professional development programmes that it provides, clear links having been found between the goals of such programmes and the vision of the institution providing them (Keengwe et al., 2009). Therefore, improved school leadership and involving teachers in making decisions are factors to be considered when technological innovations are introduced into a school (Albirini, 2006).

For a school to deploy a successful tablet introduction project it is necessary to have a leadership strategy for structuring change management which goes beyond providing devices, software and connections. The strategy must cover reaching people and keeping them trained and updated on using the technology available to them in their educational context (Keengwe et al., 2009). The first step should be assigning a project leader who has a good understanding of technology and its deployment in educational contexts, as well as familiarity with the process of implementing projects (Keengwe et al., 2009). When new technology is introduced into a school, the school ICT coordinator usually takes this important role, guiding the implementation and supporting teachers

(Goodison, 2002; Hayes, 2007). However, Crawford and Nahmias (2010) claim that the project manager does not necessarily need to have the competence needed for activities promoted by the change that he or she is leading. Knowing about the activities for which the devices are to be used will enable him or her to support the teachers involved in the project as well as to give feedback after any assessment. However, the assessment itself should be done independently by a body experienced in evaluation, which the administration should appoint to review the process of implementing the initiative and its outcomes (Keengwe et al., 2009).

Whitaker (1993) lists six management abilities that the school leadership should have in order to begin implementing change in its classrooms. I believe that it is valid to apply these to a tablet introduction project.

- The school leaders should create sources of funding and ideas regarding the classroom use of tablets. They should also have the ability to use their imagination, to assess and accept sensible suggestions, to take decisions and to act accordingly.
- They should base their planning on an analysis of the current situation in the school and relate it to the anticipated development of the project.
- They must be able to prioritise needs and deal with difficulties by stepping forward, ready to take quick decisions according to the situation.
- They should communicate with the teachers involved, listening to them in order to understand their views and needs. They must also be able to tolerate teacher's mistakes and to keep them updated in various ways.
- They must be able to motivate the teachers by helping them to set their goals, as well as providing sensible challenges that will help them to recognise their own achievements.
- School leaders should be able to evaluate their own work as well as that of others and do whatever is necessary to keep working towards their goals. Finally, they must compare the outcomes achieved with these goals.

Thus, school leaders are not simply required to provide tablets and meet teachers' direct needs; they must also ensure that the people involved in the implementation process are acknowledged with development programmes as well as resources and that best practice is followed in utilising the new technology (Keengwe et al., 2009). Nor is the leadership role limited to one or two programmes; instead, Gudmundsdottir (2010) identifies a need for a professional development strategy to set criteria that will ensure sufficient members and infrastructure for the deployment of any new technology in the institution.

2.8 Professional development

Education is not a simple matter of children learning, but depends on teachers being able to create learning opportunities for them. However, teachers tend to introduce technology into their classrooms in order to provide the same content as before, but in digital form, rather than using technology as a means to centre their teaching on the learners (Karsenti and Fievez, 2013). When mobile devices were first introduced into education, studies of their introduction tended to focus narrowly on the impact of this hardware and the associated apps on learners' attainment (Hargis et al., 2014; Jahnke and Kumar, 2014; Falloon, 2013). There was then a shift in research focus towards investigating how teachers used the devices to enhance pupils' learning (Erbes et al., 2017; Mouza and Barrett-Greenly, 2015; Ruggiero and Mong, 2015). This section identifies some factors which should be considered in order to understand how teachers can make the most of such mobile devices.

Smith and Santori (2015) warn that it is often assumed that teachers will be able to use tablets in lessons without guidance on how to use them. Tablets have the potential to support teachers to shift from a teacher-centred to a learner-centred approach to learning (Beauchamp et al., 2015) as well as supporting innovative teaching, but if teachers are not ready for such a shift they will resist the transformation of their teaching (Montrieux et al., 2014). It is important to prepare teachers to use tablets and to be able to bring innovative transformation to their teaching. Teachers' reactions to introduced technology can take any one of three forms (Abbott, 2016): They may simply choose to ignore the new technology, or

to please their administrators and supervisors by using it, thus relieving the pressure on them to do so. The third option is for them not only to take up the new technology willingly but to take the initiative to explore what it offers and how they can benefit from it. Other authors (Niederhauser and Stoddart, 2001; Becker and Ravitz, 1999) classify teachers into two categories according to the ways in which they decide to use the technological devices in teaching and learning activities. These two alternatives have been described as innovative teaching on one hand and simple “instructional teaching” methods on the other (Montrieux et al., 2014).

When introducing technology it is important to start by convincing teachers of the value of using that technology. Education is not improved by the introduction of new technology if it is used to perform the same old practices; a reform project should also introduce changes in curricula and in teaching approaches to take full advantage of the new technology (Vrasidas and Glass, 2005). Individual teachers’ reactions to the project will play a role in shaping the innovation. Hermans et al. (2008) suggest that the first step in innovating in the complex classroom context is to understand teachers’ beliefs. Palmer (2017) recommends that teachers should explore their inner selves when an innovation is introduced into a school. Acknowledging the importance of teachers’ ideas about the introduced technology, successful implementation can be achieved through the provision of training courses that help teachers not only to welcome the new technology but also to make the most of it. Fullan (2001) argues that adopting new approaches to teaching can change teachers’ beliefs and attitudes. Their beliefs about their teaching, combined with their attitudes to the use of technology, will determine various dimensions of their reactions when new technologies are introduced.

The first dimension is where teachers decide on whether to modify their teaching material or to adapt the newly introduced devices so that materials and devices fit with each other. Second, as new technology is introduced, some teachers will adopt completely new teaching approaches, which might be associated with a third dimension. Of course, teachers are not static and there are no clear boundaries between the abovementioned responses. In addition, the diversity of

teachers' experiences and practices makes it inevitable that teachers will adopt new technological practices as well as acquiring new pedagogical skills (Hermans et al., 2008). A teacher may start using a new technology as a way to please the school leadership, but this same teacher might be later be self-directed towards using technology. These categories are not easily identified and classifying teachers into them is not straightforward, as some may start with one set of intentions, then find new questions arising on how to use the new technology. Even when teachers have decided to use it their classrooms, new dimensions will arise.

Teachers may lose confidence in their successful use of tablets when they do not receive adequate training on facing the challenges to proper technology use, leading them to doubt the use of technology in lessons (Erbes et al., 2017). Even those teachers with positive attitudes towards classroom use may have concerns about facing situations that would shake their confidence if they are not sure about forthcoming challenges and changes in classroom practice (Young, 2016). On the other hand, a study of teachers' acceptance of tablets in the classroom found that not all teachers were clear on how tablets were to be used innovatively to support teaching and learning and that those who claimed to know had built their ideas on assumptions (Ifenthaler and Schweinbenz, 2013). For teachers to have positive attitudes and gain confidence about using tablets meaningfully they need to have minimum knowledge of their use. Mouza and Barrett-Greenly (2015) report that when teachers were given iPad tablets to use in their classes, they did not know how to establish user accounts, nor were they able to check connectivity or download apps for teaching purposes. This obliged them to rely on continuous support from others including their learners. Similarly, Erbes et al. (2017) found that educators depended heavily on the experience of undergraduate students to set up and use tablets in the classroom. Furthermore, the only training that teachers received as support from their pupils was the advice to switch from PowerPoint to an app suggested by their pupils (Erbes et al., 2017).

Inadequate training has been the challenge most frequently cited in studies of tablet introduction (Hu et al., 2003; Erbes et al., 2017; Beauchamp et al., 2015). However, the most difficult was to identify teachers' training needs and the

software to train them on. Another problem was that teachers having little experience with tablets regarded the use of certain functions of apps to be particularly important, while neglecting others. In response, some schools have introduced self-learning initiatives, where teachers were invited to take tablets home to explore their features (Beauchamp et al., 2015). However, this is not always possible, as a shortage of devices is another challenge that many schools face. Concerns about the use of time were also strongly linked to the effectiveness of training sessions. Three interesting findings emerged from a study of a professional development programme intended to make college educators comfortable in teaching the new generation of mobile learners: the need for training on specific software, for “strong specialist input” and for “time to digest” the input provided (Psiropoulos et al., 2016).

Finally, training is an essential determinant of the success or failure of technology projects; therefore it is important for all stakeholders to be involved in the planning of training and if possible to undergo training (Keengwe et al., 2009). However, Ruggiero and Mong (2015) found that in addition to formal training, teachers’ professional development may be advanced through observing colleagues, reading about technology and searching the internet, for example. Teachers also learned from their learners, as learning opportunities were created for both parties, which challenged the traditional teacher-pupil relationship and encouraged authoritarian teachers to accept knowledge co-construction (Erbes et al., 2017).

This chapter has reviewed the literature on activity theory and on the use of tablets in schools. The next explains the methodology adopted for the present study.

Chapter 3: Research Methodology

3.1 Introduction

The previous chapter reviewed the literature on the use of tablets in schools and other educational contexts. In this chapter, I explain the choice of methodology used in this study. I begin by considering the research paradigm, then address some ethical considerations and discuss the use of activity theory as the theoretical framework, before turning to the research design, the pilot study, the use of observational analysis and the data collection instruments.

The aim of this study is to explore what happened when tablets were introduced into an Omani school's classrooms. The research questions are:

- 1- What are the contextual factors mediating the use of tablets in the classroom?
- 2- What are the impacts in terms of the roles and responsibilities of the agents involved in using tablets in the classroom?
- 3- In what way does the use of tablets affect teaching practice in the classroom?

3.2 Research paradigm

A research paradigm or worldview is the set of beliefs that guide the researcher's actions (Creswell, 2008). Cohen (2000) suggests that this will determine what we "take understanding to be" and what we "see as the purposes of understandings". Considering that this study aims to explore what happens when tablets are introduced into Omani schools, I have adopted the constructivist paradigm, seeking to answer the above research questions by eliciting the views of various participants (Creswell, 2008). Constructivism holds that meanings are constructed by participants as they engage in the activities of interest, which in this case take place in the classrooms where tablets are introduced into their learning environment. Taking a constructivist approach also suggests that I would be holding the assumptions of individuals in seeking to understand the world in which they live and work (Creswell, 2008). This means that in order to understand

their context I had to visit the school concerned and gather information by attending classes to get a real sense of their interpretation shaped through my own experience and background. My goal was to rely as much as possible on the participants' views of the introduction of tablets and how they were used, since participants' experiences develop meanings that vary and multiply, leading me to look for a complexity of views (Creswell, 2008). I conducted interviews and observations, spending extended periods of time with participants in their classroom settings in order to use their constructed understandings to construct my own, thus making sense of how they viewed the introduction and use of tablets (Hatch, 2002).

Hatch (2002) argues that through such a joint engagement, the researcher and the participants construct the subjective reality being studied. It was therefore both impossible and undesirable for me to be a distant and objective observer, while engaged jointly with the participants in the process of meaning construction. However, this does not mean that I deliberately interfered or involved myself in any way in how the teachers or pupils decided to use tablets in their classrooms. Finally, as part of the research process, a constructivist approach often leads to knowledge production in the form of case studies or rich narratives that describe the interpretations constructed. Enough details of participants' voices are included with sufficient representation so that readers can place themselves in participants' shoes and judge the quality of the findings (Hatch, 2002).

3.3 Ethical considerations

Certain ethical considerations need to be addressed in all research. In the last few decades, universities have asked their researchers to take these into account to ensure that risks arising from participation in research are as low as possible (Creswell, 2005). Thomas (2009) states that being ethical means more than respecting university regulations, however, as ethics are about respecting others when conducting research. With that in mind, one of my first steps was to obtain the approval of the University of Leeds Ethical Committee for this research (Appendix A). Complying with the University's ethical regulations before going

into the field made things clear and guided me to consider the following ethical issues and to be prepared for tackling them on the ground.

3.3.1 Access and acceptance

Access means getting into the locations where the data required for the research can be gathered; regardless of the methods used, certain steps need to be completed before accessing data (Thomas, 2009). First, potential participants must be identified and contacted to secure their agreement to participate in the research. Next, before data gathering begins, it is important to obtain the permission of the institutions concerned and in the case of educational research this includes schools and districts (Creswell, 2005). Thus, the regulations of the Ministry of Education in Oman required me to obtain the approval of the Technical Office for Studies and Development (TOSD) at the MOE's head office. I therefore applied to the TOSD for approval with a clear indication of my study proposal and a description of the appropriate type of school and potential participants. Along with the application form I had to submit my research proposal, research tools and a letter from the University of Leeds confirming my affiliation to the University. The TOSD then collaborated with the Directorate of Information Technology at the MOE to identify a school that best matched my requirements, in particular one which had conducted a project to introduce tablets into a cycle one classroom. I was informed that a particular school had taken the initiative to be the first government school to introduce tablets into classrooms and I was authorised to conduct my study there. In this way the selection of the school was made by the Ministry of Education. The TOSD then informed the school, through its Regional Educational Office, of my intended visits to the school, their purposes and the research methods to be used.

At school level, it was necessary to inform the teachers in detail of the schedule and arrangements for my visits, because all the teachers were female and local rural culture had to be respected. At every visit, I worked on agreeing with participating teachers when my next visit would be. During the evening before each visit, I also sent text message reminders to the head teacher and the teacher responsible for the school project. This was necessary to maximise the

cooperation of all teachers in the school, particularly those participating in the study.

3.3.2 Informed consent

While it is important to obtain permission from institutions hosting research, it is also essential that all individual participants, including in this case teachers, pupils and parents of young pupils, grant their permission before data gathering starts (Creswell, 2005). I therefore prepared an informed consent letter explaining to the different participants the nature of the research, their role in it and what they were agreeing to by signing the consent form. There were three different versions of the letter and the form, which were all written in Arabic. The first version was for teachers and school administration members, explaining their roles when participating in the research. The second was for pupils and was written in a language suitable for pupils to understand why they were being asked to participate and what their role would be. The third was for parents of participating pupils, explaining what it would mean for their children to take part, the roles of pupils and parents in the research and the arrangements made to avoid any possible risk.

Potential participants were given time to consider their consent and I made it clear to them that they could withdraw from the research at any time without giving reasons, that the data related to anyone who decided to withdraw would be discarded if it were on a single file or would be kept safe if it were not possible to separate it from other data and that in any case no such data would be used in any way in the research (Appendices E, G, I and K).

3.3.3 Right to privacy

Protecting study participants' privacy and confidentiality is important and it is the researcher's responsibility to ensure their complete anonymity, regardless of how personal or sensitive the information is (Creswell, 2005). There are two important ways to protect participants' right to privacy. The first is through anonymity, which means that participants' identities should not be revealed by the data they provide (Cohen, 2000). Accordingly, this study does not use participants' real names;

instead, I have used a system that allows me to identify who said what and to check for any possible significance that may later become apparent. For example, when transcribing data from the mixed gender parents' focus group discussion, I used the labels M1, M2 and M3 for male parents and L1, L2, L3 and L4 for the females. In the same way for pupils, participating boys were labelled with B plus a number and girls with G and a number. I have used pseudonyms to hide the identities of the teachers and head teacher, all of whom were female, in order to distinguish them from the parents.

The second way to protect participants' right to privacy is to guarantee confidentiality, which means that any secrets shared by participants will remain protected and no connection to their identity will be made public (Cohen, 2000). This was made clear to participants in the first meeting, so that they would be able to trust the researcher and give their honest views freely when asked about matters related to the project.

3.4 How activity theory works

As noted in the introduction to Chapter 2, this study uses activity theory as its theoretical framework. The main principles and components of the theory having been set out in that chapter (Section 2.2), this section gives further details of its working, while section 3.5 explains its use in the present study.

There are many versions of AT; Rogers (2008) cited in (Law and Sun, 2012) claims that 57 versions exist. In all versions, the basic idea is to examine all factors that impact on an Activity, in this case the use of tablets in schools, and the different aspects of that Activity. An Activity is a system of human Actions directed toward an Object and mediated by artefacts in relation to a Community and a set of Rules. AT conceptualises human Activities as being interlinked, with each Activity connected to or leading to another. It is often difficult to isolate them or their impact (Engestrom, Yrjo, 2000); therefore understanding any single Activity involves exploring its relationship with others. It must also take account of participants' aims and values and of social and cultural factors (Kaptelinin, 1996).

AT holds that Activities are mediated through Tools, which can be instruments, signs or ideas. It is used to explain the meaning that Tools carry in social Activities. External Tools are used to enhance pupils' learning in many teaching contexts and where technological devices such as computers are integrated (Kaptelinin, 1996; Nardi, 1996).

Thus, AT is a way of analysing the complex context of an Activity, providing the researcher with concepts for developing an understanding of the Activity System. It has been used to study the conflicts arising from the implementation of new technologies, where teachers' beliefs clash with their actual practices (Russell and Schneiderheinze, 2005). For example, to understand students' resistance to the introduction of computer-assisted language learning into their learning context, Blin (2004) examined learners' educational histories and their history of technology use.

Among the reasons for using AT in this context is the fact that it makes no strong distinction between the human Subjects, the existing and newly adopted Tools and other components of the Activity, but views them all as integrated and interacting elements. AT thus helps to explore the changes in teachers' practices or the ways in which they reconstruct their teaching Activities when new technologies are introduced (Buell, 2004 cited in Murphy and Rodriguez-Manzanares, 2008)

Using Activity as a unit of analysis allows the phenomenon of interest to be analysed as an individual Activity or a collective process. AT provides a framework for examining a structured sequence of Operations, Actions and Activities with their mediating Tools within a given context. It is possible to differentiate between the collective Activity and its Actions with an extended snapshot of that Activity (Allen et al., 2011). For example, when a group of students use their computers to search for information, there will be a difference between the skills learned by individuals while searching and the information found with the operations of the search process. AT provides flexibility so that each individual's search for information can be viewed as several individual Activities that are constitutive Actions of an Activity System (Allen et al., 2011).

By breaking down the collective Activity into groups of smaller Activities within the same context, AT enables the researcher to perform a deeper level of analysis of the main Activity System in context. It also accommodates the examination of an Activity as a combination of the Actions of individuals who together constitute the Subject of the collective Activity (Engeström, Engeström, and Vähäaho cited in Allen et al., 2011). By identifying these different elements, a researcher can study the working of the relationships and patterns that make up the Activity System (Russell and Schneiderheinze, 2005). In order to explore these relations and patterns, Engeström (2001) describes five principles of AT, namely collectivity, multi-voicedness, history and development, contradiction and transformation.

3.4.1 Collectivity

The first principle of activity theory is that the prime unit of analysis is the collective Activity. This includes the Tool-mediated Activity, which is seen in relation to other Activities that exist in its network. It is thus important not to isolate the use of tablets or to view only their uses on specific tasks; instead, their presence in the lesson must be viewed against different components of AT such as Rules, Division of Labour, Object and all other pillars, in addition to different teaching and learning tasks that are carried out during the lesson.

3.4.2 Multi-voicedness

The complexity of an Activity, the people involved from the Community, along with the Subject and the Division of Labour within the Activity, create different views, interests and objectives within the Activity, which Engeström calls the multi-voicedness of the Activity. This also refers to the different views created for different components of the Activity, along with its accumulative history, which multiply in the network of Activities, since Activities are connected. Multi-voicedness is a “source of trouble and source of innovation”, requiring the action of negotiation (Engestrom, 2001, p.136).

3.4.3 History and development

AT analyses Activities in the environment in which they exist. However, it also takes account of two types of history of each Activity. The first meaning of history here relates simply to how long the Activity has existed. For example, when studying a teacher's use of computers in her classroom it is useful to know the length of her experience in classroom computer use. Secondly, it is also important to identify the history within the Activity and how each Activity has developed, as there might be varying histories within an Activity (Kaptelinin, 1996).

3.4.4 Contradictions

Engeström argues that disturbance, defined as "deviation from standard script" (Engeström, Yrjö, 2000. P 964) is a sign of considerable contradictions. Contradictions have been described in many ways, using words such as 'disturbance', 'conflict', 'denial', 'problem', 'clash', 'breakdown' and 'instability' (Murphy and Rodriguez-Manzanares, 2008). The best description I have found is "a misfit within elements, between them, between different activities, or between different developmental phases of a single activity" (Kuutti, 1996, p.34). Introducing a new Tool, such as the tablet, can create contradictions with some existing Activity components such as Rules or Division of Labour, resulting in inconsistency with the new Tool (Engeström, 2001). Contradictions are not viewed as problems or conflicts, however, but rather as guiding innovation, change and development. Contradictions appear as a visible disturbance (Capper and Williams, 2004) that reduces coordination of interaction as well as creating a noticeable change of interaction flow (Bodker, 1989). These disturbances within and between Activities start when individuals receive more than one message linked to daily practices and where these messages run counter to each other, creating contradiction (Engeström, 1987).

Innovation and developments emerge when people involved in the Activity work on resolving contradictions (Engeström and Sannino, 2010). Since they create the motive for change, paving the way for potential development and innovation through change, contradictions are not to be viewed negatively; on the contrary, they are important for development. Activity Systems work to gradually resolve

contradictions through the Zone of Proximal Development (ZPD) and by redefining Motives and Objects. However, contradictions may reappear at different stages of the Activity (Engeström, 2001). On the other hand, a positive result is not guaranteed, as it depends on how contradictions are addressed and resolved. In other words, development does not always occur, because contradiction can enable or disable the progress of a learning Activity (Nelson, 2002). Furthermore, Capper and Williams (2004) believe that it is not always easy to identify and tackle contradictions, as some of them are “invisible and undiscussable” and the invisibility of these contradictions can lead people to take them for granted and to fail to recognise their difficulties, especially in relation to culture. Undiscussable contradictions are visible, but people avoid talking about them due to cultural or political restrictions or because of personal habits that make them feel embarrassed when discussing some issues.

3.4.5 Transformation

Engeström (2001) argues that “standard” learning theories focus on the idea that learners are there to acquire defined skills or knowledge and the outcome is an observable change in their behaviour. These theories assume that skills and knowledge are stable and that it is the teacher who should identify what is to be learned. Engeström rejects this view, contending that all types of learners actually learn things that are not defined or understood ahead of the learning process. He believes that in their personal lives and practices, individuals learn as yet unseen forms of Activities, which in fact are still being created while the learning happens. He calls this “expansive transformation”, in which the learning Activity moves through a cycle of transformation as contradictions drive the Activity System and participating individuals to question and reform pre-existing norms. He claims that “standard” learning theories are of little help in trying to understand these processes. Building on these ideas, Roth et al. (2009) assert that learning, progress and development cannot be reduced to individual Subjects, because the Activity System has a non-self-identical nature, whereby different parts of the Activity may be viewed as representing individual aspects of it, but the Activity has to be considered as whole in order to see the complete developmental picture. They conclude that it makes no sense to view a classroom learning

Activity System without considering its links to the school Activity System of which it is part (Roth et al., 2009).

3.5 The use of activity theory in this study

Before embarking on the gathering of data, my general understanding of the introduction of tablets into classrooms was that it would not have only a simple and clearly identify impact which could be easily absorbed and dealt with. On the contrary, my review of the literature suggested that the introduction of any such technology would create interactions among the people involved, with the devices and the with environment, making activity theory an appropriate choice of framework because it treats all of these elements as interrelated, so that the effects of a minor change in one component might be significant for other aspects of classroom activity. Thus, the introduction of tablets should not be viewed in isolation from other factors involved in the classroom Activity, as these can be affected by the introduction and will also have their own input into the introduction process. For example, decisions taken by administrators on what apps to provide with the devices might make a difference to the classroom experience of both teachers and their pupils. There might also be implications for the school rules that would need to be identified so that due attention is given to the regulatory aspect of the introduction.

Teachers' identity is constructed through their classroom experiences, including many situations where they feel more or less satisfied with their achievements or the difficulties and unexpected challenges that they face. Experienced teachers are familiar with this mixture of situations and will try to anticipate these challenges and accomplishments when planning their lessons. This raises the question of how tablets would be integrated into teachers' self-identification and the way they perceive themselves, their teaching environment and the world around them. Thus, I undertook this study to explore deeply what happened when tablets were introduced into an Omani primary school, in the expectation that they would have an effect on teachers in terms of their teaching strategies, which meant understanding their experiences and eliciting their views of the implementation of technology use in their classrooms. Tablets might also have a

similar set of effects on pupils, administrators and the wider community, as well as on school rules and the immediate environment.

Activity theory was adopted because it provides a philosophical framework for analysing forms of individual and social developmental processes which are interlinked (Kuutti, 1996). To understand any single Activity involves exploring its relationship with other Activities in its context. Thus, when studying tablet introduction into the school system, it was important not only to look at how individual teachers or pupils used tablets from a single perspective out of its context. Learning within an Activity cannot simply be reduced to Subjects, as all components of the Activity will learn from their experiences. Thus, the Activity System must be taken as a whole. The introduction of tablets into the classroom setting may cause changes in classroom Activity. What is perceived as a minor change in a single Activity may result in disturbing the whole Activity and may go beyond that to another Activity.

Activity theory is widely used as a theoretical framework to study the complex components and relations in technology-related studies (Engeström, Yrjö, 2000). It is important to note that AT does not involve chemical or mathematical equations and that it cannot be used to predict what will happen when something is done. It is a descriptive tool that does not provide “ready-made techniques and procedures”, but “conceptual tools and methodological principles” that have to be illustrated in regard to the specific object studied (Engeström, 1993 p.97). The use of tablets in the classroom would be treated as a Tool mediating the Activities of teachers and pupils (the Subject) and their intentions, which should be viewed as part of the Activity.

AT is thus used as the spine of the research skeleton, determining the shape of the research design, the data collection tools and the data analysis. The following sections detail how AT has been used in this study. Adapting the framework proposed by Engeström (2001) to the lessons in which tablets were used, the Subject of the Activities is taken to comprise the teacher and her pupils, and the following are components of the lesson Activity:

Activity System: The whole lesson Activity.

Subjects: Teacher and Pupils are the Subject of each lesson, as they use tablets in classroom Activities.

Community: This consists of many actors such as administrators, teachers attending the lesson, parents and other school staff.

Rules: Ministry of Education regulations, classroom norms and each teacher's rules.

Division of Labour: This varies from one Activity to another, depending on the classroom situation.

Object: The lesson target set by the teacher and the various targets set by pupils as a group or individually.

Tool: Tablet.

3.6 Research design

As this study investigates what happens when introducing tablets into the classrooms of a single school and seeks to identify the people involved and their roles in the process, a qualitative case study design was selected. In order to gain a clear picture of the topic, it needs to be looked at from different viewpoints to form a balanced picture (Thomas, 2010; Yin, 2009). Applying AT principles to the case study design, I decided to consider the components of activity theory when designing the research. First, exploring the introduction of tablets was not limited to what happens in the classroom, but extended to the wider Community, by involving parents as well as administrators. Secondly, the study was designed to explore factors such as the Division of Labour and Rules in relation to tablet use. To study the development of the Activity, there were three phases of data collection and each lesson was analysed independently, then each phase was summarised and conclusions drawn.

The introduction of technology into classrooms has been investigated for more than two decades and different approaches have been used, depending on the device, the study context and the objectives of the research. To study the

introduction of tablets in the setting of an Omani cycle one school, I started by reviewing existing studies to identify appropriate approaches to studying the introduction of similar portable personal devices into teaching and learning settings. During the years before the introduction of tablets, many studies were conducted on the introduction of computers, laptops, personal digital assistants (PDAs), interactive boards and smartboards. The following are two examples of the studies reviewed.

(Mouza, 2005) conducted a qualitative case study in New York to investigate the impact of integrated technology on pupils' learning. It evaluated a project after 100 days of using a special kindergarten curriculum aiming to engage pupils with technology use in activities that would support the learning of subjects. As the study focused on teachers and the different ways in which they integrated technology to support their pupils' learning, the data was mostly on teachers' activities and how they supported pupils. However, data was collected from multiple sources, including field notes, workshop information, minutes of teachers' meetings and other documents. Classroom observation and teacher interviews were also used: each participating teacher was observed at least twice and interviewed three times (Mouza, 2005).

In a mixed-method case study in Taiwan, Hsieh et al. (2011) examined the effect on pupils' learning styles of using PDAs for teaching and learning, with each child working on one device. The study used an experimental approach with pre- and post-tests and to control variables, it involved 39 grade five pupils from one primary school taught by the same teachers. There were three stages of data collection. Pupils were first given a pre-test on a specific topic and a questionnaire to determine their learning styles. At the second stage, they were observed in two sessions as they received information about the topic using wireless technology on their PDAs. Finally, a post-test was administered to measure impact on the pupils (Hsieh et al., 2011). The study used mostly quantitative research methods, with little emphasis on qualitative data, which was represented only in pupils' reflections.

Reviewing different studies reveals the complex nature of studies of learning with technology in the classroom and different aspects embedded within different technology projects. This necessitates detailed and multi-source data collection to enable the project to be viewed from several perspectives, including those of teachers and pupils (Cooper and Brna, 2002). The use of multiple methods of data collection, known as triangulation, also improves the validity of the research findings (Mathison, 1988). Thus, I decided to take a qualitative case study approach. For a case study to form a clear and balanced picture of the topic, I needed to examine it from various perspectives (Thomas, 2010; Yin, 2009). This meant that teachers' and pupils' views should be considered along with the observational data. In order to justify a degree of generalisation from this study of the introduction of tablets in a single cycle one school to the broader context of the Omani Basic Education system, detailed descriptions of tasks and events relevant to the case have been blended with analysis.

In relation to classroom tablet use, there has been a focus on the description of classroom activities where participants use tablets (Cohen et al., 2000). I set out in the present study to explore the everyday experiences of pupils and teachers as they worked on different activities using their tablets, by observing what happened in classes and by interviewing participants. Hence, it is important to recognize that each context is unique, with complex interactions between different participants and the tablets, for which activities and relationships need to be unfolded. This is of particular importance because of the need to understand the embedded culture of working with tablets and the knowledge that the different participants used to help them make sense of their daily experiences (Hatch, 2002).

Taking account of the above considerations and the review of existing studies, it was decided that the three data collection methods to be used for the study would be classroom observation, interviews with teachers and the head teacher, and focus group discussions with pupils and parents. Although reviewing earlier studies gave me some ideas to consider when choosing the approach that best suited this study, I went into the field with my mind open to the points that might

be raised by the research participants. Table 3 indicates which datasets were used to answer each of the research questions.

Table 3: Research questions and the datasets used to answer them

Question	Dataset
1- What are the contextual factors mediating the use of tablets?	Data was collected through observation and interviews, in which the views of teachers, pupils and parents were elicited.
2- What are the impacts in terms of the roles and responsibilities of the agents involved in using tablets in the classroom?	Data was collected through observation and interviews with teachers, the head teacher, pupils and their parents.
3- In what way does the use of tablets affect teaching practice in the classroom?	Data was collected mainly by observation, but participants were also asked for their views during the interviews.

3.7 The pilot study

This section describes the pilot study which I conducted at a primary school in Leeds in July 2014. It is important to note that after conducting the pilot study I considered more recently available studies on tablets in schools, as a result of which I decided to change the research questions. Thus, the research questions used for the pilot study were different from the current ones.

The pilot study was intended to answer the following questions:

1. How do tablets impact pupils' learning?
2. How do teachers use tablets to support pupils' learning?
3. What are other factors of interest about the use of tablets in classrooms?

3.7.1 Choice of school and access to it

After discussing the choice of school with my supervisors, it was agreed to conduct the pilot at a school in Leeds. I first contacted the head teacher of the school (which my own child attends) by email in order to request permission to conduct the pilot and to make an appointment to see her, at which I presented a letter of introduction from the School of Education, University of Leeds. The letter

introduced me as a research student at the University and explained that I needed to conduct a pilot study for my research plan. The head teacher approved this and introduced me to the ICT teacher, who agreed to take part in the pilot study. We arranged for an observation and interview session, which took place on 11th July 2014.

3.7.2 Design of research instruments

Using the research questions above and issues raised in the literature that I had reviewed, I designed an observation schedule and prepared a list of questions for the post-class teacher interview. The items for the observation schedule and the interview guide were based on a range of topics related to the use of tablets in classroom teaching and learning in schools, such as the different ways that teachers use tablets for teaching purposes and their involvement in making decisions about their introduction. Items for observing pupils in class included how they were used differently in work on the assigned tasks.

3.7.3 Data collection

The lesson that I observed lasted about 40 minutes. Before the lesson I discussed with the teacher how I should conduct the observation. For example, I asked where I could sit and we discussed the possibility of moving around groups of pupils during the lesson. At the beginning I sat at the side between two groups of pupils. When pupils were asked to work on the learning task, I moved around the groups so that I could see how they worked in pairs on the tablets. Throughout the lesson, I checked the tracking sequence and the frequency of occurrence of the events, which I recorded in the observation schedule.

After the lesson, I chatted about it with the teacher and we decided to hold the post-class interview in one of the classrooms. First, I thanked the teacher for allowing me the opportunity to observe his lesson. I then asked him to confirm that he was happy for me to record the interview. I started the interview by asking general questions about introducing the use of tablets into the school. I then asked specific questions relating to the research questions and how he used tablets for teaching. The interview took about eleven minutes.

3.7.4 Analysis of pilot data

Analysis of the pilot data involved transcribing the audio recording of the interview and compiling the records from the observation schedule.

Observation notes were unpacked into readable sentences and associated with the situations they occurred in to facilitate analysis. For example, one note says “some pupils created more than one” which I expanded to become “The teacher asked pupils to create one game, but some pupils were able to create more than one game”. The sequence of events was recorded by ticking the time of occurrence of each event in the observation schedule, which was designed to facilitate the marking of the time against each note that was taken. I was thus able to put the events into a time sequence and calculate how many times particular events occurred.

The transcript of the interview with the teacher is reproduced in Appendix L. The transcription took longer than I expected, for two main reasons. First, the teacher whom I interviewed was a native speaker with a Yorkshire accent which made it difficult to transcribe every word he said; sometimes I needed to play back a word several times in order to determine what the teacher had said. This was not expected to occur when transcribing interview data from the main study, as all interviews were to be conducted in Arabic and all interviewees would be native-speaking Omani nationals. Secondly, there was a problem with some background noise in the audio recording, which caused some difficulty in listening back to it.

Following Newby (2010), I organised the data extracted from the notes and interview into units, which were then coded so that they related to issues raised by the research questions. Some units were richer and more informative than others. The coding process was informed by the interviewee’s words and ideas, but his pauses and incomplete words might also show thinking or hesitation. Table 4 gives examples of interview data coding.

Table 4: Examples of pilot interview data coding

Teacher's words	Codes	My interpretation
I think the kids <u>love them</u> , absolutely love them. I think they get <u>enthused</u> by them and <u>excited</u> and they ... it is a modern technology and summary job and it depends on how you use tablets and things and yeah... they really <u>enjoy it</u> .	Motivation	Integration of tablets makes learning a joyful activity for children.
Sometimes ... I think sometimes it's hard to find the right applications or the right way of using them in tablets we've had had for lessons. It certainly makes things a lot <u>easier in terms of</u> ... if children have to research something... it's just there at a press of a button... rather than having a laptop where you have to load it up starting it... <u>it takes time</u> ... and a tablet is instant... <u>just instant access</u> really to the internet.	Challenges	This needs to be explored more (I should have asked the teacher further questions on the nature of the challenges).
	Efficiency	Less effort and less time for individual learning.
Yeah, I think the great thing about the tablet it opens up... for example, we have to teach World War 2 or ancient Egypt which could be a <u>hard concept for the</u> children to understand or it could be quite hard to resource... <u>with a tablet you've got it all though, you've got the apps, you've got the internet, it's there at the touch of a button</u> ... if the child asks you a question in the class that you don't know the answer to...i t's there at the touch of a button ... they can be very kind of.... they can work independently... It is really useful in that sense. <u>They need lots of skills teaching really... to use it ... properly.</u>	Advantage	Tablets are useful when used to enhance conceptual understanding.
	Access	Tablets provide quick and easy access to knowledge and resources.
	Demand	The use of tablets for learning requires certain skills that pupils need to acquire.

3.7.5 General lessons learned from the piloting

The interview schedule that I used in the pilot study was difficult to relate to activity theory, so I reconfigured it to make this easier. I also found that on some occasions the questions I asked were not effective, so I restructured the interview

schedule again in order to produce more specific cues, not only about how the devices were used in class, but also what factors influenced their effectiveness.

Table 5 and Table 6 give some examples of the original interview and observation schedules respectively, the changes made in the revised schedules and some notes on why these changes were made.

Table 5: Example of changes made to interview schedule

Original schedule	Revised schedule	Difference
Questions were organised into two themes: impact on teacher's way of teaching and impact on pupils learning.	Questions organised into three themes: collaboration, facilitating learner-centred teaching, school rules.	In the old schedule questions were not linked to activity theory and themes were not derived from research questions. This has been amended in the revised schedule.

Table 6: Examples of changes made to observation schedule

Items deleted from observation schedule	- Teacher uses tablet for management	These two items did not appear in the pilot and are not linked to research questions
	- Teacher requires training - Pupils show different ability when working with tablets	Naturally there will be differences in pupils' abilities when working with tablets. What is important is not the difference, but how these differences will lead to supporting each other's learning.
Items added to observation schedule	- Pupils take turns to work on tablets - Pupils seek teacher's attention - Pupils seek each other's attention in showing achievement - Pupils achieve more than the required task.	Pupils were politely taking turns when working with tablets (might argue). Some pupils were excited about their achievements and wanted to show the teachers and other pupils (more interaction). Excited pupils do more tasks than what they are asked to (two pairs did the design task twice)

3.7.6 Lessons learned regarding content and use of research tools

During the pilot interview, when listening to the audio recording and transcribing it, I found that the teacher's answers were sometimes too general and I had missed the opportunity to elicit some important information. That is, some responses should have been followed by additional questions to prompt the interviewee to give specific examples illustrating his classroom experience. Therefore, analysis of the pilot interview made me aware that for the main study I should prepare interview questions addressing the main themes, with a list of follow-up probes to elicit richer information.

As to the observation schedule, I concluded that I needed to reorganise it to include additional items in the observation checklist. There should also be at least two sections focusing on the impact of tablets on the pupils, teachers, curriculum and environment. A number of new items were suggested by the short notes that I made immediately after observing and interviewing the pilot teacher. Although the interactions of pupils in a UK classroom were not expected to be identical to those in the Omani context, the pilot study revealed general patterns in the children's interactions that I considered of interest for the main study. I also concluded that I should review more literature on learners' interactions in the context of ICT for classroom teaching and learning. Therefore, the observation schedule used in the main study was a result of my experience in pilot study and the enhanced review of the relevant literature.

The balance between taking the lead to maintain the order of the interview and giving the interviewee a chance to speak freely without interrupting his flow was difficult to manage. I grouped the interview questions into three sections aiming to explore the teacher's view of the impact of tablets on himself, on his pupils and on the curriculum and the whole classroom environment. I also thought that starting with general questions would give the teacher enough freedom without being led to a specific answer. However, in response to my general questions I found that he repeatedly and rather confusingly moved between the topics, referring to all three impacts. This had implications both for my way of conducting the interviews in the main study and for how I should structure their contents.

I also learnt that interviews need to be held in private and in quiet conditions. In the pilot interview, there was some background noise which not only appeared in the recording, but sometimes made it very difficult for me to hear the teacher's words. The implication was that before conducting the interviews in the main study, I should discuss with participating teachers the various venues on the school premises where the possibility of interruption by background noise would be minimised.

In terms of conceptualising the study and its research questions, the experience of the pilot helped me to reflect on activity theory in practice, especially in regard to modifying the content and structure of the data collection tools.

In regard to collaboration and using the tablets, I observed that pupils generally worked straightforwardly and collaboratively in pairs, independently of the teacher, once he had given them clear instructions on what they had to do. This indicates that the tablet is a supportive tool to facilitate collaboration, as well as engaging pupils in learner-centred activities. These positive observations about the tablet as a teaching and learning tool surprised me and contrasted with my expectations of what I would find in the Omani school context, because of the material and cultural differences between the UK and Oman.

3.8 Observational analysis

Using AT as a theoretical framework led me to adopt the Activity as the unit of observational analysis. Identification of the unit of analysis is an important first step in the analysis process, but when using AT it is considered to be inappropriate to view the Activity in isolation, as it is connected with other Activities in its network. Moreover, Roth et al. (2009) contend that it "makes little (or no) sense to look at classroom learning as Activity system, which is not a full-fledged Activity that is independent of the cultural-historical Activity of the schooling as it occurs". In order to study and fully understand tablet introduction, it is important to view it in its wider context. I began analysing the classroom observations by viewing each lesson as an Activity System which is part of a school Activity System and may itself consist of several Activities. For each lesson, I marked the pupils' arrival in the classroom as the start of the lesson

Activity and considered it to end when they left the room. In order to identify what happened when tablets were introduced into the lessons through the lens of activity theory, I considered each lesson according to the five principles of AT, as outlined in Section 3.4.

3.8.1 Collectivity

Using the lesson as a prime unit of analysis, each lesson was viewed collectively from when the pupils arrived in the classroom to when they left it. Tablet use might not be extended throughout the whole lesson Activity, as it might be preceded or followed by other tasks. However, these other tasks might affect or be affected by the presence and use of tablets within the Activity System. It was therefore important not to isolate the use of tablets or to focus narrowly on their uses in specific tasks; their presence in the lesson must rather be viewed in light of the various components of AT such as Rules, Division of Labour and Object, in addition to the different teaching and learning tasks engaged in during the lesson.

By looking deeply at the level of Operations and Actions, which might sometimes become independent Activities in their own right, and by viewing various Activities embedded within the classroom Activity System using the lens of AT, I was able to identify the different Motives of the individuals performing the Activity. Comparing individual Motives to the collective Motive would then determine whether the teacher of a particular lesson and her pupils shared the same Object. Moreover, individual pupils might have set their own Objects for each Activity, which might produce a variety of different outcomes of the Activity.

3.8.2 Multi-voicedness

The multi-voicedness of the Activity System was represented in the different voices related to tablet use that appeared in the lesson Activity. It was viewed by observing the existing power structure and how the work was shared between teachers, pupils and members of the community. I also considered how these different viewpoints participated in determining the progress of the Activity. For example, in addition to teachers' and pupils' voices there were other viewpoints

that might be relevant to the lesson Activity, such as those of members of the school community or parents, as well as the voices of other actors who might be present in the lesson Activity. This multi-voicedness within the Activity played an important role in shaping the progress of the Activity, which might not necessarily correspond to the Subject's viewpoint.

3.8.3 History and development

The development of the tablet Activity appeared to affect the Activity when viewed from the perspective of its own history. It was important when studying the introduction of tablets into the classroom to consider the development of the Activity and the different histories involved. Elements of the Activity (such as Subjects) would have their individual histories, which might influence the Activity. For example, each teacher had her own experiences and many of them had many years of teaching experience, so it could be useful to identify what modifications they would need to bring to their experiences when tablets were introduced and to identify what their experiences would add to the integration of tablets. However, AT requires history to be viewed in two different ways: as development within the Activity and as history of the Activity.

3.8.3.1 History within an Activity

Each teacher can be assumed to have planned her lessons and to have tried to teach according to the plan, but she will sometimes have had to respond to circumstances as they arose by departing to some extent from the original plan for the progress of the Activity. For example, the pupils' interest in tablet use might lead a teacher to continue using tablets, or a technical issue might force her to modify the plan by presenting one task before another or by introducing a completely new task. In addition, addressing emerging contradictions might create an opportunity for innovation or restrict the progress of the lesson Activity. Thus, the teacher might start her lesson in accordance with the Activity System but the development of the Activity might not go according to plan.

3.8.3.2 History of the Activity

In addition to the history within the Activity, it was necessary to consider the history of the Activity in terms of its development across the observed lesson Activities. The lesson observations took place over a period of six months from October 2015 to March 2016, during which time the Activity was seen to have developed. This development could be expected to occur in relation to one or more aspects of the Activity such as Subjects (teachers, pupils), Community, Object, Rules, Division of Labour, or indeed the Tool, i.e. the tablets themselves, as such smart devices are capable of constant development, not least in the apps that they run, which might affect the way they are used in a class.

3.8.4 Contradictions

The introduction of a new technology to an existing Activity is likely to lead to the reconstruction of relationships between the different components of the Activity (Artemeva and Freedman, 2001). It is important to identify contradictions within the Activity System, because they are the keys to change and development and because they may disrupt the development of the Activity. However, this identification is not easy, since not all contradictions are visible or discussable. They might be within tablets, teachers, pupils, Rules or the Community. Positive results are not guaranteed, because they depend on how contradictions are addressed, but nor are contradictions to be viewed negatively, as they create the motive for change.

3.8.5 Transformation

Any Activity System, including a lesson, may go through an extended series of transformations that create the possibility of expansive transformation. The introduction of tablets into a class may thus involve changes in many related Activities, some of which the researcher may predict, while others need to be explored in reality as they happen. In addition, learning, progress and development cannot be reduced to individual 'Subjects', as the Activity System has a non-self-identical nature, whereby each of its parts may be seen to represent a single aspect of the Activity, but Activity has to be considered as a

whole in order to appreciate the overall picture. It therefore does not make sense to investigate a classroom learning Activity without considering its links to the school Activity System within which it occurs (Roth et al., 2009). Blin (2008) states that the introduction of a new Tool is likely to cause several modifications within the Activity. He also explains that expansive disruption of the Activity System may take the form of the adoption of a new curriculum or a modification of assessment techniques or teaching methodologies. If disturbance is temporary and does not lead to expansive transformation, this could be a sign of the rejection of the newly introduced Tool.

3.9 Participants

During my first visit to the school, intended mainly to allow me to get to know the participants and to establish a rapport with them, I approached the school administrators, who were aware of the purpose of my visits following the arrangements made with the ministry and the local education office, to discuss my proposed work scheme and to seek permission to contact the people involved in the tablet introduction project in order to identify potential study participants. The head teacher informed me that five teachers taught the class in which the tablet project was being implemented and gave me permission to approach them to recruit them and their pupils for the study. The following subsections detail the recruitment procedures for the four categories of participant.

3.9.1 Head teacher

The head teacher volunteered to participate in the study. Her collaboration was of great value, as she had good knowledge of all details regarding the school's tablet project. It was important to elicit her input concerning the general aim and plan of the project, what had been implemented, the challenges and what remained to be done. Once she had expressed an interest in participating in the study, I gave her an information sheet and an informed consent form.

3.9.2 Teachers

I directly approached the teachers working on the tablet introduction project, at an introductory meeting arranged by the school administration. I introduced myself and explained that my doctoral research had no relation to the Ministry of Education's plans for their school or their project and that their participation in the research would have no consequences, because the data would be used exclusively for research purposes. This clarification was important, because teachers considering participation in research to evaluate a school project might perceive a risk of the success or failure of the project being linked to their own performance evaluation. Therefore, I reassured them that the study was not evaluative and would have no implications for the future of the project itself. It was also important to assure them that information gathered would be treated confidentially and would be used only for the purposes of the research. I made it clear that I was conducting the research in fulfilment of the requirements of my doctoral studies and that the ensuing thesis would be submitted to the Leeds University library and to the Omani Ministry of Higher Education, which had sponsored the study.

In addition, I made it clear that teachers' participation was voluntary and that having decided to take part they would be free to withdraw at any time during the research. I confirmed that their names would not appear in the research data and that their identities would be disguised as far as possible to reduce any possible risk of identification. Finally, I handed each teacher an information sheet and an informed consent form and asked them to consider their participation in the coming few days. Three of them, identified by the pseudonyms Khawla, Ibtisam and Safia, consented to participate.

3.9.3 Parents

When I informed the school administrators of my plan to hold focus group discussions with some parents of participating pupils, they stated that only parents who had teaching positions in the school or in the nearby boys' school usually attended parents' meetings. They explained that the school's rural location meant that many parents had a low level of education and rarely responded to the school's invitations, while many others worked far from the

village, making it almost impossible for them to attend school meetings. I therefore decided to invite parents of pupils to participate only if they were teachers either at the same school or at the one nearby. It was possible to identify seven pupils whose parents fitted these criteria and with the support of the school administration, letters were sent to these seven parents informing them about the research and inviting them to take part.

Recruiting only these teachers to the parents' group had a number of important implications. First, as all were teachers at schools in the same village, they were alike in their circumstances, such as living standards and the time available for them to interact with their children at home, while differing significantly from many other parents of participating pupils, particularly those who lived and worked away from the home village. On the other hand, all seven parent/teachers knew what teaching is, were aware of different aspects of the classroom environment and were familiar with the expectations and requirements of the tablet introduction project. However, while this may have made their contributions better informed than they would otherwise be, the final implication was that the participating parents would always speak from a teacher's viewpoint and justify their beliefs from this perspective.

3.9.4 Pupils

I approached pupils in groups of five to eight in order to explain their potential participation in the research. I explained the research idea to them orally, using simple language that they would be able to understand. As I was a stranger to these children, who might therefore be wary of speaking to me, I asked the administration to organise informal meetings so that they would feel free to ask any questions that might cross their minds. I explained that being part of a research study would not affect their educational assessment and that if they or their parents decided to withdraw from the research this would not affect their participation in the school's tablet project, as withdrawal would only mean that their data would not be used in the research. Finally, all pupils were given an information sheet and an informed consent form to be signed by their parents.

3.9.5 Language

In order to enable all participants to understand their involvement in the research and to express themselves effectively, all of the information sheets and consent forms were in Arabic and all of the abovementioned meetings were conducted in Arabic, as were the interviews themselves (Grbich, 2013). In several cases, participants, especially among the pupils, were relaxed and informal in their spoken contributions, using colloquial language that they appeared to feel would best express their intended meaning.

3.10 Data collection instruments

3.10.1 Observation

Observation means watching events carefully as they occur in their context and recording important aspects. It is used to capture patterns and large trends over time (Cohen et al., 2000). Observation is an important method of collecting data in social research, as it yields a large amount of authentic data. I used this method to collect data on how teachers and pupils used tablets in the classroom. I also noted, in lessons where tablets were used, the emergence of issues concerning the types of Activities engaged in or the challenges faced by teachers and pupils, for example. I was then able to raise these issues for discussion in interviews with teachers. Conversely, I used the observations to check upon issues raised by teachers, pupils, the head teacher and parents when interviewed. Before beginning the classroom observations, I agreed with teachers that I would be observing real situations where the teachers were using tablets in teaching actual lessons. I also agreed with them on an approximate number of possible visits to each teacher's lessons over the period of data collection. It was important to agree upon the duration and frequency of my observations and how to record the data (Thomas, 2009). I planned to conduct a total of twelve classroom observations, as there were three participating teachers and each was to be observed twice in each data collection phase. However, I was able to conduct only ten observations because the difficulties that teachers faced in using the

internet in class reduced the overall frequency of lessons in which tablets were used.

Finally, I developed an observation schedule (Table 7) to make my observations organised and systematic. First, in order to differentiate between using tablets for teaching and for learning I decided to have separate items for observing teachers' Activities and pupils' Activities. Therefore, the schedule was designed to include two sets of statements and topics raised in literature such as teachers using educational games, using tablets to connect to the internet in the classroom, using apps on tablets, teachers' and pupils' motivation to interact and the technical support that the literature reports teachers and pupils as demanding. However, I purposely meant to keep the statements relatively general in order to allow flexibility to fit possible aspects of Activity use, such as the different apps that teachers might decide to use. In addition, Operation and Action statements within teachers' and pupils' Activities were added according to the findings of the pilot observation and adjustments were made to fit the context of Omani schools. Other items were derived from activity theory, as it was important to include items that highlight factors such as individual roles and rules related to tablet use.

Table 7: Observation schedule

Date:		Observation No:	General Notes:	
Teacher:		Class :		
		Lesson:		
Tablets for everyone? Yes / No		No of Pupils:		
Ratio:				
S	Teacher Action	Comments	Pupils' Action	Comments
1	Uses special classroom arrangement due to tablet use?		Show enthusiasm in using tablets	
2	Implements extra rules/instructions?		Talk about tablets	
3	Logs online in class using tablets		Take care of devices	
4	Uses learning games		Use tablets to go online	
5	Uses learning tablet app		Discuss what to do in tablet tasks	
6	Uses tablet to give instruction		Move in class to show achievements to other pupils	
7	Asks pupils to work on their own (individuals/pairs or groups)		Move in class to show achievements to teacher	
8	Stops pupils before finishing the task		Ask for longer time working on task	
9	Asks pupils to sit down		Work together to complete a task	
10	Requires technical assistant		Argue about taking control of tablets	
11	Uses tablet as an e-book		Take turns in working on tablets	
12	Prepared for several tasks using tablets		More than one pupil work together on a tablet	
13	Moves between groups		Provide technical support to teacher	
14	Rearranges pupils' groups		Seek teacher's attention	
15	Gives technical support to pupils		Achieve beyond teacher's task	
16	Concerned about safety of devices		Ask for support in using tablets	
17	Worried about time		Play off task	

3.10.2 The use of cameras

Observation is a useful way to gather data on the use of tablets in classrooms, but it might not be possible to capture and take note of everything that happens during a lesson. To overcome this shortcoming, I thought of using video recording to add value to the data collected through observation. However, I was not able to go ahead with this plan because the participating teachers did not agree to being videotaped while teaching. However, they promised to provide me with a videoed lesson that they would prepare themselves especially for my research. In the event, the video recording that they sent was of little or no value to the study because it was not of a full lesson; it was a two-minute clip of pupils starting a lesson with tablets in their hands.

3.10.3 Interviews

Teachers were interviewed individually so they could speak freely about their experiences. Post-lesson interviews were conducted with teachers when tablets had been used in class. It was important to consider their plans, views and reflections on using tablets with their pupils in the classroom. Interviews with teachers were of a mixture of formal and informal conversational elements (Cohen et al., 2000), as informal interviews have the advantage of increasing the relevance of questions that emerge directly from context and observations. As Cohen et al. (2000) state, every type of interview also has its own weaknesses and this evidently applies to both formal and informal ones. Therefore, I prepared an interview schedule (Table 8) to guide the process of interviewing the different participants and to ensure a systematic exploration of the issues raised with each of them. The interview questions were driven by the research questions, based in turn on issues identified during the review of literature.

The schedule was designed to include questions on aspects of activity theory such as tablets (Artefacts), teachers and pupils (Subjects), Roles and Rules, and the Community. In order to avoid leading interviewees, essential questions were designed to be on relatively general topics and to give interviewees the freedom to express themselves. However, a column for further questions was added to cover specific areas raised in the literature, such as the nature of Activities

conducted with tablets or the difference between classes with tablets and those without. Since interviews were planned to occur during post-lesson observation, a third column was added for probing questions, such as teachers' use of educational games, using tablets to connect to the internet in classrooms, using apps on tablets, teachers' and pupils' motivation to interact and the technical support which the literature reported teachers and pupils as demanding. Some modifications were also made to the schedule in response to the findings of the pilot study and to suit the Omani school context. Finally, different versions of the schedule were prepared to accommodate the differences among teachers, pupils, administrators and parents as interviewees.

I was able to conduct a total of ten individual interviews: one with the head teacher, two with the ICT teacher responsible for the tablet introduction project and seven with participating teachers. The plan was to use audio recording in order to capture all of the interviewees' words as they were spoken and to allow the conversation to flow naturally, thus helping participants to connect their ideas more easily than would have been the case if I had asked them to speak slowly so that I could take simultaneous notes. All participants except one gave their consent to my use of an audio recorder during the interviews. One teacher had reservations and her opinion was respected. I had to ask her to speak slowly in order for me to take notes of the points she raised. This was challenging, as I had to spontaneously identify, capture and summarise different points that might have relevance to the research questions as the teacher was speaking. I found that it was not easy and that I needed to do more work immediately following the interview to unpack the summarised points in preparation for data analysis.

Table 8: Interview schedule

Research Question	Essential Question	Further Question	Probing Q
1- What are the contextual factors mediating the use of tablets in the classroom?	Artefact direct impact (Tablets): 1. What difference does the introduction of tablets make in the class?	1- What happens when tablets are used in primary class? 2- What happened to pupils learning? 3- What happened to your teaching?	Influence to : ○ Your school situation? ○ Curriculum? ○ Pupils' motivation?
3- In what way does the use of tablets affect teaching practice in the classroom?		1. What difference have the tablets made in the classroom environment? 2. What about the school environment? 3. What is the nature of tasks used with tablets? 4. What types of activities are used? Any change in classroom activities?	○ Seating arrangement? ○ Pupils' Movement? ○ Use of other tools? ○ What about lesson timing? Time Saved? /Disturbed? ○ Use of educative games? Connection Required? ○ Individuals? Or group work? internet in class? or out of class?
	Impact on subject (Teachers) 1. Has your teaching been influenced by the introduction of tablets? In what way?	1. How do you use tablets in your teaching? 2. Tell me about preparing tablet lessons.	○ Has your teaching changed? In what way?

Research Question	Essential Question	Further Question	Probing Q
	<p>2. What did you need to know in order to use tablets in classes?</p>	<p>1- Have you tried observing other teachers using tablets in their classes?</p>	<ul style="list-style-type: none"> ○ Have you had formal training opportunities? What do you think of it? ○ What have you learned? ○ Anything else you would like to know about using tablets in classes? Support?
	<p>Impact on subject (Pupils)</p> <p>1. Have tablets influenced pupils' learning? In what way?</p> <p>2. How do you see the ratio of tablets and pupils' relations?</p>	<p>1- What happened to pupils' interactions?</p> <p>2- What about pupils' motor activities?</p> <p>3- How would you describe pupil-pupil interaction when using tablets?</p>	<ul style="list-style-type: none"> ○ Pupil-pupil / teacher-pupil ○ Their attention? ○ Readiness to learn? ○ Skills? Any new skills? ○ Group work?

Research Question	Essential Question	Further Question	Probing Q
	Impact on Division of Labour 1- Who plays a role in preparing and implementing a lesson with tablets?	1- What roles do pupils play? 2- Have you learned (anything) from pupils in using tablets?	<ul style="list-style-type: none"> ○ Who gets involved? And how? ○ What roles do pupils play? ○ Has it happened? Any possibility?
	Impact on class rules 1. What are the rules associated with using tablets in class / school?	1. Any change to classroom culture? Norms?	Any restrictions?
	Impact on Community 1. What influence have tablets had on the school community? 2. What comments have you received from parents regarding tablet use?	1. Has the introduction of tablets influenced teachers' willingness to take up technology? In what way? 2. As tablets are kept in the Learning Resource Centre, what implications does that have for other classes?	

Research Question	Essential Question	Further Question	Probing Q
2- What are the impacts in terms of the roles and responsibilities of the agents involved in using tablets in the classroom?	Artefact direct impact (Tablets): 1. What factors do you think affect tablet use in class? 2. What would help to improve the current situation?	1. What factors do you think determine the frequency of your tablet use with pupils? 2. What factors determine the choice of apps?	<ul style="list-style-type: none"> ○ What facilitates/obstructs? ○ Who plays a role in that?
	Impact on subject (Teachers) 1. What do you think teachers require for tablet use? 2. How do you think teachers can make the most of tablets in class?	1. What factors may support them?	<ul style="list-style-type: none"> ○ Training? ○ Resources? ○ Change in teaching hours?
	Impact on subject (Pupils) 1. How do you think pupils can make the most of tablets in class?	1. What factors may support them?	

Research Question	Essential Question	Further Question	Probing Q
	Impact on Division of Labour 1. Who do you think can provide support for tablet use?	1. Who can support teachers work? 2. How can support be provided to pupils?	○ How/in what way?
	Impact on class rules 1. What do you think of the school rules for tablet use?	1. If you were to amend the rules, what changes would you suggest?	
	Impact on Community 1. What are other school teachers' views of using tablets in class? 2. What are parents' views of the use of tablets in class?	1. What would you expect from parents?	

3.10.4 Focus group discussions

From the beginning I recognised how important it was that I interview the pupils themselves and allow them to express their views on the use of tablets in the classroom. Research with children has recently met the challenge of allowing them to speak for themselves and this approach emphasises the importance of listening to children expressing themselves, then giving due consideration to their points of view (Hartas, 2010). Pupils' views about what is taking place in their classrooms are important, and many research projects have welcomed children as competent social members to discuss their experiences (Barker and Weller, 2003; Christensen and James, 2008).

Therefore, I used focus group interviews to engage groups of pupils in semi-formal discussion regarding the use of tablets in their classrooms. Three groups, each consisting of five to seven pupils, were interviewed at different times. Focus groups are a useful way of conducting interviews by engaging groups of participants who share experience of a selected topic in formal or informal discussion (King, 2010). One advantage of these sessions over one-to-one interviews is that interactions among the participants promote data production (Hobson and Townsend, 2010). Another is the potential for discussions leading to the development of a wider range of responses, as participants build on or challenge each other's ideas, which itself brings new ideas into the discussion (Cohen et al., 2000). However, there are also some disadvantages that I had to be aware of, including the danger that the discussion might drift away from the topic (Hobson and Townsend, 2010).

I decided to conduct focus group discussions with pupils for two practical reasons. First, I was able to involve about 20 pupils in three group interviews, which reduced the possibility of disturbing their lesson attendance compared to holding individual interviews. Second, pupils were able to support each other's ideas and give explanations when needed. In fact, in the context of rural Oman, interviewing young children from a village individually could have been very difficult, as most tended to speak in short sentences and some of them hardly spoke.

Focus group interviews were also used to elicit parents' views of the introduction of tablets into classrooms. Recognising the difficulty of arranging for individual parents to come to the school, I decided that it would be better to ask the school administrators to arrange the session, which they did, inviting the participants to attend a meeting at the school during November 2016.

3.11 Analysis of interview data

This section describes the process of analysing the interview data. This followed a circular model, whereby I started the initial data analysis while still collecting data and used it to feed back to the later rounds of data collection. This contrasts with the linear model, where data analysis does not begin until all of the data has been collected (Lichtman, 2006). Initial analysis of the data so far collected was useful in adding further questions to the interview schedules for various participants. Conversely, points raised in teachers' interviews and focus group discussions led me to adjust the observation schedule and to focus on these points while observing classes where tablets were used. A clear example of this was that analysis of the data from the first phase of collection revealed many general remarks that needed further investigation, on such matters as iPads that were available but never used in lessons, network failures and the fact that certain apps were not used in the classroom. When such observations were made, it was important not to stop at note taking but to think about ways of collecting more data on the reasons for these phenomena and on their consequences. This led to further data collection being needed and it was important to explore participants' input.

During the main data analysis stage, it was important to keep in mind the research aim and not to view the data with preconceptions or ready-made judgments. Thus, I took an inductive or bottom-up approach, allowing the data to drive the analytical process (Patton, 1990).

3.11.1 Organizing the interview data

I began the analysis of the interview data with transcriptions of the audio recordings of all of the interviews. These varied in length from less than 20 to more than 45 minutes, with an average duration of about 30 minutes.

Regardless of length, the analysis of each interview started with the transcription of the audio recording, which provided “a true record of the original interview” (Drever, 1995, p60). All interviews were transcribed word by word in the original language, Arabic, so that analysis was applied to the exact words of participants, with nothing being modified or lost in translation. Appendix L provides a translated example of an interview transcription. All of the interviews were transcribed as word processor files, which in total comprised 33,673 words. Thinking about the data while transcribing, I used the Comment feature of Microsoft Word to make notes of initial thoughts, issues and potential themes as they arose, because although themes are decided at the end of thematic analysis, it has been noted that a researcher may quite often start to notice patterns even while data collection is still going on (Braun and Clarke, 2013). However, I took such notes only as reminder of initial thoughts to be revisited after I had done all of the coding and did not use them as guidance for coding. Thus, two sets of transcription files were produced and saved: one which included these initial thoughts and the other with notes and comments removed. Only the transcription files without comments were used for reviewing the transcription and for coding, which was done using the NVivo software package.

3.11.2 Unit of analysis

The coding of each interview began with a thorough reading of the entire transcript to provide a general picture of the interview before getting into the detailed ideas (Mason, 2002; Braun and Clarke, 2006). The next step was to decide on the unit of analysis and although I was working from written transcripts of spoken interviews, I decided to base my unit of analysis on sentences. The teachers were speaking naturally in the interviews, so they sometimes expressed more than one idea in a sentence or used several sentences to convey a single idea.

The following example demonstrates the steps followed to code all interviews in order to inductively find thematic patterns. The interview extract below is from a response given by one of the teachers (Khawla) to a question in a post-lesson interview.

The project has been there for two years now. Last year it was with older pupils and I think it suits them better. This year we were surprised with the project size and with the class selection. The school didn't have these devices; I don't know how the arrangements were made. Pupils were very happy but they need expertise and as a teacher I don't have the expertise and I'm slow. Mariam [the ICT teacher] always holds workshops on PowerPoint and as teachers we need lots of training; not only us who are currently working on the project, this is a school project and all school teachers need training.

To identify units of analysis from this teacher's response to my question, I began by looking for the different ideas expressed in the extract. To decide on the ideas carried by the sentences, I first underlined the key words that seemed to carry meaning in the teacher's context. Considering context when deciding on units of analysis was necessary because activity theory, which is the theoretical framework for this study, requires "a minimal meaningful context for individual actions" to be "included in the basic unit of analysis" (Kuutti, 1996, p26). Indeed, failure to consider the context would have meant that many of words that I underlined would not have been seen as important and thus not treated as key words.

The project has been there for two years now. Last year it was with older pupils and I think it suits them better. This year we were surprised with the project size and with the class selection. The school didn't have these devices; I don't know how the arrangements were made. Pupils were very happy but these devices need expertise and as a teacher I don't have the expertise and I'm slow. Mariam [the ICT teacher] always holds workshops on PowerPoint and as teachers we need lots of training; not only us who are currently working on the project, this is a school project and all school teachers need training.

After deciding on the key words, I looked for the ideas that they carried in the context that the teacher was speaking in. This meant not just looking at the surface meaning of the words, but thinking more deeply to explore the ideas that they conveyed in the context of the topic under inquiry. For example, the

idea that the project had been underway “for two years” related to the experience that the school had had with these devices since the project started. This was a single idea, so I decided that the whole sentence carried the idea of school experience. Another example is that the teacher reported what she perceived as a fact by saying: “The school didn’t have these devices”. This sentence contained a single factual idea and was followed by another sentence carrying a separate idea, as the teacher expressed her ignorance by saying that she did not know “how the arrangements were made”. Thus, I decided to code each of these sentences for the idea it carried.

However, some sentences contained more than one idea and I decided to assign multiple codes to them, depending on the ideas they carried. For example, the second sentence carried three ideas, each represented by an underlined phrase: “Last year it was with older pupils and I think it suits them better.” These three ideas related to the school’s earlier experience with older pupils, to age suitability and to a comparison of the current situation with the previous year. As these were all distinct and separate ideas, I decided to assign this sentence three codes rather than only one.

Similarly, the next sentence contained four ideas that had to be coded, as the underlining shows: “This year we were surprised with the project size and with the class selection.” The first idea, “this year”, compares the current situation to “last year”, but the sentence also introduces new ideas about the teacher being “surprised” with the project’s “size” and the “class selection”. For this reason, I decided to code each idea separately within the same unit of analysis, although it was linked to the previous sentence.

The phrase “pupils were very happy” introduces the idea that the pupils welcomed the introduction of tablets and it was coded for the idea that it carries. However, it is also connected to an idea conveyed later in the same sentence, as the teacher linked the pupils’ reaction with the new idea of her own competence by saying: “these devices need expertise and as a teacher I don’t have the expertise”. Here she expresses something that she has learned from her experience of using tablets in the classroom, that this requires a level of technical expertise, and this forms another idea to be coded. I also identified

a third idea to be coded in this sentence, where the teacher introduces a new idea by using the phrase “I’m slow” to describe herself in this context.

With the phrase “Mariam always holds workshops on PowerPoint” the teacher conveys two interlinked ideas, stating first that training was provided at the school and secondly that it was limited to one specific program. As these two ideas are linked, I decide to treat them as one coded idea (‘provided training’). However, she added that “as teachers we need lots of training” and although this in some way continues the same idea of training, it also brings out the teachers’ need for it, so I decided to treat this as a separate idea, coded as ‘training needs’.

The phrase “not only us who are currently working on the project” continues the same idea about training, but draws attention to it not being a personal need by including the words “not only us”. The teacher follows this by confirming that “this is a school project and all school teachers need training.” As these ideas are linked and confirm each other, I decided to code them separately within the sentence.

Table 9: Examples of ideas coded

Participant's words	Translation	Coded ideas
المشروع صار له سنتين الحين	<i>The project has been there for two years now.</i>	Project age
العام الماضي كان مع الطلبة الكبار واشوف انه يناسبهم اكثر	<i>Last year it was with older pupils and I think it suits them better.</i>	Experience with older students Age suitability
تفاجأنا هذي السنة باختيار الصف وبحجم المشروع	<i>This year we were surprised with the project size and with the class selection</i>	Preparing teachers Being surprised with decisions made, size of project and selection of class
هذي الأجهزة ما كانت متوفرة	<i>the school didn't have these devices</i>	Presenting factual information Availability of devices
وما أعرف كيف كان التنسيق	<i>I don't know how arrangements were made</i>	Teacher's awareness Missing updates
الطلبة فرحو كثير	<i>Pupils were very happy</i>	Pupils like tablets
هذا الأجهزة يحتاجها خبرة وأنا ما عندي الخبرة	<i>these devices need expertise and as a teacher I don't have the expertise</i>	Tablets require a level of technical expertise
في عندي بطء	<i>I'm slow</i>	Teacher describing herself (personal quality)
مريم دائما تعمل مشاغل في البوربوينت	<i>Mariam always holds workshops on PowerPoint</i>	Training provided Limited training provision
وكمعلمين نحن نحتاج للتدريب كثير	<i>as teachers we need lots of training</i>	Further training needed
ما بس نحن اللي الحين نشغل في المشروع، كل المعلمات يحتاجن تدريب هذا مشروع المدرسة	<i>not only us who are currently working in the project, this is a school project and all school teachers need training</i>	Training is not a personal need and should be for all teachers

The steps described above were followed for every interview as I continued to identify units of analysis for them all. However, I found it more practical to go immediately to the next step, which was coding the ideas identified for a particular interview, as soon as they had been identified. I then began identifying ideas for another interview and coded them in the same way, before moving on to the next.

3.11.3 Coding

To code the identified ideas it was necessary to consider the context of the participants. This step involved deeper thinking to explore the ideas conveyed by their words and to evaluate their relation to the context. For example, although the idea that the project had been ongoing “for two years” (coded as ‘project age’) was related to the introduction of tablets and relevant for the speaker, Khawla, it was less important for the other participants, Safia and Ibtisam, as they were newly appointed teachers. However, the idea that tablets had been used last year with “older pupils” and that the teacher believed that “it suits them better”, coded as ‘age suitability’, was more relevant to all participants. Another example concerns the idea that teachers were “surprised” at the project’s “size” and the “class selection”, which relates to how the school administration worked on preparing teachers to work on the project. Being surprised indicates either that teachers were not informed of the school’s original plan or that a sudden or unplanned decision was made, which teachers were not prepared for, so I decided to code it as ‘preparing teachers’. On the other hand, when Khawla stated that “the school didn’t have these devices” and that she did not know “how arrangement were made”, this shows that she was missing updates and as result was unaware of what was happening in regard to the school project, so I coded this as ‘teacher awareness’.

The statement “pupils were very happy” reflects the perception that the pupils welcomed the introduction of tablets and indicates that the teacher had noticed that it had had a motivational influence on them. Nevertheless, I decided to code the statement as ‘pupils like tablets’, because this can carry both meanings.

The words “these devices need expertise and as a teacher I don’t have the expertise” conveys the idea that the interviewee had learned from her experience of using tablets in class that this required a level of technical expertise that she lacked. A lack of expertise can be corrected by providing training and for this reason I coded this phrase as ‘training needed’. However, Khawla’s description of herself in this context as being “slow” is rather vague

and can be interpreted in different ways, as meaning slow in teaching, in learning how to use technology, or simply lacking the requisite skill, I therefore decided to code it as 'personal quality'.

The training idea was again emphasized when Khawla spoke about the training provided by the ICT teacher. By saying "Mariam always holds workshops on PowerPoint", she conveyed the idea that training was provided by the school but that it was limited to one specific application, so I decided to code this as 'training provided'. However, she added "and as teachers we need lots of training", which indicates that too little training was provided and that the teachers wanted more; I coded this as 'training is needed'.

"Not only us who are working on the project now, this is a school project and all school teachers need training." I coded this as 'all teachers need training', because it refers to teachers at the school who were not currently involved in the project and whom Khawla identifies here as needing training. By speaking in their voice, she indicated that these teachers had talked to her about the project and were curious about getting involved, and that she understood from their discussion that they thought that the starting point should be the provision of training.

I continued this method of coding the transcripts of all of the individual interviews and focus group discussions, which generated a long list of codes, reproduced in Table 10.

Table 10: Codes emerging from interviews

Teacher motivation	Teacher awareness	Influence on teacher
Alternative task prepared	First time internet in class	Challenges
Teachers not taking initiative	Change class environment	Teacher's patience
Teachers not happy with lesson outcomes	Insufficient programs	Time saving
Determined to continue	Time consumption	Pupils need change
Teacher willing to learn	Positive signs	Organisation
Teacher preparation	Tablet features	Life skills
Pupils becoming independent	Girls work together	Pupils focus
Pupils pay more attention	Suggested programs	Boys grouping problem
Seating arrangements	Reduces discussion	Checking pupils' attention
Technical support	Pupils' passion	Network failure
Overcoming obstacles	Teachers' fear of technology	Age suitability
Working on changing teachers' attitudes	Head teacher's role	Administration vision
Books are indispensable	Games	Training teachers
Pupils' enthusiasm	Low guidance	Entertaining activities
Extra work for ICT teacher	Rules	Undesired change
Community awareness	Unsure of community response	Teachers' cooperation
Teachers' time justification	Tablets distract pupils	Pupils are eager to hold tablets
Disappointment	Reason for pupils' failure	Quitter pupils
Pupils referred to books	Building ownership	Enhance typing skill
Fast	Teacher's focus diverted	Tablets getting stuck
Preparing teachers	Problem solving	Multi-sources
Tablets are useful	App selection	Other teachers' opinions
Practical use	Pupils' focus	Apps
In school community	Supporting bodies	Supervisors' roles
Supervisors' awareness	Teachers' plan	Internet needed
Teacher's judgment	Charging difficulty	Internet is prerequisite
Lesson plan	Training needed	Ability with technology
Pupils like devices	Gender differences	Teaching strategy
Pupils think about alternatives	Weak internet connection	Pupils' curiosity
Mishap	Supporting teachers	Administration neglect
Curriculum unchanged	Cost	Dangers of tablets
Teacher is a guide	Self-learning	Training week
Misuse	Teachers' technology use expanded	Preparation at school not at home
Minimal guidance	Ministry plan	

The next step was to group together codes belonging to a similar category. However, before doing so, I decided to start by coding the other datasets, gathered from focus group discussions and observations, in order to be able to include codes emerging from these sets when grouping them.

3.12 Analysis of focus group data

3.12.1 Coding focus group data

In coding the data from parents' and pupils' focus group discussions, I followed the same steps as when coding interview data, beginning with a careful reading of the transcript of the whole discussion in order to obtain a general picture. I then worked on identifying ideas to be coded, as demonstrated with regard to the following extract from the parents' focus group data.

Of course the use of tablets always attracts young pupils in cycle one. I mean that children at this age are attracted by tablets, especially with games that have an educational side. I think it will have an effect on them. It will create a competitive environment between pupils and it will enable them to be creative, because with their use of these devices they will have wider space to use technology and apps.

Again, I started by underlining the key words in the transcript that would allow me to identify ideas emerging from the discussion.

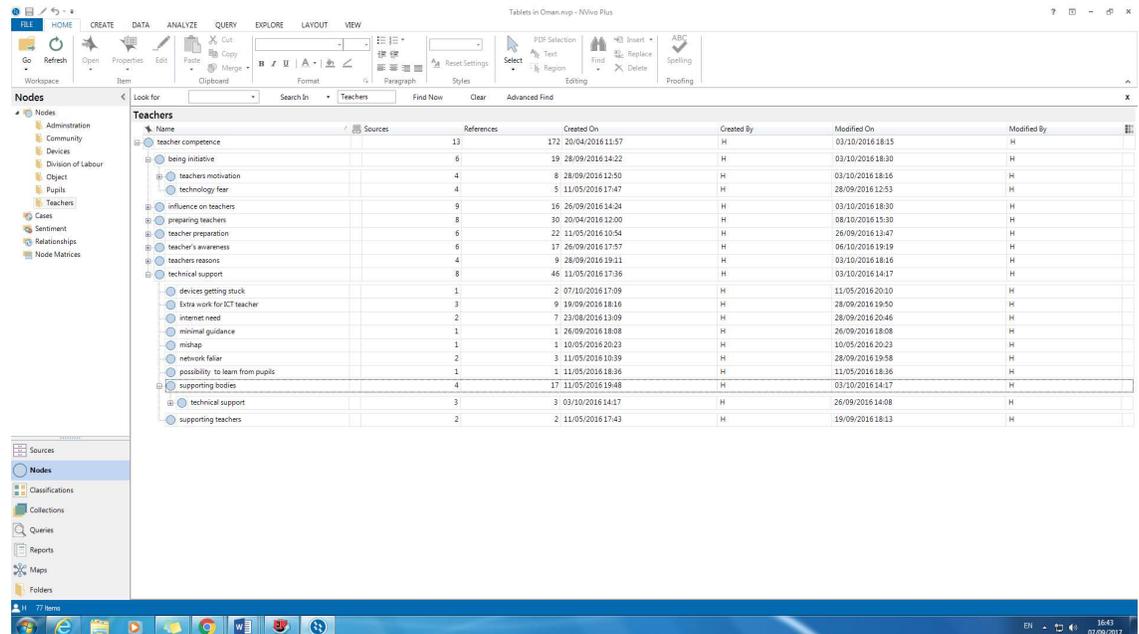
Of course the use of tablets always attracts young pupils in cycle one. I mean that children at this age are attracted by tablets, especially with games that have an educational side. I think it will have an effect on them. It will create a competitive environment between pupils and it will enable them to be creative, because with their use of these devices they will have wider space to use technology and apps.

Next, I looked at the ideas conveyed by these underlined words. On reading the first sentence ("Of course the use of tablets always attracts young pupils in cycle one") and the first part of the second ("I mean that children at this age are attracted by tablets"), I concluded that the parent had introduced two ideas

in the first sentence and explained them in the second, so I decided to treat all of this data together, as representing these two ideas to be coded. In the second part of the second sentence ("especially with games that have an educational side"), she introduces a new idea through an example ("games") that specifies the ideas introduced earlier. I therefore decided to consider this phrase as two linked coded ideas: 'games' and 'educational games'. The phrase "I think it will have an effect on them" also conveys a coded idea, that tablets have an effect on pupils. The last sentence in the extract carries several ideas, so I had to divide it into several coded units. The first idea, the role of tablets in creating a competitive environment, is conveyed by the words "It will create a competitive environment between pupils", so I assigned a code to this. The second coded unit in this sentence is "it will enable them to be creative", which introduces the idea that tablets support creativity. Although the third part ("they will have wider space to use technology and apps") serves to explain how tablets can support creativity, it also introduces another idea, so I decided to keep it as a unit of analysis.

Acknowledging the research context, I worked on coding the ideas in an inductive manner, although I used many codes that had already emerged from the teachers' interviews. For example, I coded the two ideas that appeared in "Of course the use of tablets always attracts young pupils in cycle one. I mean that children in this age are attracted by tablets" as 'tablets attract pupils' and 'age suitability', both of which had emerged from the teachers' interviews. As to "especially with games that have an educational side", I coded this as 'educational games', a new emerging code which did not appear in the teachers' data analysis. Similarly, I decided to code "I think it will have an effect on them" as 'tablets have effect', as the parent spoke about an effect, even though she did not specify here what effect she meant. On the other hand, when she said "It will create a competitive environment between pupils" and "it will enable them to be creative", I coded these as 'competitive environment' and 'enable creativity' respectively. Finally, I coded "they will have wider space to use technology and apps" as 'expand technology use'.

It is important to note that I tried to work through the coding process without thinking of topics found in literature, to allow my codes to emerge from the interviewees' words and ideas. This process continued throughout the analysis of the transcriptions of all four focus group discussions. I used NVivo to link coded text to codes and it was helpful in allocating the same code to similar texts conveying the same idea. I ended with a very long list of approximately 180 codes, because I was using the inductive approach, thinking of a code for each unit without referring to codes that had emerged earlier. However, I later worked on grouping similar ideas under categories that belonged together. Thus, coding is to be seen as only an early step in the overall analysis. The coding of data portions is a transitional process between data collection and the wider data analysis (Saldana, 2009).



The screenshot shows the NVivo software interface with a list of nodes and their references. The nodes are organized into a hierarchy on the left, with 'Teachers' selected. The main window displays a table of nodes and their references.

Name	Sources	References	Created On	Created By	Modified On	Modified By
teacher competence		13	172 20/04/2016 11:57	H	03/10/2016 18:15	H
being initiative		6	19 28/09/2016 14:22	H	03/10/2016 18:30	H
teachers motivation		4	8 28/09/2016 12:50	H	03/10/2016 18:16	H
technology fear		4	5 11/05/2016 17:47	H	28/09/2016 12:53	H
influence on teachers		9	16 26/09/2016 14:24	H	03/10/2016 18:30	H
preparing teachers		8	30 20/04/2016 12:00	H	08/10/2016 15:30	H
teacher preparation		6	22 11/05/2016 10:54	H	26/09/2016 13:47	H
teacher's awareness		6	17 26/09/2016 17:57	H	06/10/2016 19:19	H
teachers reasons		4	9 28/09/2016 18:11	H	03/10/2016 18:16	H
technical support		8	46 11/05/2016 17:36	H	03/10/2016 14:17	H
devices getting stuck		1	2 07/10/2016 17:09	H	11/05/2016 20:10	H
Extra work for ICT teacher		3	9 19/09/2016 18:16	H	28/09/2016 19:50	H
internet need		2	7 23/08/2016 13:09	H	28/09/2016 20:46	H
minimal guidance		1	1 26/09/2016 18:08	H	26/09/2016 18:08	H
mishap		1	1 10/05/2016 20:23	H	10/05/2016 20:23	H
network faller		2	3 11/05/2016 10:39	H	28/09/2016 19:58	H
possibility to learn from pupils		1	1 11/05/2016 18:36	H	11/05/2016 18:36	H
supporting teacher		4	17 11/05/2016 19:48	H	03/10/2016 14:17	H
technical support		3	3 03/10/2016 14:17	H	26/09/2016 14:08	H
supporting teachers		2	2 11/05/2016 17:43	H	19/09/2016 18:13	H

Figure 2: Screen shot of the NVivo software

As mentioned earlier, I also followed these steps of identifying ideas and coding them when coding the data from the pupils' focus group discussion. **Error! Reference source not found.** shows the new codes that emerged from the parents' focus group discussion in addition to those listed earlier in **Error! Reference source not found.** that had already emerged from the teachers' interview data.

Table 11: Codes emerging from parents' focus group data

Parents' expectations	Parents' suggestions	Parents' awareness	Tablets replace books
Reason for pupils failure	Use frequency	Admin vision	Teachers' requirement
Pupils learn to share	Electronic writing	Tablets will be community culture	Different activity
Parents want to follow up	I blame the ministry	Criticising implementation	Tablets make learning easy
Not sure of rules	Expand technology use	Educational games	Let the school provide you one (tablet)
Selfishness will increase	Parents' passion	Parents not willing to pay	Novelty
Pupils' competition	Disagreement over devices	Previous project experience	Reason for the project
Poor handwriting	Parents' suspicion	Parents will be forced	Better learning
Break school routine	Ownership	Connect learning to home	Workshop effectiveness
Support creativity	Urge teachers' development	Responsibility	Learning topic
Ratio	Anticipated result		

Error! Reference source not found. shows the new codes that emerged from the pupils' focus group data in addition to those listed in **Error! Reference source not found.** and **Error! Reference source not found.**.

Table 12: Codes emerging from pupils' focus group data

Prefer individual tablets	Sorting	Home devices	Feeling progress
Enjoy	Practical use	Social games	Wished apps
Covered topics	Apps at home	Learn organisation	Enhance understanding
Parents' concerns	Mind games	Video playing	Self-controlling
Organising priorities	Teachers teach at slow pace	Waiting for instruction	Over use
Ready to support teachers	Confused pupils	Parents refuse to provide tablets	Limited internet access
Tab-quest	Easy typing	Compare tablets to laptops	Pupils save money to buy tablets
Parents hide tablets	Tablets are only for learning	Used to support memorisation	Source of knowledge
Negative conception	Parents control		

3.12.2 Themes

According to Grbich (Grbich, 2013), an important aspect of coding is becoming familiar with the data by revisiting it and repeating the coding process. I worked on refining my coding of the different datasets, then using the 'aggregate' feature of NVivo11, I worked on organizing the codes that had emerged from all of the datasets. Codes that could be grouped under one category were put together under a new node created and named as the category. For example, the codes 'network failure', 'tablets getting stuck', 'supporting bodies', 'minimal guidance' and 'supporting teachers' were put under a new node named 'technical support'. Similarly, the codes 'insufficient programs', 'apps at home', 'app selection' and 'suggested programs' were all put under a category called 'applications', while 'tablets are only for learning', 'tablets are not much used', 'use frequency' and 'ratio' were grouped under 'use frequency'. The following table shows some other examples of the grouping of codes under categories.

Table 13: Examples of codes grouped into categories

Codes	Category
Keep up with technology Reasons for the project Teachers selection	Project planning
Project evaluation School priority Work on changing teachers' attitude	Head teacher's role
Applications Entertaining activities Multi-sources Practical Easy to use Time saving	Tablet features
Previous project experience Internet Ministry role	External factors
App selection Frequency use Charging problem Cost Time	Difficulties related to devices
Parents' unanswered questions Parents' expectations Parents' suspicions Implementation criticism	Parents' awareness

Again, I organized the emerging categories and worked on generating themes by collapsing the categories under general headings. Finally, seven themes were identified; these are listed with their component categories in **Error! Reference source not found..**

Table 14: Categories collapsed into themes

Category	Themes
Project planning Head teacher's role Parents' awareness	Vision
Preparing teachers Teacher preparation Teachers' awareness	Competence
Implementation challenges External factors In-school difficulties Difficulties related to devices	Challenges
Tablet features Reasons to use in class	Educational features
Parents' awareness Supervisors' awareness School community awareness	Awareness
Misuse Pupils' discouragement Pupils feel they are left out	Pupils' disappointment
Want change Positive signs Ownership	Drive for change
Head teacher's role Parents' roles Supervisors' roles Pupils' roles	Roles and responsibilities

3.13 Summary

This chapter has reviewed the research methodology and outlined its design. I have addressed the ethical considerations, explained how activity theory was used in the study, reported on the pilot study, discussed the study participants, described the design of the data gathering instruments and given a detailed account of the thematic analysis of each of the three datasets, gathered from interviews and focus group discussions. The next chapter presents an analysis of the observation data.

Chapter 4 : Observation Findings

4.1 Introduction

In the previous chapter, I reported on the research methodology used in the present study. This chapter gives a detailed account of the findings of classroom observations, in pursuit of the research aim, which was to explore what happened when tablets were introduced into an Omani school, and in response to these research questions:

- 1- What are the contextual factors mediating the use of tablets in the classroom?
- 2- What are the impacts in terms of the roles and responsibilities of the agents involved in using tablets in the classroom?
- 3- In what way does the use of tablets affect teaching practice in the classroom?

Classroom observations were conducted between October 2015 and March 2016, to allow maximum time possible for development and for participants to build up their use of tablets in class. The observations were carried out in three phases, as listed in Table 15.

Table 15: Phases of observation

Phase one	October 2015	3 observations
Phase two	December 2015	3 observations
Phase three	March 2016	2 observations

Phases one and two comprised three observations each, whereas I observed only two lessons in the third phase, as one of the teachers, Khawla, while not withdrawing from either the school's tablet project or this study, chose not to make herself available for any further observations or interviews after 14th March 2016. Since I had gathered a relatively small amount of observational

data from these eight classroom observations, I decided to use manual analysis, which helped me to stay close to the data (Creswell, 2005). Here, in the following sections, I present the analysis of this classroom observational data. However, before doing so it is important to give the following notes that apply to the analysis of all my classroom observations and their analysis.

First, all lesson observation were conducted in the Interactive Room, as it was known in the school, where the tablet devices were always stored and used. The school administration claimed that it sought to equip this room with the best possible materials and equipment. Second, as Arabic was the language of instruction in the school, it was used in all lessons that I observed, whatever the subject. Finally, having adopted activity theory as the framework for the study, I also used AT to guide the analysis of observational data.

4.1.1 Preparing the data

In order to present the data in a clear form and since it was important to present lesson development with events in sequence as they happened, I wrote a description of each lesson to highlight sequences with some details that might not be clearly shown in the observation sheet, as shown in Figure 3.

Table 1 Classroom observation Sheet

Date: 15/3/2016		Observation No: 3/3	General Notes: 136 modem is used for wifi	
Teacher: S		Class: 4	- ICT is present to help	
Tablets for everyone? Yes/(No)		Lesson: 5	- No Key Pads are attached.	
Ratio: 2:1		No of Pupils: 20	- T. very happy to hear different suggestion given by PPs. <i>enjoyed hearing</i>	
S	Teacher Action	Comments	Pupils Action	Comments
1	Uses special classroom arrangement due to tablets use?	<p>- More than 10 mins T. checking tablets connectivity to Wifi and internet</p> <p>- T. keeps talking to pupils (as a whole class) though many are busy on their tablets.</p> <p>- T. ask pupils to find solution for connectivity</p> <p>- T asks pupils to try suggestions they gave.</p> <p>- T. asks pupils to stop connectivity for better signal</p> <p>T. tries to show "class" from a tablet " -> 1 pair found</p> <p>T ask pupils to look for signal again.</p> <p>T. ask pupils to sit down</p>	Show enthusiasm in using tablets ✓	- Pupils move from their seats to T.
2	Implements extra rules/instructions? ✓		Talk about tablets	- Pupils give suggestion to overcome connectivity problem
3	Logs online in class using tablets		Take care of devices	
4	Uses learning games		Use tablets to go online ✓	- one P. suggested to get closer to Modem
5	Uses learning tablet App		Discuss what to do on tablets task ✓	- another suggested to go out of class for better signal.
6	Uses tablet to give instruction		Move in class to show achievement to other pupils ✓	- All pupils are moving from their seats -> to show what they got -> seeking help
7	Asks pupils to work on their own (individuals/pairs or groups) ✓		Move in class to show achievement to teacher ✓	- one pupils suggests to reduce No tablets for better signal.
8	Stops pupils before finishing the task		Ask for longer time working on task ✓	-> to pupils gathered around T
9	Asks pupils to sit down ✓		Work together to complete a task ✓	
10	Requires technical assistant ✓		Argue to take control of tablets	
11	Uses tablet as an e-book		take turn in working on tablets	
12	Prepared for several tasks using tablets		More than one pupil work together on a tablet	
13	Moves between groups ✓		Provide technical support to teacher ✓	
14	Rearranges pupils groups ✓		Seek teacher's attention	
15	Gives technical support to pupils		Achieve beyond teacher's task	
16	Concerned about devices safety		Ask for support in using tablets	
17	Worried about time		Play off task ✓	

- T. sets class in rows B4 pupils arrived
- T. gets pupils in selected pairs and ~~strong~~ them where to sit.
- Tablets on pupils desks but T. tells pupils not to touch them unless she says so.
- T. elicits the word "internet" from pupils → 2 mins
- T. asks pupils to use tablets to log to internet and search for "dinosaurs"
- T. ask pupils to work in groups to reduce no. of tablets
- T. finds some pupils work off task
↓ she punishes by stopping them from working with tablet and asking them to stand up.
- Time finished before completing the tasks and T. ask pupils to go back to their class promising them to do it again in another time - (leave tablet on) desk.
- T. expressed her happiness with the lesson
satisfied.
"I got 8 suggested solutions from pupils"

class map

- All pupils are paying attention to T. instructor before using tablets.
- ~~At~~ only four girls were on seats → the rest are moving
- All pupils are keen and actively participating in "signal search"
- Pupils gathered in groups (3/4 of 16)
- 1 pair search for car race.
- 1 pupil said عذو نوتل
فنه لسه
- two girls didn't leave saying they want to help T. عن الة

Figure 3: Example of observation sheets

4.1.2 Unit of analysis

It was important to decide on the Activity to be used as the unit of analysis, in conformity with AT as theoretical framework. I decided to use the whole lesson, beginning as soon as the pupils entered the room and ending when they left. However, acknowledging that some related events may happen before or after the lesson Activity, these were identified and dealt with as separate Activities. When analysing the classroom observational data, it was important to view the lesson in two different ways. First, each lesson was treated as an Activity constituting part of a school Activity System which also consisted of many other Activities and other components that might influence or be influenced by the observed lesson. Second, each lesson was seen as an Activity System, in that its constituent Operations and Actions might eventually become Activities in themselves.

The following subsections present the analysis of the data gathered from lesson observations in each of the three phases, with main headings identifying the lesson by the phase of data collection and the teacher's pseudonym.

4.2 Phase 1, Ibtisam

4.2.1.1 Observation Findings

On Monday 12th October 2015 I observed a Grade 4 maths lesson taught by Ibtisam to a mixed gender class of 24 pupils. This was the fifth lesson of the day, timetabled to begin at 10:35 and end at 11:15. The topic of the lesson was axes of symmetry, to teach pupils about how symmetrical shapes mirror around an axis. When the pupils arrived in the Interactive Room at 10:35 carrying their maths textbooks, Ibtisam had already prepared the tablets, placing them on their desks with keyboards attached so that they looked like laptops. She asked them to sit in groups, with boys and girls separated. The lesson was also attended by Mariam, the ICT teacher, and Safia, the science teacher.

As soon as pupils sat at their desks, they immediately started exploring the tablets. Ibtisam told them to stop and pay attention to her. She started the lesson with a revision of the previous one, asking questions which most pupils participated in answering. Their gaze moved between the teacher and the tablets on their desks. Some of them moved their hands to the tablets while they looked at the teacher and there was some discreet talk about the tablets among pupils. When Ibtisam noticed this, she asked them to be quiet.

At 10:50, the teacher used the interactive board to show various shapes, on which she drew axes of symmetry using a marker. She explained with examples shown on the board that there might be more than one axis of symmetry for some shapes. First, she asked the pupils to imagine what the axis of symmetry of each shape would be, then she used foldable paper shapes to explain the idea. During her explanation, she noticed that some pupils had gone back to exploring their tablets. In a soft tone of voice, she called on them to pay attention to her.

Ibtisam continued with her explanation until 11:02, when she told pupils to open a specific folder in their tablets, containing a Word document. Not all of them were able to find the file on their tablets, so Ibtisam, Mariam and Safia helped some individual pairs to locate and open it. The pupils eagerly opened the document, which showed around ten different shapes, each crossed by several lines. They were told to identify which of these were axes of symmetry and to count how many there were for each shape. They worked in pairs on this task and each pair appeared to want to finish first, as if they were in a competition, with pupils actively raising their voices when discussing which lines were to count as axes of symmetry. Ibtisam moved around the groups and with a smile asked the pupils to lower their voices. The tablets were not only attached to keyboards; some were also connected to chargers, meaning that the pupils had to sit beside the electric sockets at the side of the room. Mariam and Safia also moved around the groups to support their work.

The first pair to finish the exercise ran to the teacher carrying their tablet with its keyboard, to show her their achievement and to get confirmation of their

answers. Ibtisam raised the tablet to show the class what these two boys had achieved, then some other pairs took their tablets to show her. Not only did the pupils actively discuss their answers within their pairs; they also spoke individually to others whom they meet on their way to the teacher.

At 11:15 when the bell rang to announce the end of the lesson, not all pupils had been able to finish the task and all of them wanted more time with the tablets. However, the teacher asked them to put the tablets on their desks and leave the room, promising them another lesson with tablets soon.

4.2.1.2 Development leading to transformation

I decided to begin the analysis by separating the lesson into distinct parts to make the analysis clearer when applying the principles of AT. In regard to tablet use, this lesson can be divided into two parts, the first being the time before the tablets were used as part of the lesson and the second being when they were used.

The first part started when the pupils arrived in the room and settled in their groups. The pupils wanted to explore the tablets on their desks, but Ibtisam told them that the lesson would start with an oral revision of the previous lesson. She asked the pupils to pay attention to her in a 15-minute question and answer session. After this, she introduced the main topic of the lesson, for which she decided to use the interactive board with a marker.

4.2.1.3 Disturbance leading to Contradictions

Although tablets use only started at 11:02 which was 27 minutes after the lesson had started, they were present on pupils' desks from the moment that they entered the room and therefore played a role from the beginning of the lesson. The pupils could not ignore the tablets that were placed on their desks, as their eyes were moving between the teacher and the tablets. Some touched the tablets or became involved in a discreet discussion about them. Thus, although their use was planned for the second part of the lesson and Ibtisam did not approve pupils' wish to use them during the first part, their presence

was noticeable, as was their role in creating tension by attracting pupils' attention. The pupils had a different perspective, driven by the sight of the tablets. Many wanted to start using them immediately, while Ibtisam wanted to make the link with the previous lesson by asking pupils questions about it. These were the main viewpoints of the two Subjects during this lesson Activity. Their incompatibility created a disturbance in the first part of the lesson. Ibtisam wanted the pupils to focus their attention on her, but many could not resist dividing their gaze between the tablets and the teacher. They tried to be discreet, but Ibtisam noticed that they were discussing the presence of the tablets, so she had to stop the session in order to bring their attention back to where she wanted it, as a discussion about tablets was not supposed to happen during this part of the lesson.

History development : As this was my first observation of Ibtisam and her pupils using tablets, there was no available history of their use in earlier lessons. What follows is thus an analysis of the development of tablet use within this lesson Activity. However, the following points are also to be taken into account when analysing the observations of phases two and three, when the development of tablet use will be identifiable within the history of the overall Activity.

In this first lesson it appears that Ibtisam was faced with an early challenge as pupils entered the room. Her plan was not to start by using the tablets, but pupils immediately began to handle and examine them. Here, the teacher had to take a decision, either to modify her plan and allow the pupils to explore the tablets or to stick to the original plan and get them to work according to this. Ibtisam decided to do the latter and started asking questions about the previous lesson. Some pupils answered her questions, but not all were able to give her their full attention, as many continued to explore the tablets or to discuss them with their neighbours. The presence of the devices on pupils' desks thus created a disturbance in the task with which Ibtisam started the lesson. In fact, the pupils did not wait for her to give instructions but started exploring the tablets as soon as they sat down. Later in the lesson, however,

when Ibtisam asked them to use the tablets, they all became actively involved and paid full attention to the task that she set them.

Contradictions: In order to identify contradictions in this Activity, it is first necessary to identify any disturbances that occurred during the lesson due to the introduction of tablets, because according to AT, contradictions manifest themselves when an Activity tries to resolve disturbances. My analysis identifies the following areas of disturbance:

- In this lesson it appears that Ibtisam was faced with an early challenge. Her plan was not to start by using the tablets, but her pupils immediately began to handle them and discuss them. Thus, she had to take a decision either to modify her plan and allow pupils to explore the tablets or to stick to the original plan and get them to work according to what she wanted.
- Ibtisam's decision to continue with her original plan made many pupils struggle in responding to her order to pay attention, as shown by their shifting gaze from teacher to tablet and back.
- Having the tablets on pupils' desks from the beginning of the lesson created a distraction, as they wanted to use them immediately. This diverted their attention, at least in part, away from what Ibtisam was saying, so they concentrated on her words less than she would have wished.
- Ibtisam did not inform the pupils when they would be able to use the tablets. For 27 minutes she simply continued to tell them not to touch them, without telling them when they would be able to do so.
- Many Tools were used during the lesson, starting with the interactive board and paper shapes, leaving the tablets until the second part of the lesson, although the pupils wanted to start with the tablets.
- Ibtisam needed the support of other teachers during this lesson, which was unusual.

- The use of an external keyboard attached to the tablets was unexpected, as was the use of a Word document rather than a dedicated educational app.
- Change of roles with tablets use. When the tablets were not in use, Ibtisam did not approve of her pupils doing anything without her permission, whereas when they were in use, the pupils moved around and talked to each other without asking permission and Ibtisam did not say anything about this.
- Tablets transformed teacher's attitude. With tablets task achievement pupils moved from their seats and ran to the teachers without taking permission from the teacher which Ibtisam approved. She also with a smile expressed her change in attitude towards pupils "noise" and loud voices while discussion brought with tablets. accepted pupils moving

At first, it appeared that the use of Word documents was inappropriate for the tablets. However, Ibtisam decided to use the word processor to overcome the lack of other available apps. When I examined the tablets I found that the only apps provided were those in the Microsoft Office package. This makes it clear that the decision to use Word documents was made to enable the teacher and her pupils to use the tablets at all. The pupils enjoyed using the tablets, regardless of the minor challenges they faced, such as using a touch-screen device where the cursor moved as they touched the screen, causing them to type their answers in the wrong place. Their enjoyment of several aspects of the lesson was clear as they competed to answer, as pairs supported each other and as they wanted to continue using the tablets after the bell rang for the end of the lesson.

Safia and Mariam were present not only to observe the lesson but to take part, as they were directly involved in helping the pupils to use the tablets and in supporting Ibtisam as she supervised her pupils' work. Most of the time during the lesson, Ibtisam stood by the whiteboard in front of the class and when a pair of pupils asked for support Mariam and Safia were there to help.

Some pupils were also happy to volunteer to support other pupils and on several occasions they actively provided such support before one of the teachers arrived. This will have given these pupils confidence.

Pupils' support for each other made another space for changing class norms and the teacher's rules. During the first part of the lesson, Ibtisam was in full control of the class and did not allow her pupils to do anything without being told to do so. No single pupil moved from his/her seat without asking permission and those who did ask were denied permission. At the same time, pupils' attitudes and behaviour showed that they wanted to start the lesson by using the tablets, but they did not directly ask permission to do so, which shows their knowledge of the rules. However, when tablets were used in the second part, pupils actively moved around without thinking about permission or rules and Ibtisam expressed her approval of this by smiling at them.

Tablets were delivered to the school with external keyboards and the teachers decided to use everything that came in the box. However, attaching keyboards to tablets makes them look just like laptops and takes away many features that make them different from laptops. For example, two of the main features of tablets that are supposed to make them suitable for young pupils are their convenience and mobility. This contradiction did not stop pupils from moving around the classroom. They carried their tablets as they would carry laptops, showing their screens to the teacher and to other pairs. They moved around actively and held the keyboards firmly, so that although these were only partially attached to the tablets, leading me to think on two occasions that they were about to drop them, they were careful enough for the lesson to end without incident. None of the teachers present made any comment about the safety of the devices.

For some reason, there was no use of dedicated educational apps in any of the lessons that I observed, but this teacher found a way to use the tablets in class by using the word processor contained in Microsoft Office, the only set of apps installed on the tablets. However, pupils did not feel comfortable in working with Word documents, because of the difficulty of operating the small

touch screens. While working in pairs, they were asked to type their answers in tables within a Word document, but as they touched the screen while talking to each other, and pointing to a place within the table, they would inadvertently move the cursor from its correct place, making the rest of the words that they were typing go into the wrong cell. The tablet screens were also too small to show the whole table that the pupils were required to fill.

There was diversion of attention for both pupils and teacher. Not all pupils were able to complete the task because there was not enough time. Ibtisam asked them to leave the tablets at the end of the lesson and promised them that they were to be used in another lesson soon. Here, the focus of the teacher and perhaps the pupils was more on the tablets themselves than on the objective to be served by using them.

Transformation: Pupils' support for each other made another space for changing class norms and the teacher's rules. During the first part of the lesson before tablet use, Ibtisam was in full control of the class and did not allow her pupils to do anything without being told to do so. No single pupil moved from his/her seat without asking for permission and those who did ask were denied permission. At the same time, pupils' attitudes and behaviour showed that they wanted to start the lesson by using the tablets, but they did not directly ask permission to do so, which shows their knowledge of the rules. However, Once tablets were used in the second part, pupils actively moved around without thinking about permission or rules and Ibtisam expressed her approval of this by smiling at them.

As this lesson was at an early stage of the tablet introduction project, the teacher planned and taught the lesson as she would have done before tablets were used. She began by acting as if the tablets were not there and expected her pupils to ignore them on their desks. The pupils wanted to explore them and to start the lesson by using them. However, as the teacher decided to continue with her plan, they had limited time to explore the devices. Ibtisam's decision to postpone their use until the later part of the lesson prevented the pupils from exploring the potential of the tablets and their own abilities.

Allocating one tablet to each pair of pupils encouraged them to discuss in pairs and groups how to go about completing the allotted task. They were happy to move about to support each other and share ideas, apparently enjoying the task and hurrying to finish it within the limited time, but the fact that keyboards were attached restricted their movements and limited discussion to their seated groups. If they had been more mobile, they could have used discovery to serve the lesson in much better ways.

As to the teacher, she used the tablets in the final stage of the lesson, as if they were exercise books, for pupils to demonstrate their understanding of what had been discussed earlier. Rather than taking an overall view of the lesson, the different activities within it and the history of previous observations, Ibtisam did not plan to use tablets until she was convinced that pupils had achieved the main aims of the lesson. As a teacher, she had planned her lesson in advance, divided it into sections and Activities, then decided to use tablets towards the end of the lesson only. Her view of tablet use guided both her actions when planning these Activities and her reaction to the pupils' attempts to use tablets at the beginning of the lesson. Her fundamental understanding of tablet use in class appeared to be as devices for complementary exercises, not as a tool to be used when teaching the main part of the lesson.

4.2.2 Phase one, Safia

4.2.2.1 Observation

On Wednesday 21st October 2015, I observed a science lesson that Safia taught to a grade 4 mixed-gender class of 22 pupils, scheduled to begin at 9:15 and finish at 10:00. The topic was environmental changes caused by human activities and as Safia intended to use tablets during the lesson, she prepared them before the pupils' arrival and put them on their desks with keyboards attached.

When the pupils arrived at 9:15, carrying their science textbooks, they were asked to sit in groups. Mariam and Ibtisam also attended. Safia started with a

four-minute warm-up activity, asking the pupils about the previous lesson, which was on the same topic, then explained that this lesson would be a continuation of that earlier one. She asked the pupils to go to the desktop on their tablets and open a folder that contained a PowerPoint file. Not all of them were able to locate the file among those in the folder and those who were able to do so struggled with opening it, as PowerPoint asked for some configuration. At this point, Safia requested support from Mariam, the ICT teacher, who gave her some advice and stood to help at the same time. Ibtisam also stood and the three teachers helped different pairs to open the PowerPoint file. Those pupils who had the difficulty resolved first also moved from their seats to show other pupils how to do it. They moved without being told to do so and the teachers did not require them to seek permission. After about seven minutes, when all of the pupils had been able to open the file on their tablets, Safia also opened it on the interactive board. The first slide showed that the file had been prepared by a teacher from another school. When Safia asked the pupils to change the slide, some were unable to do so, as they were in 'design mode' and had not switched to 'slideshow mode'. The three teachers supported the pupils, showing them how to switch and move between slides.

The slides contained photos of environmental changes and at 9:33, Safia asked the pupils to comment orally on each photo. Although they were shown in a larger format on the board, the pupils enjoyed controlling the slideshow and were very active during the lesson. They used the display on the board to check that they were following correctly, as they sometimes double-clicked and skipped a slide. For each photo, Safia asked them if what they saw was natural and about humanity's role in environmental change. She did not accept choral answers and when she asked them to raise their hands individually before answering, many did so, calling "Teacher, Teacher". The class responded actively to each question and almost every pupil paid attention to Safia, with at least one member of each pair being involved in answering one question. Safia spoke to the class in a tone that was full of energy. The task continued until 10:00, when the bell rang for the end of the

lesson and the beginning of the break. As not all of the photos had been looked at, Safia asked the pupils if they wanted to take their break or continue the lesson. Only five opted for the break, while the remaining 17 preferred to continue with the lesson. However, after having eye contact with the other two teachers, Safia decided to stop the lesson, as some wanted to go. She asked the pupils to leave the tablets on the desks and go, but some did not want to leave and offered to help her in closing and storing the tablets. The teachers responded that the pupils should take their break and that the three of them would take care of the tablets.

4.2.2.2 Analysis

As Safia had spent only four minutes in reminding the pupils of the previous lesson and had then immediately asked them to open their tablets, I concluded that that the lesson comprised one main part preceded by an introductory linking task, so that it would be appropriate to analyse it as a whole, using the principles of activity theory.

Collectivity: Apart from the warm-up task, tablets were used throughout the lesson, in an Activity lasting until the end of the lesson. To construct a general understanding of their use in the lesson, it is necessary to examine in detail how they were used throughout this time. At various points during the lesson, the use of tablets can be seen differently, as each occasion presented aspects illustrating certain issues related to the introduction of tablets. There were incidents where tablet use triggered general issues, such as Safia and her pupils requiring technical support from Mariam. This support was not limited to the difficulty in opening the file, but paved the way for Ibtisam and Mariam to be involved in several other incidents during the lesson. On the other hand, it was obvious that the pupils were enthusiastic about using the tablets, paying close attention to the lesson and participating strongly. These issues are discussed further in the following paragraphs.

Multi-voicedness: Different viewpoints were represented within the Activity. First, Safia asked the pupils if they wanted to prolong the lesson into the break, showing her willingness to continue the lesson and to give up her free time to

do so. However, recognising that the break was also meant for the pupils, she decided to ask their opinion. Although only a few said that they wanted to take the break, she recognised that not everyone wanted to continue and decided to stop the lesson, not wishing to deny those who did not want to continue their right to a break. Interestingly, maintaining eye contact with other teachers as she gave her final decision made it appear that she was seeking their opinions and their approval of the decision that she was about to take. The second point concerns the pupils' enthusiasm about using tablets in the lesson and their desire to make progress, shown by the observation that some offered to help their classmates once they had learned how to open the file. Their enthusiastic involvement in the lesson and the use of tablets was reflected in the fact that they did this without being told. As to the teacher, she made no objection to their moving from their seats and accepted that some pupils had the chance to share what they knew, thus helping their teacher by helping the other pupils.

History: The development of the tablet Activity is evident when the Activity is viewed in relation to its history, which is to be viewed both as development within the Activity and as the overall history of the Activity. As this was my first observation of Safia's use of tablets in the classroom, no overall history of her teaching with tablets existed. However, Safia had attended the lesson that I observed a week earlier, where Ibtisam used tablets, and there were evident similarities between these lessons which are discussed in the summary of phase one (Section 4.4.7).

As to history within the Activity, there was a noticeable change in the pupils' level of enthusiasm during the lesson, which began with them moving normally and listening attentively to the teacher as they waited for her instructions on what to do next. When they were asked to use the tablets there was a sudden burst of energy as they rushed to open the PowerPoint file, assuming that it would as usual be an easy task that they could do on their own, but they were faced with the first challenge which restrained their impulse and forced them to stop and wait for support. Not all pupils stopped for long and many actively continued using their tablets as the teachers helped individual pairs. Although

the pupils were asked to work in pairs, they did not care only about success within their own pairs, as those who had learned how to solve the problem went to help others. Their passion for using the tablets did not make them inconsiderate of their peers who were not able to start. The pupils remained alert throughout the lesson, following Safia's instructions and answering her questions. The whole class called out in response to her question about the first picture and when she disapproved of this and asked them to raise their hands for permission to answer, the pupils did so, demonstrating their enthusiasm by calling "Teacher, teacher". This continued with every slide and when the lesson ended before they had seen them all, a majority of the pupils were ready to give up their break time to continue the lesson. Furthermore, the fact that five pupils preferred to take a break does not indicate that they had not enjoyed the lesson.

It is notable that Safia stopped as soon as she was faced the first challenge, as she was unable to suggest how to open PowerPoint on the tablets. In fact, she did not even try, but instead immediately turned to Mariam for help. There were other examples, as Mariam and Ibtisam continued to support the pupils throughout the lesson and Safia appeared to depend on them in monitoring and supporting several pairs.

Contradictions are visible in attempts to resolve disturbances within an Activity. Although not every disturbance will necessarily lead to a contradiction, it was again important to begin by identifying the following disturbances that occurred during the lesson in relation to the introduction of tablets.

- The need for technical support required the ICT teacher to be present in the lesson.
- The PowerPoint presentation was shown on the smartboard, although pupils had the same material on their tablets.
- Pupils' movement round the room was restricted by the tablets being connected to keyboards.

- Safia continued to talk to the class as a whole, regardless of the fact that they were working in pairs, and in return they replied together with one voice.
- Enthusiasm made Safia hurry through a session of rapid questions and answers to cover as many slides as she could within the limited time available. The pupils rushed to switch slides.
- The use of a PowerPoint presentation on devices with highly sensitive touch screens resulted in several pupils accidentally changing slides at the wrong time by touching the screen while discussing a photo.

It is not clear why there was no use of educational apps, but Safia decided to use what was available, which was a PowerPoint presentation that had already been prepared. Despite minor problems such as multiple touches causing unwanted multiple slide changes, the pupils engaged strongly with the lesson. The use of tablets gave every pupil the chance to participate in controlling the PowerPoint slides, instead of them being entirely controlled by the teacher. Safia made use of her pupils' engagement by involving them in a question and answer session, asking them open questions to elicit their knowledge of the topic and relate it to the photos provided.

On the other hand, the fact that Safia decided to show the PowerPoint slides simultaneously on the smartboard projector while the pupils viewed them on their devices, thus using two teaching technologies at the same time to present the same photos, appeared to be a strange approach to the task. However, it became apparent that this was useful for pupils who had lost track due to inadvertent slide changes to know which slide the teacher was talking about. On several occasions I observed pupils checking that they were in step with their teacher by looking at the smartboard.

Transformation: The pupils were not only following the teacher, but also controlling the display of slides on their tablets and referring to the smartboard display to keep in step with the rest of the class. Safia empowered the individual pupils through their use of the tablets to control the display of the

PowerPoint slides. As they were working in pairs, all pupils had the opportunity to change the slides by touching their screens. Safia's use of the smartboard projector to provide a reference for pupils meant that while controlling their own slides, they could keep track of the lesson progress and discuss slide together as a class.

Almost all pupils participated in the whole class discussion with Safia, but they also had many small-scale discussions in their pairs. They thus engaged actively in discussing each photo in two ways. Safia asked them a rapid series of questions and they competed to answer first. However, those who were not given a chance to answer aloud were able to discuss their ideas with their partners. Safia was as active as her pupils, throwing out questions one after another. This action was useful for the discussion that she led, which was meant to engage every pupil in the class. However, the speed of this process meant that the pupils did not have much time for further discussion in pairs before the next question.

Safia lost a few minutes at the beginning of the lesson when the use of tablets was interrupted by a technical problem. It was not only a matter of lacking knowledge or experience; Safia did not waste time, which she knew was limited, on trial and error but turned directly to Mariam for help. Having offered some initial advice, Mariam gave further support by helping some of the pairs to open the file and Ibtisam also came forward to provide what support she could. Finally, the support that Safia received was not limited to her colleagues, as some pupils also helped to support their classmates.

Safia allowed the pupils to leave their seats to help each other without permission from her, but later in the lesson she told them to ask permission before giving answers to her questions. In a situation where both pupils and teacher were hurrying through the lesson, with rapid questions being answered immediately, Safia had to decide what was acceptable and what was not, in other words, whether to allow the pupils to continue to depart from the usual rule that pupils would need permission to move from their places or speak out loud. There were other occasions where Safia had to take

challenging decisions, such as asking pupils if they wanted to continue the lesson during the break, which indicates that she was willing to break the normal rule regarding the daily timetable. Finally, by making eye contact with her colleagues, Safia showed that she was consulting them and involving them in a major decision about her lesson.

4.2.3 Phase one, Khawla

4.2.3.1 Observation

On Wednesday 26th October 2015, I observed Khawla giving an Arabic language lesson to a grade 4 mixed-gender class of 24, timetabled to start at 11:20 and end at 12:00. Khawla intended to use tablets during the lesson, which was about reading skill, specifically reading aloud. Before the lesson, she explained to me that her limited knowledge and use of technology meant that she needed support from other teachers. Because the ICT teacher was not free, her colleagues Safia and Ibtisam volunteered to help. Khawla prepared the tablets so that when the pupils entered the interactive room carrying their Arabic textbooks, the tablets were on their desks with keyboards attached.

When the pupils arrived they were asked to sit in five single-gender groups. Ibtisam and Safia attended from the beginning and helped Khawla to start up the tablets and download the lesson file from a memory stick onto each tablet. The pupils were immediately asked to open a specific folder. As it contained many files, the pupils did not know which one to open. Khawla told them the name of the Word file they should open and her colleagues moved among the pairs to make sure that they all opened the right one. The file contained three pages scanned from the textbook and Khawla asked the pupils to read these silently. They quickly started to read and since the tablets were connected to keyboards, some pairs decided to take turns in reading, moving the tablet to face them one at a time.

At 11:32, some pupils said "We've finished" and Khawla gave the class two more minutes before she gave out the next task. She asked the pupils to

suggest a title for the first paragraph and individual pupils quickly responded by shouting out their suggestions. Khawla asked them to read the paragraph again and gave them three options. In less than a minute some individuals loudly suggested one option as others shouted another, then Khawla agreed with one girl who had chosen the right title.

At 11:43, Khawla asked one pupil to come to the front of the class and read aloud from her tablet, but then stopped her because she noticed that many pupils were exploring their tablets and not paying attention. She told the class to follow the text as the girl read aloud. After she had read half a paragraph at a good reading speed, Khawla stopped her again and asked another pupil to continue reading aloud from his place in the room, rather than coming to the front of the class. As this procedure was repeated, I observed that each reader had to detach the tablet from the keyboard in order to stand and read, leaving the other member of the pair without a tablet on which to follow the text. Some looked bewildered and unsure of what to do, some decided to join another pair and others simply sat idle. The pupils were also all using a stylus to follow the text and note where the reader had reached. As Khawla continued to ask different pupils to take turns in reading aloud, she noticed that some of those who should have been following were not doing so, but talking about different topics while exploring their tablets. She asked them to be quiet and to follow the text as she asked a girl to continue reading. Just before the end of the last paragraph, Khawla asked one pupil to stop yawning. The bell rang just after the last paragraph had been completed and Khawla instructed the pupils to close their tablets and leave the room.

4.2.3.2 Analysis

In this Activity, tablets were used from the beginning of the lesson, but for two separate tasks, so I decided to break up the analysis into two corresponding parts. The first part started once pupils had settled into their groups. They began by exploring the tablets on their desks, then Khawla directed them to look in a specific folder for the file to be used in the lesson. At this point, all pupils were happy to listen and do what she asked, which was to use their

tablets in a silent individual reading task that lasted 22 minutes. In the second part, which started at 11:43, tablets were used in a reading aloud task, where one pupil at a time read for the whole class and the others followed the text using their styluses.

Collectivity: The collective view of the lesson shows that Khawla used her previous teaching experience to help her manage the overall lesson with tablets. However, Actions and Operations within the lesson presented more details that were dissolved in the lesson. In the collective view, it appears that although Khawla's knowledge and use of technology were limited, her general teaching experience helped her to lead the lesson, as she used the pupils' interest to direct it. The pupils began exploring the devices as soon as they entered the room and the teacher allowed them to do so, as she planned to use tablets from the beginning of the lesson. Moreover, she had decided to use tablets throughout the whole lesson, since she knew that the pupils loved technology. Regardless of her own lack of experience in using technology, she incorporated her twelve years of teaching experience in planning the lesson.

Khawla wanted all 24 members of the class to use tablets in working towards her Object, but while the pupils were keen to use tablets, not all of them shared her Object. At this stage, the teacher continued to teach in her usual way, simply using the tablets as electronic replacements for the books that she would normally have used, with her teaching style unchanged, asking the pupils to stand up and come to the front of the class to read aloud. For those at their desks, Khawla did not notice that the keyboards attached to the tablets changed the screen angle, making it difficult for pupils to read while sharing tablets. By allowing the pupils to explore the devices at the beginning of the lesson, she ensured that they all had the same Object as her, for some time at least. However, individual pupils had their own Objects which differed from the teacher's when she asked them to follow the text while one pupil read aloud. Although Khawla knew that the pupils' Motives were different from her own, she wanted them to use the tablets to achieve her Object, regardless of

these differences in Motives. It was a chance for the teacher to divert pupils' Motives to serve her Object for the lesson.

Multi-voicedness: There was little disagreement between teacher and pupils at first, since Khawla's plan matched the pupils' desire to use their tablets from the beginning of the lesson. However, a difference in viewpoints appeared during the second part of the lesson when Khawla asked individual pupils to read aloud and the rest were to follow. Here, many pupils wanted to do something else and so did not follow the reader as they were told. This divergence of views did not happen in the first silent reading part of the lesson, as all pupils had roles that they were satisfied with.

History: In part one, the pupils found it uncomfortable to read in pairs with tablets fixed to keyboards, which they dealt with by leaning over the screen and taking turns in reading, whereas in part two each pupil who was asked to read detached the tablet from its keyboard and held it in his or her hands while reading.

The viewpoints of Khawla and her pupils matched in part one, when she asked them all to read silently from their tablets. They were very keen to use the tablets and were expecting further activities that would allow them to use the devices and to explore their features with their fingers, rather than simply holding them to read. This expectation was reflected in part two, when pupils started to explore the devices on their own without the teacher's consent, having lost interest in the undemanding task she had given them.

As this was my first observation of Khawla's use of tablets, there was no overall history of her using them in class. I noticed, however, that the teachers were attending each other's lessons to offer help and support, which would also help them to learn from what they observed in others' lessons. Furthermore, at the end of the first phase it would allow me to consider the history of the tablet introduction Activity by comparing the different lesson Activities. In the event, Khawla was the only participating teacher who did not attend the lessons given by her colleagues which I observed for the study.

Contradictions: Khawla did not want to begin introducing tablets into her lessons without having other teachers in class ready to offer support, but the two teachers who joined her barely did anything essential for the completion of the lesson. Her insistence on their presence may be seen as unexpected, given that Khawla was a confident teacher with twelve years of experience. Indeed, she demonstrated her confidence by willingly participating in the study and welcoming me as a stranger to attend her classes.

In part one, where all pupils had a role in the reading task, they organised themselves in a way that helped them to best perform the task. As everyone had a role and knew what to do, the pupils accepted what they were asked to do and listened to the teacher, making her plan go smoothly. However, in part two where only one pupil was to read at a time, the rest of the pupils were not satisfied with the role of following the text using a stylus. This created a contradiction as pupils started to work on something else.

Safia and Ibtisam helped in checking that all pupils were opening the right file for the lesson and as there was no technical issue they did nothing else, but their presence gave Khawla psychological support, which she needed more than technical support.

The pupils decided to take turns in reading silently from their shared tablets, because the seven-inch screen being attached to a keyboard obliged them either to view it from the side, at an inconvenient angle, or to take turns in their pairs. Even when only one pupil was reading from each tablet, having it attached to a keyboard determined the angle at which they could view the text. Pupils would usually put a book on the desk and view it vertically from above. They could have done this with a simple tablet, but with the keyboard in place, they had to lower their heads in order to face the screen horizontally.

Tablets enable users to enlarge photos and Adobe files, but during this lesson the pupils read from a scanned text inserted in a Word document, which did not allow them to use the finger-driven enlargement feature.

Transformation: From the teacher's perspective, Khawla used the tablets as if they were textbooks. The pupils each had a textbook with them, but each pair had to share a tablet, which created two conflicts. In part one, some pupils found it easier to read one at a time and decided to take turns, which doubled the reading time. In part two, as one pupil from a pair stood to read holding the tablet, the other was left sitting with no tablet. Some joined another pair but those who did not were excluded from the Activity while their partner was reading aloud. Overall, reading a text meant that pupils did not have to touch the screen or click different icons. Pupils' behaviour towards the end of the lesson Activity reflected what they felt about it, as they stopped doing what the teacher asked and some were visibly bored, prompting the teacher to ask one pupil to stop yawning.

4.2.4 Summary of phase one

As all phase one observations were of the first lesson in which each teacher had used tablets with her pupils, there was no overall history of tablet use in class. Each of the lessons observed was attended by two other teachers, at least one of whom was a full participant in this study, and in all cases the teacher giving the lesson required some support from these colleagues.

Pupils showed a keen interest in using tablets in the lessons and had they not been controlled by the teachers they would have started using them as soon as they entered the room. Many pupils helped their teachers by helping other pupils who needed support. They appeared to be motivated to do all they could not to waste time on problems that they were able to solve.

There was not enough time to complete two of the three lessons, while in the third, the bell rang just as pupils finished the last paragraph of a reading lesson.

The use of tablets enabled the science teacher to provide a good number of photographs, asking pupils to comment on them by using their existing knowledge. Tablets were used in all three lessons to take up topics that had previously been introduced and two of the teachers began the lesson without

using them. During all three lessons, the tablets were connected to keyboards, making them stand like laptop screens. The teachers did not have access to educational apps, but instead used Microsoft Office components with which they were familiar, namely Word and PowerPoint.

The three participating teachers and the school's ICT teacher supported each other in planning and delivering the lessons. The participating teachers appeared to rely on Mariam's technological skills, knowledge and experience whenever she attended their lessons. The teachers also learned from observing each other. Safia attended Ibtisam's observed lesson nine days before her own and the similarities in the way that these two teachers went about their lessons indicates that they cooperated well and learned from each other.

The use of tablets in Ibtisam's lesson provided the opportunity for members of the community to participate directly in the lesson, as the three participant teachers, along with the ICT teacher, discussed before the lesson how to go about it and what help Ibtisam might need.

4.2.5 Phase 2, Ibtisam

During the second phase of observations, the three teachers continued working together in their planning of tablet use. Here I present my AT analysis of one lesson as an example of their teaching during this phase.

4.2.5.1 Observation

On Monday 7th December 2015, I observed a maths lesson on the topic of shapes, given by Ibtisam to a grade 4 mixed-gender class of 23 pupils, timetabled to run from 10:35 to 11:15. As before, the teacher had prepared the tablets in advance, so that when the pupils arrived, carrying their maths textbooks, the tablets were on their desks with keyboards attached.

At 10:35, Ibtisam asked the pupils to sit in single-gender groups, of 14 girls working with 10 tablets and nine boys working with five tablets. The pupils immediately started exploring the tablets, but Ibtisam told them to stop and

pay attention to her. One group of girls immediately put their tablets down, whereas the rest of the class was slower to do so and four boys went back to their tablets just a few seconds after putting them down. Again Ibtisam asked the class to pay attention and when it took some pupils several minutes to do so, she warned them that she would take the tablets from them. After making sure that they were all paying attention to her, she began an explanation, using the whiteboard, of what a square is and how it differs from other shapes. Most pupils paid attention as she continued explaining about right angles and equal sides, the exception being three boys who went back to exploring the tablets on their desks. A few minutes later, three girls started to do so as well. When the teacher looked angrily at two boys because they were talking and not listening to her, one tried to explain that he was only clicking on the keypad, not talking. She asked them a comprehension question which they answered correctly, so she continued her explanation with examples of different shapes, their angles, the properties of their sides and their distinguishing features. Two minutes later she looked angrily at all of the boys' group but said nothing, then after two more minutes she looked angrily at them again, asked two boys to stand up and continued her lesson while they were standing. One of the two boys continued to work on the tablet while he was standing. Ibtisam angrily asked him a comprehension question and when he answered correctly she allowed him to sit.

At 11:07 Ibtisam finished her explanation and started the projector to show a five-minute PowerPoint slideshow in which she presented a summary of what she had explained in the first part of the lesson.

At 11:12 Ibtisam asked the pupils to open their tablets to work on a task she had downloaded before the lesson started. They had a Word document containing an image of a square on which they were required to name the sides and angles. When, almost immediately, the bell rang to announce the end of the lesson at 11:15, Ibtisam stood in silence as the pupils expressed their dissatisfaction, then they continued working on the task despite the lesson having officially ended. They needed to change the language between Arabic and English and many asked the teacher for support. The pupils

discussed within their groups how to complete the task and worked together in haste. Those in one group offered to help the members of another group, showing them how they had found the 'virtual keypad'. Two girls took their tablet to show the others that it was easier to use this than the external keypad. Some others accidentally split in two the table that they were supposed to complete in the document. Finally, the teacher asked individual pupils to come forward and write their answers on the whiteboard. At 11:30, she asked the class to close their tablets and leave the room.

4.2.5.2 Analysis

This analysis divides the lesson Activity into three parts. During the first part, which started as soon as the pupils had settled in their groups, Ibtisam spent 32 minutes introducing the main topic of the lesson, which was the sides, angles and properties of various shapes. Tablets were present but not used and when some pupils tried to start using them Ibtisam disapproved. Their presence thus created a disturbance for both pupils and teacher. From time to time, some pupils would start touching the tablets and whenever Ibtisam noticed this, she stopped them. In her attempts to keep the pupils focused on her and the whiteboard, she warned them that she would take the tablets if they did not pay attention to her.

Part two was a PowerPoint-mediated Activity in which Ibtisam used the projector to give a five-minute summary of her earlier explanation.

Tablets were finally used in part three, when Ibtisam introduced an exercise asking pupils to use a Word document on their tablets to name the sides and angles of given shapes. As this part of the lesson started there were only three minutes of lesson time left. The pupils showed their disappointment when the bell rang, as they had been eagerly waiting to use their tablets. They decided to ignore the bell and continue with the task, which lasted for 18 minutes. Ibtisam allowed them to continue until they had completed the task and she also asked a few individuals to write the correct answers on the whiteboard, before announcing the end of the Activity at 11:30.

Collectivity: Tablet use is to be viewed in relation to all parts of the lesson, not only the part that tablets were used in. Although they were not used until three minutes before the timetabled end of the lesson, their presence was felt from the moment the pupils entered the room. The pupils wanted to use the tablets immediately, but Ibtisam's plan was to start with an explanatory whole-class Activity to ensure that all pupils would hear and understand the topic she was introducing. The pupils were distracted by the tablets, leading Ibtisam to warn them that she would take the tablets from them. These distractions extended the time needed for this introduction to 32 minutes, leaving little time for the PowerPoint summary and very limited time for the third part, where tablets were used.

Multi-voicedness: The presence of the tablets during parts one and two created conflicting views among the participants: Ibtisam wanted the pupils to pay attention to her introductory explanation, whereas many of them wanted to begin using the tablets immediately. She insisted on completing the lesson as planned, but some pupils were unwilling to wait until she told them to use the tablets and began to do so without permission. These non-matching viewpoints disturbed the first part and made it last longer than planned.

Conversely, when Ibtisam allowed the use of tablets in part three, her viewpoint was in harmony with her pupils' desire and this harmony continued even after the bell rang, as she allowed them to carry on using the tablets. The pupils' wish to complete the tablet-mediated task was evident from their audible disappointment when the bell rang. At first, as Ibtisam appeared undecided and confused, many pupils prompted a decision by not stopping their Activity, which she accepted, despite knowing that allowing her pupils to continue working on their tablets after the bell meant taking time from the next lesson.

History: The development of the lesson Activity can be understood by viewing it within its own short history, as this was the second lesson in which I had observed Ibtisam using tablets with her pupils. Table 16 lists some points of similarity and difference between these two observed lessons.

Table 16: Similarities and differences between Ibtisam's lessons

Similarities	Differences
<ul style="list-style-type: none"> - Tablets were on pupils' desks when they entered the room. - Tablets were connected to external keyboards, making them resemble laptops in front of pupils. - Ibtisam decided to start with other tasks before getting to the tablet-mediated task. - Only Microsoft Office apps were used. - Both lessons ended before pupils had completed the tablet-mediated task. 	<ul style="list-style-type: none"> - In phase 1, tablets were used to continue a previously taught topic, whereas in phase 2, they were used in a lesson introducing a new topic. - Ibtisam ended the first lesson on time, without completing the tablet-mediated task, promising to use tablets again soon, whereas in the second lesson, she allowed pupils to continue working after the bell.

Ibtisam began her second lesson by leading the class, exercising full control over what was done and when. However, the tablets distracted the pupils and became the focus of their attention, so although Ibtisam refused to allow them to use them, some pupils chose to ignore this instruction and tried to use the tablets without her noticing. Not willing to lose control of the lesson, the teacher insisted on her plan and looked angrily at pupils whenever she noticed them handling the tablets. This continued throughout the lesson until Ibtisam decided that it was now time to use them. In part three, the pupils took the lead by choosing not to stop when the bell rang. This time, Ibtisam decided to conform to her pupils' wishes and allowed them to continue working with their tablets.

Contradictions: Attaching external keyboards to the tablets, thus effectively converting them into laptops, negated the mobility which is a main feature of tablets for pupils. The keyboards created a disturbance, as they made it difficult for pupils to share control of the tablets. Eventually, some pupils found the virtual keyboard and happily informed others that it was easier to use, as it made them focus their eyes and fingers on the screen, rather than looking at the keyboard while typing in the wrong cell.

The use of Word documents also presented difficulties for pupils, especially in combination with the touch-screen feature. They found it difficult to type into a Word document on such a small screen, which did not display the whole of the table that they were asked to complete. Mistakes were introduced when pupils touched the screen, thus moving the cursor from one cell to another, when pointing to show each other where to type. They also sometimes created confusion by breaking the table into two, especially as they were rushing to finish within the extra time allowed.

Finally, Ibtisam allowed pupils to continue working on the tablet Activity for more than 15 minutes after the bell and that time was taken from a lesson with another teacher. Moreover, as the pupils were in the interactive room, they would need some time to return to their usual classroom, meaning that almost 20 minutes will have been lost from the next lesson, creating a disturbance for the teacher of that lesson which would continue beyond the following lesson, as that teacher would have to make up the lost time by taking some time from another lesson on another day.

Transformation: During part three of the lesson, the pupils worked together to complete the tablet-mediated task and although each pair of pupils shared a tablet, they discussed how to go about completing the task in groups. Moreover, many pupils moved between groups to support each other and to inform others of better ways of working, such as using the virtual keyboard. Despite the pressure of time, they appeared to be enjoying the task and were determined to finish it before being told to stop.

By contrast, the overall shape of the lesson reflected the history of the earlier lesson observation, with Ibtisam dividing the lesson into tasks and Activities and planning to postpone the use of tablets to the third part of the lesson. She stuck to this plan for most of the time, but changed her mind when the bell rang, agreeing with the pupils that they could have more time to complete the tablet-mediated task.

4.2.5.3 Summary of phase two

The three subject teachers and the ICT teacher helped each other in planning and preparing to use the tablets, as if their joint mission was to make the most of the opportunity to learn how best to use tablets in the classroom. They then used the tablets for complementary exercises rather than when teaching the main topic of each lesson. Therefore, the three teachers continued to use PowerPoint and Word materials on the tablets. However, they expressed in post-observation interviews an increasingly strong desire to connect the tablets to the internet.

4.2.6 Phase 3, Safia

4.2.6.1 Observation

Arrangements were made to observe a 40-minute science lesson given by Safia on Tuesday 15th March 2016 to a mixed-gender grade 4 class, in which she intended to use tablets connected to the internet. The school had recently received three Wi-Fi broadband routers. However, the ICT teacher, Mariam, was advised by Ali, the visiting technician hired to support the school on ICT matters, to use only one router, on the grounds that it would be enough for 15 tablets and that it would be a waste of resources to subscribe to three bundles at the same time.

Arriving 15 minutes before the timetabled start of the lesson, I observed the final stages of the setting up of the room and the tablets, which the teachers present, Safia and Mariam, told me had started an hour and 25 minutes before my arrival. This time was used to prepare the tablets for the delivery of a lesson which Safia had already prepared. As the tablets had not been connected to this router before, Mariam helped Safia to configure the devices and they tried each tablet in turn. This set-up took so long that both teachers had to ask colleagues to cover the lessons that they were timetabled to teach before the observed one. Their plan was to use a SIM card to subscribe to a daily internet bundle providing one gigabyte of data. The first few attempts to subscribe to the bundle failed for an unknown reason. They tried removing

and reinstalling the SIM card before restarting the router, but were still unable to subscribe. They then removed the SIM card and used it in a mobile phone, which did enable them to subscribe to the bundle. Setting up the tablets and ensuring that they were all connected to the Wi-Fi then took a long time, so that only 11 of the 15 tablets were ready in time for the lesson. Safia and Mariam agreed that this would be enough, so they distributed the 11 tablets on the pupils' desks. While the teacher was enthusiastic about using the internet in class, she said before the lesson started: "I'm not very optimistic. If it does not work we will sit idle doing nothing". This was to be not only the school's first lesson with an internet connection, but also the first time that pupils would use the tablets without keyboards attached.

When the pupils arrived, Safia asked them to wait outside for her to call them in individually, pair them up and tell them where to sit. All pairs sat in rows facing the front, waiting to be allowed to use the tablets, which were face down on their desks and which they were instructed not to touch yet. Speaking in Arabic, the language of instruction for science, the teacher began by asking questions to elicit the word "internet". To her first question, "Where do we get information from?" the pupils answered "Computers and tablets", so she asked "What do we need to use to get information from tablets?" When the pupils answered "Applications", Safia asked a third question: "And from where do we download applications to tablets?" Finally, a pupil answered "From the internet". Having spent two minutes in eliciting this response, Safia asked the class to use their tablets to search the internet for references to dinosaurs. All pairs opened their browsers but discovered that not all tablets had a connection.

All of the pupils participated actively, eagerly trying different possible ways to connect. When a pair of pupils said that they had "got something", meaning a connection, the teacher asked them to show her. Connectivity was not stable, however, and did not allow the pupils to perform the allotted task, with the result that there was constant movement from their places to the front, either to show the teacher their connectivity or to seek her support. At one point there were 10 pupils surrounding the teacher and only four of the 20 in

the class seated at their desks. Safia asked the whole class to sit back on their seats so that she could coordinate their efforts to solve the connectivity problem. She invited suggestions from the class and each time a pupil made a suggestion she asked them to try it out. One boy suggested that they might get a better signal closer to the router and another that the signal would be better outside the room. The teacher continued to accept pupils' suggestions and was very pleased with their engagement in the search for solutions. Ten minutes were spent on looking unsuccessfully for network connectivity and I noted that the teacher used the word 'network' more than 35 times during the lesson.

One suggestion which appeared to be successful was to reduce the number of devices connected to the internet to four. After more than twelve minutes of signal search, the teachers finally asked the pupils to work in groups around four tablets that were connected. The pupils gathered in groups but continued holding all of the tablets in their hands. Clearly they had not lost hope of connecting all of the devices to the internet. They began to discuss how to search using the four tablets as instructed, although this was not straightforward with eight to twelve hands in each group. As a result, not all pupils were happy to work in groups and some went back to searching for connectivity on their tablets. Many began again to move around the room to show their search results to the teacher, who in turn held up their tablet to show the rest of the class what each group had found. As pupils were moving from their seats and the teacher was busy talking to different children, she noticed that one pair had connectivity but were working off task, searching for car racing. She punished them by telling them to stand and to stop using the tablet.

The lesson ended without the class having completed the teacher's planned task of searching the internet for anything related to dinosaurs. One girl obtained connectivity just after the bell rang and uttered a colloquial phrase indicating that the tablet was "rubbish" because it only worked after the bell. The teacher asked the pupils to leave the tablets on their desks and go back to their own classroom, promising that they would try again another time. Two

girls continued working after their classmates had left the room and when they were asked why, explained that they were helping the teacher to turn off the tablets. After the lesson, Safia reported that she was very happy at having elicited eight suggestions from pupils to resolve the difficulty in connecting the tablets to the internet.

4.2.6.2 Analysis

Tablets were used from the beginning of this lesson Activity, as soon as the pupils entered the room. As they used tablets throughout the lesson, this analysis does not break it into parts.

Collectivity: The use of the internet required the devices themselves to be set up before they could be used in this lesson, which was totally different from the preparation of tasks to be performed on tablets, as described in relation to earlier observations. Safia realised that she could not set up the tablets on her own, as it involved completing several steps within a limited time. Even with the help of Mariam, making sure that all tablets had sufficiently charged batteries, checking their connectivity to the internet router and downloading the prepared task to each tablet required so much time that she had to swap classes with other teachers. Safia spent an hour and forty minutes on setting up before the lesson and was only able to finish within that time with Mariam's help. It is likely that she would have been unable to set up the 3G router in time without the ICT teacher's support. Spending so much time on setting up and facing so many challenges before the actual lesson reduced Safia's optimism about the Activity. Having had no time to prepare an alternative lesson plan, she worried aloud that nothing might be achieved in the lesson.

Multi-voicedness: In this lesson, the use of the internet made the involvement of members of the school community obvious. The ICT teacher was present during the set-up and the lesson, while other community members not directly present were also involved. The cooperation of other teachers was necessary to the execution of the Activity, to swap classes with both Safia and Mariam. Indeed, the range of Community involvement in the this Activity extended to include people who were not present in the school at

the time, such as the technician who had recommended the use of only one 3G hotspot router. His involvement turned out to affect the Activity negatively, as it became obvious that this was not sufficient to connect all eleven tablets. Following Ali's advice had the consequence that when one pair of pupils succeeded in connecting their tablet to the internet via Wi-Fi, another pair lost their connection. Thus, the connection was always lost within a few seconds, before the pupils had the opportunity to search for anything.

History: The lesson started with the teacher deciding who should sit where and with whom. By imposing this arrangement, she was implementing extra rules to facilitate her work when the tablets were being used. However, as she had not had time to prepare an alternative task for the pupils, she had to compromise her original pairing and seating rules when the tablets proved difficult to connect. As the pupils followed her instruction to look for solutions to the poor connectivity, she allowed them to move freely around the room to show her or their classmates what they had found. However, there were limits to what she considered acceptable, as shown by her refusal to tolerate a pair working off task. Again she implemented her rules by punishing these two pupils.

In addition to Safia's rules, there were school rules which could not be ignored. The lesson duration was unchangeable, to fit within the fixed school timetable imposed on all teachers and pupils. Knowing this, Safia spent several valuable minutes on pairing the pupils and on eliciting the word 'internet' from the class. She then gave over the rest of the lesson time to trying out the pupils' various suggestions. Having struggled to find enough time to set up before the lesson started, she was unable to finish the planned Activity within the scheduled time.

Contradictions: As Safia was not ready with an alternative plan, she asked her pupils to find solutions to the connectivity problem. The children played an important role in supporting her during the lesson, as they took the lead and worked actively to find solutions. Rather than remaining passive, they participated fully in that part of the Activity and appeared to enjoy doing so.

On the other hand, having started the lesson with an authoritarian stance, imposing her seating and pairing decisions, Safia was later open to pupils' suggestions, giving them a leading role in the Activity. After the lesson, she expressed her satisfaction at having received eight suggestions from pupils in response to the connectivity challenge. Indeed, listening to these suggestions almost led to a solution, in the form of reducing the number of working devices to four.

Apart from the teacher and pupils, whose roles exist naturally in every lesson Activity, the ICT teacher played the fundamental role of supporting Safia in preparing for and executing this Activity. The roles of other members of the community were also obvious, as Safia would not have been able to find time to set up the room and tablets without their involvement and cooperation. Finally, despite not being present in the school, the technician had a role in the Activity, affecting its outcome by his advice to use only one Wi-Fi router.

Transformation: Tablets had transformed the lesson Activity, as all pupils were actively participating in the lesson and only four of the twenty pupils were seated at their desks, while ten pupils surrounded the teacher. Pupils were not only actively involved, but also they took the lead to find solution in order for the lesson to get started. Pupils were trying their best to get tablets connected to internet as Safia invited them to make suggestions and appeared to enjoy receiving their suggestions to the extent that she forgot about her lesson aims. Overcoming the connectivity challenge appeared to be her new aim, while the pupils' required task became connecting their tablets to the internet. Before the lesson started, connecting the tablets to the internet was meant to be a means of achieving the lesson aims, but during the lesson her aims changed. At the end of the lesson she was satisfied with what had been achieved, even though only one group had been able to connect to the internet and find one minor piece of information. Safia demonstrated her satisfaction to the class by holding up the tablet in question for them all to see.

4.2.7 Phase 3, Ibtisam

4.2.7.1 Observation

On Wednesday 16th March 2016 I observed a 40-minute maths lesson which Ibtisam gave to a grade 4 mixed-gender class of 23 pupils, timetabled to begin at 10:35. Ibtisam's aims were to teach pupils about geometric shapes. When the pupils arrived, carrying their maths textbooks, she had already spent a long time in the room preparing the tablets and the materials she intended to use during the lesson, but had not placed the tablets on pupils' desks.

The lesson started once the pupils had entered the room and sat in two groups of boys and three groups of girls. The teacher started by asking one pupil to sit up straight and by reminding the rest of the class to sit properly on their seats. She introduced the topic by eliciting examples of two-dimensional shapes from pupils, then spent fifteen minutes using small objects to represent different shapes and explaining verbally how plain figures such as the circle, triangle and square differed from solid geometric shapes such as cylinders and pyramids. She delivered this explanation standing in front of the class by the interactive board and the whiteboard, but did not use these.

At 10:50, Ibtisam asked the pupils to fetch the tablets and connect to the internet using Internet Explorer. Individual pupils started to call out, asking for the teacher's support, and these calls quickly became louder and more numerous. It was clear that no one was able to connect the internet, so Ibtisam gave verbal instructions to the whole class on how to log on using a five-character password, which was simply the letter Y repeated five times. With many pupils' shouting loudly that this was not working, Ibtisam moved between the different pairs for 15 minutes without being able to connect any of the tablets to the internet.

At 11:05 the ICT teacher entered the class to support Ibtisam and started by reminding everyone of the password for the network. Ibtisam wrote this on the whiteboard and gave instructions to the pupils to search for "cylindrical shapes". Mariam picked up a tablet to check why it was not making a

connection. After two more minutes, during which no one was able to connect a tablet, Ibtisam said: “Put your tablets aside. We will wait. The network might come back later, but for now pay attention to me”. Using a laptop connected to the smartboard, she then opened a Word document into which she inserted a table, asking the pupils to fill it with similarities and differences between a cylinder and a cone. One pupil came to the laptop to type an answer and as she could not switch the language from English to Arabic, another girl was called to help with switching the typing language. Meanwhile, more than nine pupils were still working on their tablets and wanted to switch the language on these devices as well, despite having no tablet-mediated task to work on. They called the teacher, saying “We don’t have that”, referring to the language switch icon. For five minutes, these pupils tried to switch the language on their own, then the teacher came to help as one boy came to the laptop to type in a similarity. He appeared to be looking for each letter when typing with one hand while standing in front of the class. It was the same when another girl came to type in a difference. Ibtisam gave her instructions on how to leave spaces when typing. When the end-of-lesson bell rang at 11:15, she asked the pupils to switch the tablets off; however, before doing so one boy raised his tablet to take a photo of the table of similarities and differences on the smartboard.

4.2.7.2 Analysis

This lesson can be analysed as an Activity System in three parts, the first being the fifteen minutes during which Ibtisam used small tangible objects as mediating tools to introduce the topic and explained how solid geometric shapes differed from flat ones. The second part was intended to be the main lesson Activity, but lasted only 17 minutes, as the pupils were unable to connect to the internet as instructed in order to search for cylindrical objects. The third part, a laptop-mediated activity, replaced the planned second activity, which Ibtisam aborted when she realised that time was passing and the pupils were not able to obtain connectivity on their tablets to search the web. The teacher had decided that it was necessary to introduce this

unplanned Activity to replace the aborted one, in order for the pupils to apply what they had learned from the initial Activity.

The use of tablets was the intended core of the lesson Activity, preceded by an introductory part and followed by a complementary one. A change of mediating Artefact was the main noticeable difference among these three component Activities of the lesson, as they were performed by the same Subjects in pursuit of the same Objects.

Collectivity: The whole of the lesson is to be viewed in relation to the second part, where tablets were used. The first part, in which Ibtisam used real objects to explain what the pupils would need to understand when using their tablets during the second part, introduced the concept of multidimensional shapes as well as key Arabic words such as *haram* (pyramid) that pupils would use when searching the internet. These are standard Arabic words used in written text but not common in the spoken language and pupils might not have come across them, or at least might need to be reminded. For example, in everyday spoken Arabic, the pupils would not normally hear the word *istiwanh* (cylinder), because Omanis usually use the English word 'cylinder', as in the phrase 'gas cylinder', commonly used in the context of cooking. Thus, the first fifteen minutes of the lesson were importantly related to the later use of tablets.

As to the third part of the lesson, it constituted a replacement Activity which Ibtisam had to introduce because the aims of the second part were not achieved as a result of the technical difficulties preventing effective tablet use. In other words, this third activity existed purely as a result of the technical issues affecting the tablet-mediated Activity.

Multi-voicedness: The pupils played a role in deciding how the lesson Activity proceeded, as they did not simply wait for the teacher to decide then follow her instructions. Having spent 17 minutes trying to solve the connectivity issue, Ibtisam showed no sign of wanting to stop trying until the pupils raised their voices, shouting "It's not working". The pupils did not ask Ibtisam to change the Activity, but their "voice" was a key factor that led her to amend how the rest of the Activity System would go. However, as Engeström (2000)

writes, “multi-voicedness is a source of trouble and source of innovation, demanding actions of translation and negotiation”. Ibtisam did not show any anger, but listened to pupils’ views and worked on a different path for the lesson. In other words, the multi-voicedness of the Activity had an effect on the Division of Labour.

History: It is important to view the Activity in the context of its history. Overall, the school had accumulated only a short history of tablet use, as the project to introduce them had begun very recently. To trace the history of tablet-mediated Activities, three phases of lesson observations were conducted over a period of time, during which the tablet-mediated Activities underwent noticeable developmental progress. This particular lesson was the third in which Ibtisam had been observed using tablets and within this short available history, four overall developments can be identified, concerning the set-up, the time allowed for the tablet Activity, pupils’ satisfaction and the teacher’s tolerance of their behaviour.

In a change to the previous set-up, the pupils arrived this time to find no tablets on their desks. To prevent them from being distracted by their presence, Ibtisam had decided this time not to let the students have the tablets until they were needed.

During her first two observed lessons, the pupils had very little time to work with the tablets because Ibtisam had spent most of the time on introductory Activities. This time, by contrast, having again started with a different Activity, she began the tablet-mediated Activity before the half-way point in the lesson, thus allowing more time for it.

Being given the chance to begin using the tablets during the first half of the lesson not only gave the pupils a better chance of working with them, but also enhanced their satisfaction. They did not show signs of dissatisfaction towards the end of the lesson as they had in Ibtisam’s two previous observed lessons, despite the Activity being uncompleted once more.

Just as in the earlier lessons, the pupils repeatedly called out to Ibtisam when they could not proceed with the task because a problem had arisen. This time, however, Ibtisam's reaction was more tolerant. When pupils shouted "It's not working", she simply and quietly asked them to put the tablets aside and pay attention to her as she introduced a new Activity. Although not all pupils did put down their tablets and nine of them continued to ask about switching languages, she did not display anger towards any pupil as she had in the second observed lesson.

Contradictions: The first contradiction was internal to the tablet Activity. Ibtisam asked pupils to search the internet for cylindrical shapes, but the Activity did not progress as she wished, because the pupils could not connect to the internet, which also prevented her from asking them to perform any other searches using the tablets. This contradiction halted the Subjects' progress towards their Object. The technical problem with the internet connectivity of the tablets imposed changes on the progress of the Activity, prompting the teacher to take the decision to abandon the tablets, at least temporarily. Her words "the network might come back later" show that she did not want to stop the Activity but was obliged to do so because she could not control the 'network factor' on which the progress of the activity towards the object depended. They also indicate that Ibtisam had not lost hope of completing the Activity and that even after initiating a completely new Activity, she would have gone back to the tablets if the network issue had been resolved.

This technical issue and the way that Ibtisam dealt with it also caused a secondary contradiction for the Activity System in general. First, the introduction of the third Activity came as a result of not being able to proceed with the table-mediated Activity. Secondly, with a considerable proportion of the lesson time (17 of the 40 minutes) having been spent on trying to obtain connectivity, Ibtisam found herself having less time to spend on the third Activity, which remained incomplete when the end-of-lesson bell rang.

Although the tablets were working as electronic devices, the teacher was not able to use them as intended in class. The provision of teaching aids is on the cusp of fundamental change. Previously it was enough for administrators to provide teachers with devices that functioned independently. However, tablets are not conventional teaching aids and in order for them to be used effectively in class it is not sufficient that they should be working, in the sense of not being defective. In this lesson, the teacher intended to use the internet and her planned Activity therefore depended on an internet connection, whose failure obliged her to abandon the use of tablets.

Transformation: The expectation of an internet connection for the tablets provided Ibtisam with an opportunity for pedagogic innovation, as she was able to plan her lesson differently from those which I had previously observed. She planned for the pupils to search the internet and thus to make independent contributions to the lesson Activity. However, as this was the first time that she had planned such a lesson using internet-connected tablets, Ibtisam recognised its experimental nature and was ready with alternative Activities that did not rely on the tablets being connected. Nor did she use tablets as the only mediation tool for her lesson, but began by using realia to distinguish solid geometric shapes from planar ones before asking them to find examples using their tablets.

4.2.8 Summary of phase three

Khawla decided not take part in the third phase of observational data collection, when the teachers had access to the internet, while Ibtisam and Safia did attempt to have their pupils use internet-connected tablets during their lessons. These two teachers tried to introduce new teaching techniques, preparing activities in which pupils would independently search the internet. However, internet connection problems and Community involvement each played a role in how teachers planned and executed their work, which raises questions about providing teachers with teaching materials. The roles of the administration and the wider Community go beyond providing teachers with devices that work, as their further support for teachers will also affect how

things go in the classroom. Tablets are not conventional teaching aids which simply have to function in order to be useful in class, as illustrated by Ibtisam having to abandon their use for want of an internet connection.

4.3 Summary of observational findings

Classroom Activity transformation

Despite the challenges and obstacles facing the use of tablets in the classroom, there were opportunities for expansive transformation in the lesson Activity. Pupils' support for each other made space for changing class norms and the teacher's rules. Changes of rules in turn had implications for the division of labour, as pupils did not wait for instructions but reacted spontaneously to each Activity, taking the lead in lessons. For example, as Safia was not ready with alternative tasks during a lesson relying on an internet connection, she depended on her pupils to find solutions to the problem. This not only gave the pupils the opportunity to innovate and to try out their suggestions, but also changed the division of labour by giving the pupils a leading role in the lesson, as they became active participants who supported their teacher in resolving obstacles to teaching. This led to a transformation in Safia's attitude as she expressed her satisfaction at having received eight suggestions from pupils in response to the connectivity challenge, regardless of what was traditionally viewed in the school as noise, disorganisation and loss of classroom control. A similar transformation occurred in another lesson, with Ibtisam's lesson Activity. During the first part of the lesson before tablet use, Ibtisam was in full control of the class and did not allow her pupils to do anything without being told to do so. No single pupil moved from his/her seat without asking for permission and those who did ask were denied permission. At the same time, pupils' attitudes and behaviour showed that they wanted to start the lesson by using the tablets, but they did not directly ask permission to do so, which shows their knowledge of the rules. However, Once tablets were used in the second part, pupils actively moved around without thinking about permission or rules and Ibtisam expressed her approval of this by smiling at them.

Also, pupils were taking the lead as the Multi-voicedness: The pupils played a role in deciding how the lesson Activity proceeded, as they did not simply wait for the teacher to decide then follow her instructions. Having spent 17 minutes trying to solve the connectivity issue, Ibtisam showed no sign of wanting to stop trying until the pupils raised their voices, shouting “It’s not working”. The pupils did not ask Ibtisam to change the Activity, but their “voice” was a key factor that led her to amend how the rest of the Activity System would go. However, as Engeström (2000) writes, “multi-voicedness is a source of trouble and source of innovation, demanding actions of translation and negotiation”. Ibtisam did not show any anger, but listened to pupils’ views and worked on a different path for the lesson. In other words, the multi-voicedness of the Activity had an effect on the Division of Labour.

Finally, a transformation opportunity that was not completely developed due to time restriction as it appeared after the bell rang and Ibtisam has already asked pupils to put their tablets on their desk and leave the room. One of the pupils innovatively and without being told raised his tablet to use the camera in order to take a photo of the table Ibtisam drew on the board contrasting similarities and differences. A transformational opportunity to use tablet features that perfectly worked in their classroom context. This opportunity also presented a transformation in pupils thinking out of the box and their best possible exploitation to available features that tablets present.

4.4 Conclusion

In this chapter, I have offered a detailed presentation of the findings of data gathered via classroom observations. Thematic analysis was used for the first and second of these datasets. As the adoption of activity theory as the study’s theoretical framework required the Activity (in this case, the whole of each lesson in which tablets were used) to be used as unit of analysis for the observational data, I represented the transformations that occurred during lesson Activities as well as chances for possible transformation.

Chapter 5 : Findings

5.1 Introduction

In the previous chapter I offered an analysis of the data gathered by observations. This chapter presents the findings derived from all three datasets in pursuit of the aim of this study, to explore what happened when tablets were introduced into the classrooms of an Omani primary school and specifically to address the following research questions:

- 1- What are the contextual factors mediating the use of tablets in the classroom?
- 2- What are the impacts in terms of the roles and responsibilities of the agents involved in using tablets in the classroom?
- 3- In what way does the use of tablets affect teaching practice in the classroom?

First, links were identified between themes that emerged from different interviews, the thematic analysis and the Activity Theory framework, as the table below shows, in order for them to be merged and supported by observational findings.

Themes	Links to AT Framework
Vision	Community (whole school)
Competence	Subject (Teachers)
Challenges	Community Device (Artefact)
Educational features	Device (Artefact)
Awareness	Community
Pupils' Disappointment	Subject (pupils)
Drive for Change	Subject (pupils)
Roles and responsibilities	Division of labour and Rules

For example, the contextual factors that challenge the progress of school and classroom Activity System reported in interview such as the location of the school, time and other circumstances that related to the context were viewed

as part of the community in which the Activity System existed in. In the same way exploitation of the Artefact (tablets features) and transformation were specific to the school Activity System context. Hence, in the school context, pupils taking the initiative in helping the teacher in solving the connectivity problem is transformational change in division of labour and their movement around classroom without asking for permission is transforming the rules and norms of the school classroom Activity System.

In addition, influence of members of the community such as the school head teacher with her role in setting school vision and related decisions made for tablets use were viewed in relation to teachers competence as subject of Activity system.

Therefore, section 5.2, which follows, considers the contextual factors affecting tablet use, then Section 5.3 discusses in turn the role of each of the agents involved and Section 5.4 examines how tablets were used at the school and the consequences for teaching practice.

5.2 Contextual factors mediating tablet use

5.2.1 School location

The geographical location of the school was found to affect the teachers' planning of their use of tablets in the classroom. The school was in a mountainous village and despite its being built on a hill to ensure the safety of pupils and teachers during flash floods, its general location appeared to be problematic. In interview, Mariam expressed concern regarding the weather, wondering if the pupils would be coming to school. Travelling to and from the school was a real concern for the teaching and administration staff during the rains. On Sunday 6th March 2016, as I was arranging an observation timetable with the teachers, they warned me against planning any observations for that week because of the risk of flooding. Indeed, they advised me to avoid coming to the village at all, as floods might block the main access road, which was still under construction. Lesson planning was often disrupted by the weather, with the school having to close when heavy rain was expected because flooding

would cut off pupils and teachers from their homes. Finally, the first observation of a lesson with tablets that I was able to arrange was on Tuesday 15th March 2016. Even then, the teachers were still worried about the rain, as this excerpt from an interview with Mariam illustrates.

<p><i>"I am worried about rain these days as you can see. The school was not working for three days due to rain."</i></p> <p>Mariam interview 2</p>	<p>انا اخاف وضع الامطار هذي الايام كله مثل ما تشوف. نحن ثلاثة ايام تأجل الدوام في مدرستنا بسبب الامطار وداوموا أمس يوم الاحد</p>
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This uncertainty led the teachers to avoid preparing for tablets to be used on days during which the school might be closed. We agreed that I would observe a lesson on 15th March, but teachers were still hesitant and unsure whether the pupils would be able to come. In the event, the observation went ahead, but the school had been closed for the three preceding days because of flash flooding. Thus, the school's geographical location impacted tablet use by disrupting lesson planning.

At a more general level, the remoteness of the school meant that there was a high turnover of teaching and administrative staff, limiting the direct experience of the teachers who worked on the tablet project. Every year, several members of staff applied to be transferred to schools closer to their own homes. Then, as older teachers had their transfer requests accepted, newly qualified teachers and administrators were appointed and would consider their posts in such a remote location to be temporary, until suitable vacancies became available elsewhere. In fact, two of the four teachers participating in this study (Safia and Ibtisam) were newly appointed to the school, while the head teacher was newly promoted to her position as head and all three of these participants were transferred to other schools at the end of the school year in which the data were gathered.

Thus, the school's location was at least partly responsible for the fact that the head teacher came with only a few years of teaching experience plus one year as an assistant head teacher and was in her first few months as a school head when the tablet project began. It also had an impact on the teachers'

experience and on the head teacher's choice of teachers to work on the project, as one criterion was to select teachers whom she expected to stay longer at the school.

5.2.2 Teachers' experience

The participant teachers varied in terms of general experience and of experience in using technology, Safia and Ibtisam being in their first year of teaching while Khawla had twelve years of teaching experience. The findings show that experience was a differentiating factor in the way that they used tablets in the classroom.

Although Mariam complained that all three teachers lacked initiative, often waiting for her to tell them what to do, Safia and Ibtisam as young fresh graduates were more enthusiastic about technology use in class and ready to try out the ICT teacher's suggestions. They showed less resistance than their older colleague, regardless of the challenges that they faced, and Mariam was confident of their willingness to follow her suggestions, as she made clear with the following remark about using YouTube in a lesson.

<p><i>"Now we will try it out, we will connect a number of devices to the modem I already put there and will try to open YouTube. I may ask Safia to try it out tomorrow."</i></p>	<p><i>"نحن تو بنجربيه انا هناك مخليتته المودم وبنشوف نشبك كمين جهاز ونشوف الشبكة كيف وبنحاول نفتح اليوتيوب وكذا .. وحتى انا اخلي (صف) باكر تقدم لك درس"</i></p>
<p>Mariam interview 2</p>	

Ibtisam and Safia considered using tablets in the classroom to be a success in itself, as was clear from their comments after trying to connect them to the internet. Safia was very happy after the lesson with the process and the suggestions she received from the pupils on overcoming the connectivity challenge, despite the lesson ending before the pupils could search the internet for the topic of the lesson as planned. In a similar situation, after a lesson which Ibtisam described as "incomplete", because her "aim was not completely achieved", which left her wishing that there had been an internet connection, she nevertheless smiled in satisfaction as she commented that

the pupils “were actively engaged, although the internet did not help”. This spirit made her determined to try again to use the tablets to connect to the internet “in the next few days”.

The participating teachers were able to prepare activities in which all of their pupils participated actively and enthusiastically, whether it was completing a task on a Word file, changing PowerPoint slides or exploring a topic by searching the internet. However, as their teaching experience was limited, their planning and timing of lesson activities where tablets were used did not match the classroom reality and pupils’ expectations. Although the pupils knew from the moment they entered the room that tablets were to be used in the lesson, either because the teacher informed them herself or because they saw the tablets ready on their desks, both Ibtisam and Safia tended not to use the tablets for the main explanatory part of the lesson but limited their use to the last fifteen minutes. For example, in the lesson that she gave on 7th December 2015, Ibtisam spent time explaining the topic of shapes and angles using the whiteboard and paper cut-outs, while the pupils keenly tried to explore the tablets that were ready on their desks. She did not allow them to use these until she had finished the explanation, just three minutes before the bell announced the end of the lesson.

It was notable that in two of the lessons I observed being given by each of the younger teachers, they used tablets to continue teaching a topic known to the pupils, rather than to introduce new topics, and that the tablets were used in tasks that checked pupils’ comprehension, which occurred towards the end of the lesson, leaving the pupils too little time to complete the given task. Not only did both Safia and Ibtisam spend more time than they ought to have done on revising the previous lessons, but they did so verbally or with the aid of the whiteboard or the interactive board, rather than the tablets, despite both being enthusiastic to incorporate the new technology into their lessons.

By contrast, the much more experienced Khawla was more reluctant to try new things in her classroom, acknowledging her limited knowledge of technology: “As teachers, we are used to paper activities, not using tablets”.

She wanted to be sure how things would work in her classroom before trying them, which affected her use of tablets. She wanted to guarantee that their introduction would not disrupt her 'system' of classroom organisation. Therefore, she made sure that the pupils remained in single-gender groups as they always had in her lessons. On the other hand, her long experience warned her that the presence of the tablets was likely to distract the pupils during any part of the lesson where they were not being used, so because they had been prepared before the lesson started, she decided to use them from the beginning. By using them simply as electronic books, she allowed her pupils to handle them throughout the lesson. Their eagerness to use them was partially satisfied by the length of the reading aloud task in her language class, compared with the short time that they were able to use their tablets in science and maths lessons. However, Khawla's limited knowledge of technology did not help her in preparing tasks that would fully hold the pupils' interest.

<p><i>"It was a new lesson and pupils came unprepared. Pupils were interacting in their groups. Girls were better than boys who were in separate groups as they are old. This is the system I follow with year three and year four, better to be separated. Maybe if we mix them boys will learn from girls but we cannot. Boys are naughty and we cannot."</i></p> <p>Khawla interview</p>	<p><i>"درس جديد والطلبة ما محضرين. البنات أشطر من الأولاد. الطلبة متفاعلين مع بعض حسب المجموعات. الأولاد وحدهم في مجموعة كبار. أنا نظامي كذا خاصة مع صف ثالث ورابع .. أحسن معزولين وما أعتقد يآثر عليهم. ويمكن لو دمجتهم بيتعلموا من البنات لكن ما تقدر الأولاد وحدهم ريشة وما تقدر ندمجهم."</i></p>
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5.2.3 Time

The study has found that time was a crucial factor in the tablet implementation project, as pointed out by teachers, pupils, schools administrators and parents. The word 'time' occurred 118 times in different interviews (Table 17).

Table 17: Frequency of mentions of time in interviews

Teachers	74
Head teacher	11
Pupils	19
Parents	14

I also observed several classroom incidents where time was clearly a factor affecting lesson progress. The following are three different ways in which time impacted tablet implementation.

<p><i>“For example, you need time to start the tablets, also you need time to connect them to the internet, time for setting out the desks and pupils to get seated. We want everything to be ready when pupils come to the room so they just sit and we deliver the lesson. Every lesson we have to repeat all that all over again, that takes time.”</i></p> <p>Safia, interview 3</p>	<p><i>“يعني مثلا لحد ما تشغل التابلات بيالها وقت .. لحد ما نشبك التابلات بالنت بيالها وقت .. لحد ما نغير الطاومات بيالها وقت .. لحد ما يجلسوا الطلاب بيالها وقت .. نحن نريد يكون جاهز فقط بمجرد ما يجي الطالب يجلس تعطيه الدرس ويروح ما نضطر نجلس نرتب كل شي في كل مرة من أول وجديد هذا وحدة بياله وقت .. Safia ”</i></p>
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First, the short length of the lessons made teachers work in haste when using tablets and devote less time to their use in class. To express this idea, all four teachers used words such as “there was no time”, “shortage of time” and “we spend time and effort preparing and come to present in a very short time”. In addition, the head teachers said:

We are bound to a timeline for the curriculum which we have to follow and that might hinder tablet use, as there are short test pupils have to prepare for, and many other things ... A supervisor might come and ask the teacher “Why are you still on this lesson when you were supposed to have reached this lesson?”

Lesson length was fixed to only 40 minutes, out of which the pupils took about four to seven minutes to move from their usual classroom to the interactive room where all of the tablet lessons were given. The teachers then had to divide the remaining 33 to 36 minutes among the different activities they had prepared. Four of the eight lessons I observed started with activities not

involving tablets, leaving little time for the pupils to use them. Setting up also raised difficulties. For example, about 12 minutes were lost from teaching time in setting up the tablets for the lesson I observed on Wednesday 26th October 2015 with Khawla, even though Ibtisam and Safia attended from the beginning to help Khawla in starting up the tablets and downloading the lesson file using a memory stick.

Therefore, in order not to lose lesson time, the teachers needed to find time to set up the tablets in advance, so that they could spend the whole of the lesson executing the planned activity. As reported in Chapter 4, Section 4.4.9, setting up for the first lesson in which the tablets were to be connected to the internet involved configuring all of the tablets and subscribing to a Wi-Fi bundle, a process which was only partially successful and which took two teachers, one of them the ICT teacher, more than an hour and a half. This required them to swap classes with other teachers to free them for this setting up. Time was also needed after each lesson to ensure that the tablets were stored securely in the designated cupboard, so the teachers could not simply leave the room as it was and move on to the next lesson. Concerns about time spent on preparation and clearing up whenever tablet use was considered led Safia to say: "Last semester my tablet use in class was very limited as I was concerned about time, because using tablets would have resulted in a long delay in the curriculum". Unsurprisingly, the teachers tended to reduce the frequency of using tablets in the classroom to avoid such delays in curriculum progress.

The third way in which time was an important factor was in organising the whole project to take shape and to formulate initial ideas to be put into practice, as Mariam said in interview.

<p><i>"When I speak to them about using tablets they say we are bound to the curriculum, exams, short tests and other activities to be presented to pupils. The project needs time to be devoted to it and it needs participating teachers who have the ability to search, initiate, download apps and cooperate."</i></p> <p>Mariam interview 2</p>	<p>"لما اقولهن عن الاجهزة هن يقولن نحن عندنا مناهج ومرتبطات بمنهج وامتحانات واسئلة قصيرة وانشطة تقدمها للطلاب. هو المشروع بعده بياله وقت وبياله المعلمات اللي يشاركن فيه يكون عندهن القدرة ويحاولن يبحثن ويبادرن وينزلن البرامج ويتعاونن معك"</p>
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The tablet introduction project developed slowly. While waiting for more tablets to be delivered after a positive response from the Ministry of Education to a request for extra devices, the school started the project during the school year 2014/2015 with only four iPads. Until the promised devices arrived, the four iPads were used only by the ICT teacher to support one class in an experimental phase, using one device per group. The start of the project proper was in fact delayed for more than six months as the school waited for further tablets from the Ministry. Eventually, towards the end of the 2014/2015 academic year the school took delivery of 15 Lenovo ThinkPad tablets, which were different from the existing iPads. The school administration decided that there was not enough time remaining in the current academic year to work on expanding the project to include more subjects. Use of the ThinkPad was therefore postponed until the start of the new year in September 2015. There was then a further delay of one and a half months before the school received the electronic versions of the textbooks. Thus, in addition to the effects on lesson timing and preparation, time was also an important factor as the school administration and teachers waited for support to develop the project to take its current shape and to set up the project framework. These delays were followed by another major one, as the school waited for the internet connection to be established. This caused delays in developing different aspects of the project, which had consequences both for how often teachers decided to use tablets in the classroom and for the selection of the software and materials to be used. Table 18 lists three significant school-level delays to the project.

Table 18: Delays to the tablet introduction project

Event	Delay period
Delivery of 15 additional tablets	Six months, resulting in wider use of tablets being postponed until academic year 2015/2016
Supply of electronic versions of textbooks	One and a half months after the start of 2015/2016
Internet connection	Five months

Teachers attributed the limited frequency with which they used tablets to their concern about time spent, which they said caused delays with the curriculum.

<p><i>"I limited the use of tablets last semester because pupils didn't know how to use tablets well and I was worried about time because tablets use will get us delayed in the curriculum as I teach them on how to use tablets"</i></p> <p>Safia interview 3</p>	<p><i>"الفصل الماضي كان محدود جدا .. لأن الطلاب ما يعرفوا واجد للتأيات فأن كنت احاتي موضوع الوقت لأن استخدام التأيات راح يأخرنا في المنهج كثير بسبب أني أنا أعلمهم كيف يستخدموا التأيات"</i></p>
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5.2.4 Classroom set-up

One of the factors that affected the use of tablets at the classroom level was the need for electric sockets adjacent to the pupils' desks so that the tablets could be charged whenever there was a need. Although the devices were brand new, with long-lasting batteries, these were not always sufficiently fully charged to keep them running for a full lesson, because of the teachers' practice of returning them to the store cupboard immediately after each lesson. Thus, in three of the seven lessons observed for this study, some pupils had to use tablets while they were connected to a charger, obliging them to sit at the sides of the room, close to the sockets. In general, the teachers preferred to arrange the seating so that the pupils were in curved lines, in order to enable them to work in groups facing the front. However, when there was a need to charge the tablets, this arrangement was not always possible. Figure 4 shows the interactive room during a lesson, with some pupils seated at tables and others on the floor at the side of the room.



Figure 4: Pupils' seating in the interactive room (Images provided by the school)

Despite efforts made by teachers to ensure that preparations were complete before lessons started, there were situations where they found at the start of a lesson that some tablet batteries were completely discharged. The alternative to having pupils sit near charging points was to leave some tablets charging at the side of the room, as illustrated in Figure 5. This not only reduced number of tablets available and thus the ratio of tablets to pupils, but also raised concerns about the safety of the classroom environment, as extension cables trailed across the ground to the charging tablets while pupils were actively moving around the room.

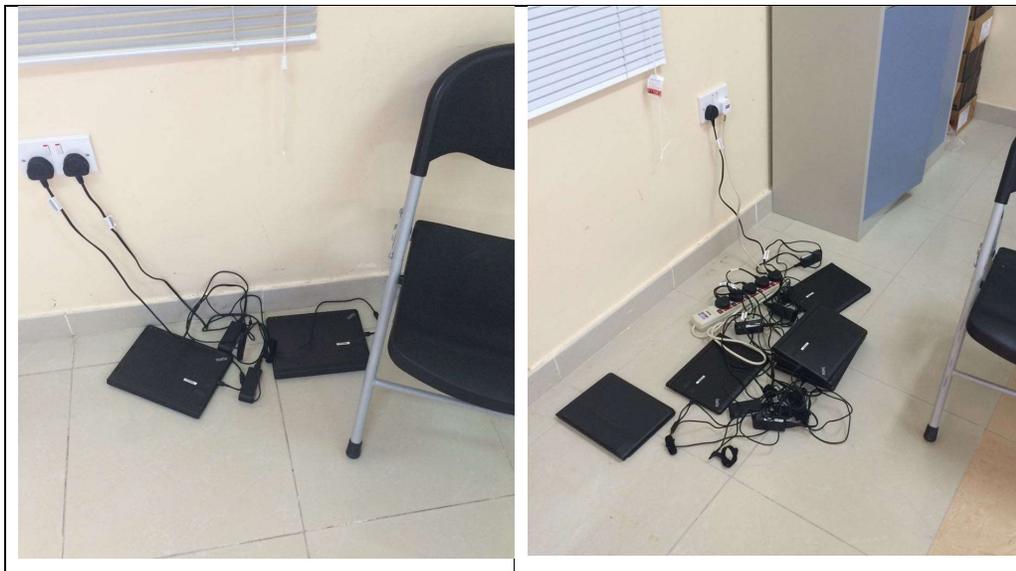


Figure 5: Tablets charging in the interactive room (Images provided by the school)

5.2.5 Internet access

Another important contextual factor affecting the use of tablets was the need for an internet connection in the classroom. At the beginning of the project, teachers had to find their own ways to use the tablets, as they were challenged to start using them before the school had an internet connection and without specialised educational apps being provided. The ways that they decided to use them without an internet connection were similar to how they would use desktop computers. However, once they had an albeit limited internet connection they started to change their teaching strategies as they introduced their pupils to the use of Google to search the internet and to playing YouTube videos. The limited reliability of the connection meant that the search process consumed more time than was planned, with the result that lessons tended to end before the class could complete the planned tasks and that pupils were not satisfied with the amount of tablet use they experienced.

Participants used different words interchangeably to refer to the internet; for example, pupils used the English word “wireless” when speaking about the internet at home, while teachers and parents referred to the internet, the net and *al shabakah*, the Arabic for “net”. These English and Arabic words referring to the internet appeared in interviews 102 times, as Table 19 shows.

Table 19: Frequency of mentions of the internet in interviews

Teachers	82
Head teacher	11
Pupils	4
Parents	5

Without the internet, tablet use was limited to Microsoft Office programs. In all six of the lessons that I observed before the internet connection was established, tablets were used with either PowerPoint or Word. Using these programs on tablets was not convenient for either teachers or pupils, as features such as the touch-screen created problems. During my observation of one lesson, for example, multiple screen touches led to unwanted multiple slide changes when using PowerPoint, while in another lesson the pupils

found it difficult to enter words into a table within a Word document because touching the small screen caused the cursor to move from one cell to another. When an internet connection was eventually provided, I observed Ibtisam trying to provide pupils with a new experience by instructing them to search online for shapes. After spending more than 15 minutes trying in vain to establish the connection, the teacher was obliged to abandon the tablets and use a laptop connected to the smartboard to present another exercise based on filling in a table in a Word document.

When I asked the head teacher what she now knew about using tablets which she would like to have known before starting the project, her answer indicated the realisation that internet access should be seen not as a feature, but a requirement.

<p><i>"Nothing in my mind except internet, having internet connection in school was one of the most important points to enable us to perform tablet introduction at its best. We tried our best but our school is supposed to be located within range of fibre optic and to be included within the budget. Had it happened, it would have been an excellent turn in the project as it would make things much easier for teachers and their pupils."</i></p> <p>(Head teacher interview)</p>	<p>"ما فيه حاجة في بالي الا الانترنت ..كانت اهم نقطة تواجد الانترنت عشان نادي الغرض كامل .تواجد الانترنت في المدرسة وحاولنا قدر الامكان لان نحن مدرستنا المفروض تقع ضمن الالياف البصرية ويكون في ميزانية وعرفنا من الوزارة ولو صارت هذي النقطة بيكون تحول جدا متميز للمشروع، ببسهل على المعلم كثير، وببسهل على الطالب كثير."</p>
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5.2.6 Lack of vision

The tablet introduction project was not guided by a well communicated institutional vision and the teachers involved were not clear on how to go about using tablets. Teachers were not much involved in planning the project and were therefore lost as their ideas were not coherent with the school administration's views. For example, Khawla made the following remarks.

<p><i>"The project has been here for two years and we were surprised this year with the selection of the class and with size of the project. These devices were not available and I don't know how arrangement were made ...All teachers need training, not only us, as this is a school project. Why did she choose a grade 4 class, not a grade 5 class? Older pupils are more mature and have better knowledge."</i></p> <p>Khawla interview</p>	<p><i>"المشروع صار له سنتين. تفاجأنا هذي السنة باختيار الصف وبحجم المشروع، هذي الأجهزة ما كانت متوفرة وما أعرفت كيف كان التنسيق..... كل المعلمات يحتاجن تدريب ما بس نحن، هذا مشروع المدرسة. وليش اختيرت صف رابع؟ ليش ما صف خامس؟ الطلبة الكبار أكثر نضج وأكثر معرفة"</i></p>
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Khawla was surprised at the expansion of the project from the four tablets that had been in use the year before and she was not aware how arrangements for the new tablets were made. Again, she was not informed of the basis for selecting the class in which she was to use tablets and wondered why this specific class had been chosen. Her remark that "this is a school project" expressed a belief that all of the school's teachers had a right to be informed of what was going on in the project, to receive the appropriate training and to be involved in decision making regarding the project.

Mariam, as ICT teacher, also had concerns about the making of decisions regarding the tablet project. She was not happy with selection of subject teachers for the project and was not clear about the criteria for their selection.

<p><i>"The main problem is with teachers' selection. There are other teachers in the school who take the initiative and spare time for the project. The problem with the current teachers is that we have to direct them, do this and do that."</i></p> <p><i>"She knows them, I told her and she replied 'We have already started the project with class 4 pupils and the teachers who teach them are teaching this class. Maybe if we had implemented the project with a different class and different teachers it would have had better success. Maybe we'll try that in later years."</i></p> <p>Mariam interview 2</p>	<p>" ترا المشكلة الاساسية كانت في اختيار المعلمات في معلمات اخريات عندهن المبادرة يحين يتعلمن ويطلعن اشياء جديدة ومخصصات وقت لهذا المشروع. هذي المعلمات المشكلة انه كله نوجهن بس .. سوي كذا وسوي كذا"</p> <p>" ترا هي عارفتنهن... انا قتلها وقالت ترا عندنا طبقنا في الصف الرابع وبيديا والمعلمات هن اللي يدرسن الصف الرابع ، يمكن لو مطبقينه مع طلاب مرحلة اخرى ومعلمات ثانيايات يمكن يكون أنجح. يمكن نحاول في السنوات الجاية"</p>
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Mariam believed that teachers were selected because they taught class 4, which did not match the criteria explicitly stated by the head teacher: "to select teachers from the village to guarantee project sustainability". Therefore, as Mariam was not involved in thinking about the project sustainability she was thinking of changing the teachers working on the project if she had a say in the project next year: "Of course I would change them".

Differences between the head teacher's vision for the project and classroom practices also appeared as teachers were not involved and not aware of the project vision. The head teacher spoke about her own vision, not the school's vision, as indicated by the use of "my" and "I" in the following excerpt.

<p><i>"My vision is that I get each pupil to start learning on his own, to start recognising what he wants and to understand why these devices are provided for him. A pupil would then start to get information on his own. I don't feel we've got to this point yet."</i></p> <p>Head teacher interview</p>	<p>"رؤيتي أن أوصل أنه الطالب خلاص بدأ يتعلم وحده .. بدأ يعرف هو هيش باغي يتعلم .. بدأ الطالب يعرف هو ليش هذا الجهاز موجود عنده ... الطالب بيدي يعطي المعلومة .. ما حسيت أن وصلت لهذي النقطة"</p>
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The head teacher spoke about getting pupils to be independent and learn on their own, yet in two of the three lessons in which I observed Ibtisam, she did

not allow pupils to touch the tablets until the last 10 minutes of a 40-minute lesson.

The head teacher's vision of pupils' independent tablet use contrasted with Mariam's complaint that teachers leading the classes showed no initiative in using the tablets but depended on her guidance. Without a clear school vision on tablet use, in other words, teachers were getting guidance that clashed with the head teacher's vision. The ICT technician, whose role is discussed in Section 5.3.5, advised the teachers to control what the pupils could do with their tablets and promised to provide them with software that would allow them to control the pupils' screens. Ali was evidently unaware of the head teacher's vision of pupils using the tablets independently to "start learning on their own"; indeed, he claimed that he did not "recognise why these devices are provided" at all. The next subsection addresses this question.

5.2.6.1 Reasons to use tablets in the classroom

<p><i>"Tablets mean keeping up with technology updates and changing learning tools from the usual book to a device that contains subject content and using these devices attracts the pupils. Using tablets in learning allows more interactivity, since they contain more and wider information compared to paper books. In addition, as tools pupils are attracted to these tablets more than to ordinary books."</i></p>	<p>من الأجهزة اللوحية تعني مواكبة التقانة ومتابعة التطورات وتغيير وسيلة التعلم، من الكتاب الروتيني الى جهاز في المادة العلمية يجعل الطالب اكثر تشويق ويكون تفاعله اكثر لما تكون الدراسة بالجهاز اللوحي ويكون يحتوي على معلومات اكثر واشمل واكبر من الكتاب الورقي... وكوسيل ايضا تكون جذابة للطالب ويكون الطالب منشد لها أكثر من الكتاب العادي."</p>
<p>Head teacher interview</p>	

The head teacher saw the introduction of tablets to the classroom as a change of tool from the usual books to the latest advances in technology, but with the same subject content. The reason she gave for this change is that these devices were attractive to the pupils. Comparing the "usual books" with tablets, she believed that interactivity would increase with the wider information tablets would provide for the pupils. She saw tablets as eventually replacing books and made this clear by referring to the problem of the heavy school bag.

<p><i>"At least in the first stage from grad 1 to grade 1 we use tablets with them, since we have the problem of the school bag from grade 1 to grade 4. It is a big problem and if we can change it in one way or another. Of course these are dreams and insha'Allah [God willing]."</i></p> <p>Head teacher interview</p>	<p><i>"أقل شيء المرحلة الأولى، المرحلة من أول إلى رابع نستخدم معاهم التاب، لأن نحن عندنا مشكلة الحقيقية المدرسية من أول إلى رابع.. مشكلة كبيرة .. ولو قدرنا انه نغير بصورة أو بأخرى وطبعاً هذي أحلام وان شاء الله"</i></p>
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By contrast, Khawla was sure that books could not be entirely replaced.

<p><i>"Books are indispensable. Even if we downloaded all lessons into tablets, books are indispensable."</i></p> <p>Khawla interview</p>	<p><i>"الكتاب لا غنى عنه، حتى لو دخلنا الدروس في التابات الكتاب لا غنى عنه"</i></p>
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Interestingly, the head teacher's views on tablet introduction appeared to match those of the parents in some matters. First, the parents believed that the school's use of technology in general and tablets in particular would be beneficial. As one mother said, "Schools use technology and it is good to make use of these devices and surely they will be useful" [L1]. Other parents suggested that tablets were introduced to teach pupils about new trends and to inform them about what was going in the world so that they would not be left behind. During the parents' focus group session, two of the parents also raised the idea that tablets were introduced "to keep up with the new technology" [M1] and that "it is good to learn things in school so they keep up with the new trends and they know what is going on in the world, so they are not left behind" [M2]. Finally, one of the parents agreed with the head teacher that "these devices are useful especially to get rid of the heavy bag our children carry every day. Why not use electronic books in tablets and then one device will carry more books than what a bag can carry and the weight will be light for the children. If each child had a device this would solve the problem" [L3].

Parents were not informed about the existence of the tablet project, let alone being involved in its planning. Nevertheless, their views matched those of the

head teacher on the benefit of using tablets to replace paper books, thus reducing the weight of pupils' bags. The head teacher's reasons for not informing them about the project, although it was in its second year, was that "we considered it to be a project for the school alone". Parents therefore learned about the project only when they were informed that I was about to conduct my study. How and why people became involved in the project at different stages can help to explain their roles and is worth considering here as a prelude to the following section on roles and responsibilities, which more directly addresses the second research question.

5.3 The influence of the agents involved in tablet use

Although the project of introducing tablets into the classroom was initiated as the fulfilment of an idea from within the school, not imposed from above, it was the head teacher's personal dream. She declared that "every idea starts with a dream and insha'Allah we will get to the end ... a balanced end". However, when I asked her about the plan, she replied: "The plan comes from the ministry for all subjects and at the beginning of the school year. An information letter comes for each subject with a time frame and we are supposed to follow it." The head teacher had a general idea but no written or clear plan on how the tablet project should be implemented. The original idea was to equip a room within the school in which access to educational technology was provided at its best for teaching and learning activities. From the beginning, this was called the "interactive room" as it was to be equipped with different interactive educational tools. In fact, the idea of providing tablets appears to be a logical continuation of that project and it was to be a unique step, taking the school and its administration ahead of other schools. The head teacher was thus the focal point of the project to introduce tablets into the school.

The teachers were directly involved with the pupils in planning and using tablets but were not the only people who influenced the implementation process. Others, whether present or not, also affected tablet use in the

classroom. When I asked the head teacher to identify such people, she replied:

<p><i>"First and most important comes the teacher, then parents at home. ...Subject supervisors, head teacher or her assistant, ... and pupils' motivation."</i></p> <p>Head teacher interview</p>	<p>"أول شئ واهم شئى يجي المعلم ولي الأمر في البيت .. بس هذا..المشرف.. مدير المدرسة .. أوالمساعد ..تحفيز الطلاب"</p>
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5.3.1 Head teacher

<p><i>"My role is to change the teachers and take away their technology fear and push them towards globalisation. I should keep up with all technology and try to bring that to the classroom and implement it in a comprehensive way. Try to get courses for the teachers on how to do that."</i></p> <p>Head teacher interview</p>	<p>"..دوري انا صار انه .. المفروض اغير معلماتي.. اخليهم انه رهاب التكنولوجيا هذا اشيله منهم .. احاول ادفعهم الى العولمة .. الى متابعة كل ما يخص التكنولوجيا ومحاولة ادخالها الى الغرفة الصفية ... محاولة تفعيلها تفعيل اكثر شمولي.. ومحاولة اخذ دورات للمعلمات في استخدام هذي الاجهزة."</p>
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This study has identified several distinct ways in which the head teacher's decisions impacted on tablet use in the classroom. First, it was she who suggested introducing tablets to classrooms when she was assistant head teacher. As head, she therefore saw the project as the fulfilment of a dream which she worked to make a reality.

5.3.1.1 Planning, shaping and organising the project

In taking the tablet project from a dream to a tangible reality, the head teacher began with the available resources, arguing that "if the administration is convinced with the idea, they will be able to utilize the available resources", but at the same time worked on winning external support. The school itself provided the initial four iPads, which was an achievement in itself, but the head teacher was not content with this humble start and did not want to stop improving the project. Rather than following the long official bureaucratic procedure by which requests for support should have been made through the regional educational office, she used her personal relations to establish and maintain direct contact with the head of the IT department at the ministry level

(Appendix O) in order to seek the support the school needed. She was thus able to bring the project to life and obtain fifteen tablets from the MOE, which also provided support with the internet connection. A measure of the head teacher's achievement is that the highly experienced Khawla reported being surprised that the project was extended in this way. It was also the head teacher herself who had the vision and set the rules on how and when tablets were to be used, taking all decisions on which teachers would use the tablets, in which subjects and with which classes.

<p><i>"My vision is that a pupil starts to learn on his own, starts to recognise what he wants and to understand why these devices are provided for him. A pupil would then start to get information on his own.. I don't feel we've got to this point yet."</i></p> <p>Head teacher interview</p>	<p>"رؤيتي أن أوصل أنه الطالب خلاص بدأ يتعلم وحده .. بدأ يعرف هو هيش باغي يتعلم .. بدأ الطالب يعرف هو ليش هذا الجهاز موجود عنده ... الطالب بيدي يعطي المعلومة .. ما حسيت أن وصلت لهذي النقطة"</p>
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In addition, the head teacher's role was vital to the project, as the findings reveal specific ways in which it directly impacted tablet use in the classroom, although on some occasions it was indirect. The first direct impact was through supporting teachers and facilitating the use of tablets in classrooms by working to support them. For example, she showed understanding of their comments on how the project was progressing, their complaints about subject supervisors not caring about time spent on the project, and their demands for things to be provided.

<p><i>"I suppose that preparation is the same. If you ask about written preparation, written preparation should be there. But mental preparation should be wider and more comprehensive than it was before. It is not enough to use what is available in the textbook. Pupils can search google or YouTube, therefore, a teacher should be prepared with wider knowledge. But written preparation is the same."</i></p> <p>Head teacher interview</p>	<p>"المفروض يكون نفس التحضير استاذ.. يكون تحضير ورقي موجود .. وهذا التحضير يكون تحضير ذهني .. اذا كنت تقصد التحضير الورقي ف هو هو ما تغير.. لكن التحضير الذهني لازم يكون اشمل لانه كما قلنا سابقا ما بس يكتفي بالشئ الموجود في الكتاب .. الطالب ممكن يبحث في جوجل أو يوتيوب .. يعني المعلم المفروض يكون عنده اشمل ذهنيا. لكن التحضير الكتابي هو هو."</p>
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However, the head teacher argued that there should be no difference in planning for a lesson whether or not tablets were used. Similarly, the encouragement given to teachers working on the project was the same as that given to other teachers working at the school. Those working on the project should not be asking for special recognition but should prove themselves equal to any other teacher in the school.

<p><i>"As a school administration we have overall steps for encouragement as we have a comprehensive follow-up form. And we have a monthly award for teachers, the excellent teacher. The teacher who does well in her class and is committed. We haven't specified, but it is general for the excellent teacher and by the way the excellent teacher will be doing well in everything."</i></p> <p>Head teacher interview</p>	<p>" هو في خطوات تشجيعية شاملة عندنا كإدارة مدرسة، في عندنا استمارة متابعة شاملة وفي عندنا تكريم تقريبا شهري للمعلمات، يعني المعلمة المجيدة، تحصيلها متميز، فصولها متميزة، ملتزمة، الخ.. يعني احنه ما خصصنا ، يعني بوجه عام، وعلى فكرة المعلم المتميز يكون متميز في كل حاجة."</p>
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5.3.1.2 Providing tablets

<p><i>"We wish to have 30 tablets so that every pupil in the class would have one. We also want each pupil to have a tablet under his responsibility so he does not leave it at school but can take it home, interact with it and bring it to school the next day. Pupils should use tablets to replace their bags and books. That is all that we want."</i></p>	<p>"نحن نتمنى ٣٠ جهاز على عدد كل طالب .. نفس الشئ نتمنى انه لكل طالب الجهاز يكون معاه عهده حتى في البيت. يكون حتى في البيت يتفاعل معاه. ما بس يحطه في المدرسة. ويجيبه اليوم الثاني معاه، بدل ما يشيل شنطة يشيل تاب، يشيله معاه البيت ويذاكر منه ويرجعه، بدل ما يكون في</p>
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<p><i>Our aim is to get rid of the school bag and we make it an electronic bag."</i></p> <p>Head teacher interview</p>	<p>كتاب، خلاص، نحن نتمنى .. اهدافنا انه نلغي الشنطة ، ونخليها كلها الكترونية الشنطة تكون."</p>
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The head teacher's decision to work on getting external funding support for more tablets increased the ratio of tablets to pupils. She was not content with the four iPads that the school could afford to buy and expressly stated her wish "to have 30 tablets so that every pupil in the class would have one." Although she had not achieved a one-to-one pupil-to-tablet ratio, her efforts had improved it from one per group of six pupils to one per pair by securing the provision of 15 devices from the Ministry of Education.

5.3.1.3 Appointing a project manager

<p><i>"Mariam is the project manager... and the criteria, as we said before, are the teacher's experience and knowledge in technology, so a teacher does not teach anything she does not know about."</i></p> <p>Head teacher</p>	<p>"المعلمة مع مشرفة المشروع .. المعايير كما قلنا سابقا حسب خبرة المعلمة وثقافتها الالكترونية .. عشان ما تدرس حاجة وهي ما تعرف عنها."</p>
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The head teacher's decision to appoint Mariam, the ICT teacher, as project manager with responsibility for improving the project and supporting other teachers appeared to be logical, as she lived in the local village, which served the sustainability aim. Her contribution is explained in detail in Section 5.3.3.

5.3.1.4 Selecting teachers

The head teacher's decision to base the selection of teachers to work on the tablet project on the criterion of proximity of residence affected how tablets were used in classroom. As project manager, Mariam was not happy with the head teacher's declared decision to select teachers living in the village "to guarantee project sustainability", complaining that this resulted in the selection of teachers who lacked initiative, thus adding to Mariam's workload.

<p><i>"The main problem is with teachers' selection. There are other teachers in the</i></p>	<p>" ترا المشكلة الاساسية كانت في اختيار المعلمات في معلمات اخريات عندهن</p>
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<p><i>school who take the initiative and spare time for the project. The problem with current teachers is that we have to direct them, do this and do that."</i></p> <p>Mariam interview</p>	<p>المبادرة يحين يتعلمن ويطلعن اشياء جديدة ومخصصات وقت لهذا المشروع. هذي المعلمات المشكلة انه كله نوجهن بس .. سوي كذا وسوي كذا."</p>
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Mariam's argument that there were other teachers at the school who would serve the project in a better way may have had some justification and she was correct in saying that the selection of teachers for the project was made directly by the head teacher. However, they were not chosen entirely on the criterion of living locally, as Safia and Ibtisam were not from the village or nearby. In fact, only two of the four involved, namely Khawla and Mariam herself, lived in the village. Mariam was there to supervise the project but did not use tablets in teaching, as she did not teach any of the classes selected for participation in the project. As to Khawla, who was thus the only locally resident teacher using tablets in her teaching, she appeared to lose interest in the project towards the end of the academic year, reflected in her decision not to take part in phase three of data collection for this study.

5.3.1.5 Training provision

<p><i>"Yes, we conducted courses in December... on programs such as Quiz Creator and some other programs, conducted by the ICT teachers. There is a plan for professional development, several courses, but the problem is that teachers did not attend many of these because of timetable clashes with these teachers' lessons. We wanted to repeat these programmes between the two semesters when teachers are usually free but they were busy with exams. No matter how much we try, and we keep trying, there are always challenges, not only within the school but externally too."</i></p> <p>Head teacher interview</p>	<p>"أبوا سوبينا دورات في شهر ١٢ .. بعض البرامج مثل برنامج كوييز كريبينور.. وبرنامج كذا عملوه معلمات تقنية المعلومات .. في خطة عندهم موجودة للأبناء .. عدة برامج لكن المشكلة أن المعلمات ما كثير راحوا للبرامج هذي بسبب أوقاتهن تتصادف مع حصصهن. وبغينا نسويها في نصف السنة المعلمات فاضيات والمشكلة انه المعلمات انشغلوا بالامتحانات. يعني نحس انه لو نحاول نعدل ونحاول نغير.. في معوقات خارجية ما بس في المدرسة في اعباء خارجية".</p>
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There appeared to be a problem with planning and managing training sessions, which teachers did not attend because they clashed with their classes. Although the head teacher did not deliver the training herself, she worked on addressing this issue and on managing the teachers' training. When she explained that the professional development plan was constrained by the teachers being busy with exams in the break between semesters, I asked her about the two training days usually specified in the school calendar within each semester and she answered:

<p><i>"It's a full week for professional development, but we are required to present a variety of programmes, not only technology. I mean educational programmes, programmes on pupils' performance and it's only a week. We try to cover things that are important and necessary."</i></p>	<p>"اسبوع كامل للإنماء المهني .. بس احنه مطلوب منها عدة برامج متنوعة ما بس تقنية ... يعني برامج تربوية ... برامج خاصة بالتحصيل الطلابي .. وهو كله اسبوع... نحاول نغطي فيه الأشياء الهامة الضرورية."</p>
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In other words, the week allotted to professional development was hardly adequate in her assessment to cover all of the training requirements, so the use of technology and specifically the newly introduced tablets could not be allocated more time. On the other hand, when asked about using the training week for teachers involved in the tablet project to have specific intensive training, she replied that they were also obligated to attend other programmes provided for all teachers.

5.3.1.6 Involving others

Considering the project to be a matter for the school alone, the head teacher decided not to involve the parents or even to inform them about it, as noted in Section 5.2.6.1.

<p>"No, no, we considered it to be purely a school project. It's normal." Head teacher interview</p>	<p>" لا لا .. أعتبرناه كمشروع خاص بالمدرسة عادي يعني "</p>
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They were not informed about the project until I began my study, although it was by then in its second year. The head teacher appeared to anticipate that

parents would disagree and stand against the project, as indicated by her response when I asked her about the role she would expect parents to play in the project, stating that she hoped they would “encourage their children” and not “stand against the project”. She agreed to meet some curious parents only after they had heard about the devices.

<p><i>“Tomorrow I have a meeting with the mothers and I intend to show them the devices. They heard about them but they haven’t seen them. I met some parents and they said they want to see the devices and we haven’t shown them.”</i></p> <p>Head teacher interview</p>	<p>” في عندي اجتماع باكر مع الامهات وناوية أعرض عليهم الأجهزة .. هم بس سمعوا بس ما شافوا هذي الأجهزة .. انا قابلت بعض أولياء الأمور ويقولوا نحن ما شفناهن .. ونحن الى الان ما راويناهم الاجهزة”</p>
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However, when I repeated my question about the roles that parents might play in the project, the head teacher answered:

<p><i>“For example, if I find that a parent has the knowledge or the experience, he can conduct workshops for the teachers or support me in some programs that I use. Or he can teach his son, who would pass on the experience if the father cannot come. Or he can also support us financially.”</i></p> <p>Head teacher interview</p>	<p>” مثلا أنا عندي ولي أمر مثقف .. أو عنده خبرة بإمكانه أن يعمل ورش أو دورات عمل للمعلمات .. أو ممكن يساعدني في بعض البرامج المفيدة اللي استخدمها .. أو يفهم ولده .. وولده ينقل الخبرة إذا هو ما يقدر يجي ... يساعدني ماديا .. ايضا... ولي الأمر.”</p>
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The head teacher’s actions and responses reflect her understanding of her supervisory role, as she appeared to keep herself at a distance from the project. This was shown in two ways. First, when I asked her about what she had noticed, she mentioned observing the pupils using computers, but did not mention tablets, which suggests that she had not observed pupils in classes where tablets were used. “When a pupil works alone he will be lonely with the device, but when there is another pupil sharing the device they will be forced to work together, but this does not really work. I noticed it when I visited pupils working on computers. There is always one ahead of another”. The second indication of distance, which may explain the first, is the appointment of Mariam as project manager. The head clearly trusted Mariam and her technology skills, so depended on her to supervise and manage everything

related to the project. This increased the workload for Mariam, who as ICT teacher had to help her colleagues in preparing and implementing their lessons. In her own interviews, Mariam stated that she had trained the other teachers earlier, but this study has shown that any such training appeared inadequate, as they were not confident enough to conduct tablet-mediated lessons without support.

5.3.1.7 Understanding her role

This final subsection on the head teacher's role concerns her understanding of her responsibilities for planning and leading the tablet introduction project. As noted above, the inspiration for the project had been hers when she was deputy head teacher. When the project began, she had a general idea of how it should be implemented, but no clear written plan. The original idea was to equip a room within the school to provide access to educational technology at its best for teaching and learning activities. From the beginning it was referred to as the interactive room, because it was to be equipped with a range of interactive educational tools. The notion of providing tablets appears to have been a logical continuation of that project, in which the head teacher saw the role of her administrative team as central.

<p><i>"The school administration and its relations outside the school are the most important. The teachers have a secondary role. The supervisor's role is also secondary, but the most important is the administration. If a school administration is convinced with the idea, they will be able to utilize the available resources."</i></p>	<p>" أهم شيء إدارة المدرسة بعلاقتها الخارجية .. المعلم يجي دوره ثانوي .. المشرف دوره ثانوي .. لكن أهم شيء إدارة المدرسة .. إذا اقتنعت إدارة المدرسة بالفكرة هذي تقدر ان تسخر الإمكانيات المادية والمعنوية "</p>
<p>Head teacher interview</p>	

When I asked the head teacher specifically about her own role, she answered that it was "to provide the facilities. Teachers ask for an internet connection... daily internet subscription... I try to provide this facility and provide a suitable space... I see my role to be solely supervisory and to provide what the teachers ask for." In other words, she saw it as her responsibility to provide

the necessary infrastructure and support, while the teachers' role would be to deliver the practical details of the project.

Her understanding of her role as essentially facilitative and supervisory is reflected in the way she kept herself distanced from the project, as noted in the previous subsection. In practice, however, she may be seen as falling short of the teachers' needs or expectations. She was able to provide the financial support they asked for, such as for modems and the internet subscription, but found herself helpless when they asked her for some other forms of support and was unable to provide the technical planning and implementation strategies that the teachers felt they needed.

5.3.2 Subject teachers

The subject teachers were faced with the challenge of not knowing where to start, as they found themselves provided with tablets that came with no apps installed and had to decide whether to deal with this situation themselves by finding a solution or to wait until they were provided with the resources they needed. The problem was exacerbated by the lack of an internet connection, which prevented them from searching for and downloading software from the internet to be used in their classes. To overcome this challenge, they decided to use familiar programs pre-installed on the tablets, such as Word and PowerPoint. They continued to do this from October 2015 until they received electronic versions of the textbooks as PDF files in December 2015. This decision to use available software not only got them started on using tablets in their classes but also saved them waiting time, as the situation of not having an internet connection continued until March 2016.

On the other hand, teachers lacked confidence in using tablets in their lessons and did not want to do so without support. In five of the lessons that I observed, there was at least one other teacher attending to support the main teacher. On one occasion, as reported in Chapter 4, Section 4.4.6, Khawla, despite her twelve years of teaching experience, refused to start a lesson without having other teachers in the room ready to support her, although in the event the other two teachers who attended barely contributed to the lesson.

<p><i>"There is an observable comment and I will be very honest in saying this. Most teachers or some of them, not all, don't have enough knowledge of using tablets in classroom. ... You have the responsibility to teach using tablets, but how can you give what you don't have? How can I implement this with young pupils in cycle 1?"</i></p> <p>Khawla interview</p>	<p>" في ملاحظة واقعية وراح أكون صريحة جدا .. ان معظم المعلمات او بعضهم المعلمات ما معظمهم .. ما عندها دراية كافية في استخدام الالواح داخل الفصل .. دي محتاجة ... انتي مكلفة بتدريس الفصل كذا باستخدام الالواح .. اذا كان هي نفس اللي ح بيدي المعلومة .. فافقد الشيء لا يعطيه .. ما عندي دراية ب كيفية استخدامها .. كيف انا استخدمها ... كيف انزل برامج .. كيف اطبق ده واوصل المعلومة لطفل في الحلقة الاولى "</p>
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Parents also commented that some teachers did not have the required capability to use tablets in teaching. One mother went further, anticipating the potential negative impact on both teachers and pupils:

<p><i>"This will have a negative impact on both teacher and pupils. When a teacher finds pupils in front of her have higher capabilities or clarify things for her as pupils would innocently correct her by saying this is not right .. no it's wrong .. a teacher may not accept this, which will discourage pupils. A teacher will be discouraged as well because she does not want to appear ignorant in front of her pupils. This will discourage both.</i></p> <p>L4, parents' focus group</p>	<p>"تأثيره سلبي على الطرفين .. لأنه دائما العلم أو المعلمة لما يتلاقى الطالب اللي أمامها قدرته أكبر أو بينبها لشيئ .. الاطفال ببرائتهم بتتكلم .. يعني استاذة لا هذا كذا .. استاذة غلط في ده .. المعلم احيانا أو المعلمة لا تقبل هذا .. فيبيكون رد فعلها لطفل احباط .. لأنه هي برضة مش عابزة تظهر في الفصل امام الطلاب انه هي عندها قصور .. او تقليل من شأنها .. وبالتالي بتعمل احباط للطفل"</p>
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Interestingly, one parent defended teachers and put the blame on the MOE for imposing projects on schools without providing teachers with the necessary training.

<p><i>"I don't blame the teacher, I blame the ministry. They say we have such and such an electronic project, but before getting the project to any school you need to qualify trainers, prepare curricula and workshops, and specify which workshop for each teacher. For example, the interactive board, a one-day workshop for teachers. Not all teachers will be free to attend. How could a teacher divide herself if she has to be at school and at a workshop at the same time. A teacher has to be set free from 8:00 to 2:00 with the interactive board."</i></p> <p>L2, Parents' focus group interview</p>	<p>"هنا ما الوم المعلم.. الوم مثلا الوزارة. يقولك مشروع معين الكتروني.. اول لا تدخل هذي في اي مدرسة لازم تعد مدربين وتعد اي منهج بيكون وتعد ورقة عمل لكل مدرس.. تسويلهم ورش عمل .. ما كفاية يوم واحد.. مثال الصبورة التفاعلية ما تكفي ورشة عمل يوم واحد للمعلم. بعدين رابطتين المعلم بمدرسة وربطتينه بمشاغل. يعني المعلم وين ايقسم نفسه في هذي الحالة . يعني لازم يكون مثلا متفرغ . معلم واحد يمكن من الساعة ٨ الى الساعة ٢ مع الصبورة التفاعلية"</p>
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My observations of lessons revealed that teachers' lack of knowledge and competence in using tablets made them limit their thinking to what had been provided. For two months, they continued to give the tablets to their pupils with keyboards attached, despite the apparent disadvantages of this configuration. For example, it was difficult for the pupils to work in groups because the viewing angle of the screen was limited one or two pupils. It also restricted the mobility of the devices and increased the risk of damage, as there were occasions when pupils attempted to carry a tablet by holding the keyboard. Throughout phases one and two, the teachers also continued to use only Microsoft Office apps. They thus appeared to lack the confidence to introduce any changes to the appearance or the content of the tablets.

On the other hand, the three subject teachers worked on overcoming the risk of facing technical problems that might interrupt their lessons by tending to work as a teaching team in every tablet-mediated lesson and by involving Mariam whenever she was available. This pattern was repeated in five of the lessons I observed. Although colleagues were supposed to attend only to offer support with tablet use when needed, their presence was taken as part of the lesson, so that both or all of the teachers present acted as a teaching team in these lessons.

5.3.3 The ICT teacher

There were signs that the project needed major decisions to be taken, but Mariam, who was responsible only for its technical aspects, was not able to take such decisions or did not have the authority to do so. For example, as noted in Section 5.2.2, she would have liked to change the participating teachers, claiming that there were others in the school who had a better attitude and showed more initiative in learning what the project required.

The three teachers who did participate had no experience with using technology in teaching and limited knowledge of using technology in general, so they relied on support and advice given by Mariam. This put pressure on Mariam, since she had teaching and other school duties.

<p><i>“And I tell you, it is ok, I will do all that I can to help them. If there is software I’ll download it for them, sometimes I’ll charge the tablets so they can use them, and I’ll give them ideas. For example, yesterday Safia came and I told her ‘Now we have the internet, let the pupils search the net or give them a topic and let them go to YouTube and look for information’.</i></p> <p><i>“It is true that I’m supervising the project, but I’m a teacher and I have a curriculum to cover, pupils, and classes, so I’m not always free to go there.”</i></p> <p>Mariam interview</p>	<p><i>“ وانا اقولك عادي ما بقصر معهن اي حاجة بسويلهن اياهان ، اذا برنامج بنزللهن اياه واحيانا اشحن اليبين التابات عشان يستخدمنهن، وعطيتهن افكار ، مثلا امس جاتني (صف) وقتلتها مثلا الحين النت متوفرة خلي الطلبة يبحثوا في النت او اعطيهم موضوع وخليهم يبحثوا في اليوتيوب ويتصفحوا المعلومات في المواقع.”</i></p> <p><i>“صح اني انا مشرفة للمشروع لكن انا معلمة وعندي منهج وطلاب وحصص فما افضى طول الوقت اروح هناك”</i></p>
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In parallel to the head teacher’s use of her connections to gain the support of people at the regional office and at the ministry, Mariam also contacted people she knew at the IT Department and invited a representative to come to the school to see the project in action, as well as the challenges she and other teachers faced. Her work in helping her colleagues was acknowledged by Khawla: *“All preparation is done with Mariam’s help. She teaches us, although she gets tired with us because she has her own work”.*

Thus, for the first two lessons I observed, she was there to help Safia and Ibtisam in setting up tablets before the lessons started, then continued her support by attending the lessons with both teachers. Ibtisam and Safia also requested her presence when they first used the internet in class, as she was there to help them in connecting the devices to the internet modem.

<p><i>"I contacted Mr Khalid who came here from the regional educational office. He took photos and said the room needs furniture. He took one device to check its system and he spoke about the electricity supply and charging problem, saying a carpenter can easily make a charging cupboard that can charge devices easily. I also told him that we needed the internet urgently. When I contacted him again in February and reminded him about these things, he said he had raised my points, supported with photos, to the higher authorities but no one did anything."</i></p> <p>Mariam interview</p>	<p>"انا تواصلت مع استاذ (خليل) وهو جاء هنا وصور القاعة وقال محتاجة اثاث... واخذ جهاز واحد عشان يشوف النظام ماله، وقتله سالفه الكهرباء وقال عادي بنجيب نجار يضبط الكم اياه في دولاب بأكثر من بلك بحيث انكم تعبوا الاجهزة بسهولة. وخبرته بالانترنت انا محتاجينها بشكل أساسي و خبرته طبعا بكل شئ، وتواصلت معه مرة في شهر فبراير وقال هو كان مسافر الهند وسألته انا خبرتك بكذا وكذا، قال كل الكلام اللي قلتيه والصور والتوثيق رفعتنه للمسؤولين في المديرية بس محد سوا شئ ابدا"</p>
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Mariam was recruited for the project because she taught ICT at the school and because she lived locally, which served the sustainability aim. Apart from Khawla, who had a limited interest in technology, Mariam was the only person involved in the project whose residence in the village would support the continuation of the project, which made it logical to appoint her as project manager. She showed initiative by suggesting improvements and trying solutions to the challenges that arose, directing teachers to experiment with her suggestions.

<p><i>"We will try this now. There is one modem left in the room. We will try connecting a few devices and we will see how the network goes and we will try opening YouTube. I will let Safia try it tomorrow during the lesson observation you attend."</i></p> <p>Mariam interview</p>	<p>" نحن تو بنجربه انا هناك مخليته المودم وبنشوف نشبك كمين جهاز ونشوف الشبكة كيف وبنحاول نفتح اليوتيوب وكذا ،، وحتى انا اخلي (صف) باكر تقدم لك درس ،،"</p>
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The head teacher acknowledged Mariam's value to the project:

<p><i>"She's the teacher supervising the project so she facilitates it, because she already has the experience and she is available in the interactive room as she acts as room keeper. She encourages the teachers, tells them how to operate devices, informs them about the aims and supports them during the lessons, as she sometimes attends with them to support them until they get used to using the devices."</i></p> <p>Head teacher interview.</p>	<p>" للمعلمة المسؤولة عن المشروع... عشان تسهل علي لان هي خلاص عندها خبرة، نفس الشيء هي تواجدها في القاعة .. مثل أمينة القاعة، أمينة المصادر هي امينة القاعة.. تحت المعلمات، تخبرهم كيف يشتغلو، ويش الاهداف، تتعاون معاهم في الحصة واحيانا حتى تحضر معاهم، توجههم لحد ما يتعودوا عليهم."</p>
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However, this role was not a privilege, as Mariam was overloaded with the demands of supporting teaching in different projects in addition to her own teaching requirements. She said that there were days when she went to workshops in the regional office, building up a backlog of work from the lessons that she would have been teaching, as well as supporting teachers in preparing for the tablet project.

<p><i>"There are times when I have workshops. For example, next week I will not be here as I have a workshop on robots. We've got boxes here we have to fit and use in teaching children who will be taught programming on Babylon. This means I am also bound to a curriculum and a plan and being followed by a supervisor, as well as the administration."</i></p> <p>Mariam interview</p>	<p>" واحيانا عندي مشاغل مثل الاسبوع القادم انا ما موجودة عندي مشغل عن الروبوت ..متايلنا اياه بكراتينه والحين لازم نركبه وندرس الطلاب ، بيدرسوا في السكراتش ويرمجة في البايثون ... يعني انا وحدي ملتزمة بمنهج وخطط ومتابعة من المشرف والادارة ،،،"</p>
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5.3.4 Parents

In their focus group, the pupils stated that their parents did not allow them to use tablets at home during school days, because they would distract them and spoil their minds.

<p><i>"We do have tablets, but they are hidden from us because we go to school. During school days tablets are hidden until school closes."</i> [G3]</p> <p><i>"So we can be excellent and be top achievers in class."</i> [G2]</p> <p><i>"They distract our minds so we do not understand and we can't concentrate in exams."</i> [B1]</p> <p><i>"They don't let me play with the tablet because it distracts my mind and I don't understand the exams."</i> [G2]</p> <p><i>"My parents refuse to get me an iPad because they say someone discovered that they spoil the mind."</i> [B2]</p> <p>Pupils' focus group 1</p>	<p>" عندنا لكن تو مضموم عنا حيتنه مدرسة... أيام الدراسة يضم علينا ويوم تخلص أيام الدراسة يخرج لنا"</p> <p>" عشان نكون شاطرين ونجيب الأول"</p> <p>" يشوشلنا العقل وما نفهم ولا نركز في الاختبارات"</p> <p>" ما يطيعوني ألعب في التاب لانه يشوش العقل وما افهم في الإختبارات"</p> <p>" انا اهلي ما طابعيين يسوولي أبياد لانه نفس الشئ يقولوا اوين واحد مكتشف انه الأبياد يخرب العقل"</p>
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The parents appeared to have a negative impression of tablets in general, which they meant to pass to their children. The pupils spoke about horror stories narrated to them at home to scare them from using tablets. However, one girl described these stories as "rumours" and insisted that she had learned useful things from using tablets.

<p><i>"Also rumours come and reach our parents who then say we don't want such things to happen for our children. For example, a girl was playing with an iPad and her tongue got twisted."</i></p> <p><i>"Yes, rumours. I don't think these are true, because tablets are useful."</i></p> <p>G3, pupils' focus group 1</p>	<p>" بعده يطلعن اشاعات ويسمعونه اهلنا .. يقولوا أنه ما نبا اولادنا يستويلهم كذلك... هذي بنية جلست تلعب بالأبياد ... فلتوت لسانها"</p> <p>"ايوا اشاعة .. لكن ما اعتقد انها حقيقية... لأنه مفيد هو"</p>
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Pupils also revealed that their parents promised to buy them tablets to be used during holidays but on condition that no games were to be installed.

<p><i>"My dad will by me a tablet for the holiday and will install .. not games ... he will put on educational puzzles and the Quran."</i></p> <p>G1, pupils' focus group 1</p>	<p>" انا ابينا يشتري لي تاب حال الإجازة ويسوي لي ما العاب ... يسوي لي الغاز تعليمية .. قران ."</p>
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Parents themselves spoke positively about the project and their children having a chance to use tablets in school.

<p><i>"When my daughter brought the form for the project she showed it to me and asked me to agree without reading. I said let me see and as I read it I said 'That's great, you'll get the chance to be part of this project'."</i></p> <p>M2, Parents' focus group</p>	<p>"بنتي لما عطوه الاستمارة .. كان في استمارة خاصة بالمشروع وعرضتلي اياها فلما وصلت كانت تقول لي .. باباه وافق وافق أنني اكون في هذا الموضوع .. فانا ما عارف الموضوع اصلا .. قائلتي لا وافق وافق من دون ما تقرا أريد اكون في هذا الموضوع .. فقلتلها اعطيني اشوف .. فلما قرئت قلتلها ممتاز انه انفتحلك المجال انك تكوني من ضمن المشروع"</p>
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Parents L2 and L4 also spoke about tablets encouraging pupils to learn by disrupting their daily learning routine and stimulating competition between pupils when using software, which will encourage them to learn about using the devices.

Interestingly, L2 mentioned educational games as a special means to attract pupils at this age, thus creating a competitive environment that would lead to innovation.

<p><i>"Children at this age are attracted by tablets, especially when it comes to games. I think it will affect them. It will create a competitive environment which will enable pupils to be innovative, because by using these devices they will have a horizon of using technologies and programs."</i></p> <p>L2, Parents' focus group</p>	<p>"يعني همه الأطفال في مثل هذه الاعمار يشدندهم استخدام الألواح. خاصة في الألعاب لكن في الجانب التعليمي باعتقادني انه راح ياتر عليهم أكثر. انه راح يخلق بيئة تنافسية بين الطلاب كذلك راح يمكن الطالب انه بيدع لانه هم باستخدامهم لهذه الألواح يكون عندهم مجال واسع لاستخدام التقنيات والبرامج"</p>
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One parent had concerns about being asked to pay for a device, arguing that as the MOE wanted to implement the project, it should pay for it. However, not all parents agreed with this idea and some were ready to pay, having seen

“benefits and seriousness” in the project. They also suggested that the school should contact companies to provide “wholesale offers on instalment”.

<p><i>“I will tell you of my personal experience. When they started using tablets my daughter came to her father asking for a tablet. He replied, ‘Let the school provide you one. They want to implement this... Do you know how much they cost?’ The girl was silent, then she said that a teacher had said whoever can afford one should buy one. He replied: ‘If she can afford it, let her buy you one’.”</i></p> <p>L4, Parents’ focus group</p>	<p>“انا حاقول لحضرتك تجربة شخصية بس.. اول ما بدؤوا يستخدموا الالواح ده جت بنتي لبيهاها عايزة لوح. قالها خلي المدرسة توفرك باماما .. مش همه اللي طبقوا؟! انتي عارفه قيمته بكم ده؟ فالبنت سكنت ما قدرتش تتكلم .. قالتلو انه احد المعلمات قالت اللي تقدر تشتري تشتري... قالها خلاص اذا كانت هي تقدر تشتري تشتريك”</p>
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Parents complained that not only were they not involved in the project, but that they were left unaware of its aims and the procedures for its implementation, as well as being ignorant of any role they might have in the implementation process. When the parents’ focus group was asked what they should have known before the project started, one of the fathers responded:

<p><i>“In short, the overall idea of the project, how will it be implemented, the criteria for implementation in the school and my role as a parent. For example, the usual activities with the curriculum and homework are clear. The lessons I need to study with my son, if he wants to prepare for the next day’s lessons, these things are clear to me. But with these tablets, things are not clear to me. For example, what activities are there in their tablets and what help can I give with follow-up to be done at home? Do I need to buy a tablet? Will the school help me in finding content and activities for follow-up, to study at home or prepare for the next day’s lessons? These are some of the questions that come to our minds.”</i></p> <p>M1, Parents’ focus group</p>	<p>“ هي بصورة مختصرة .. الفكرة العامة المشروع كيف راح يتم تطبيقه والالية الى راح يتطبق بها المشروع في المدرسة ودوري اناك ولي امر. مثلا انا في الانشطة العادية في المنهج واضح الواجبات الدروس اللي اريد اذاكرها مع الطالب واذا يحتاج تحضير ليكرة فهو واضح بس في الاجهزة اللوحية انا ما واضح معي مثلا الانشطة نازلة في الاجهزة وهل يحتاج مني متابعة في البيت واي نوع من المتابعة ممكن انا اقدم. هل يحتاج انا اشتري جهاز والمدرسة تساعدني في ايجاد المحتوى الانشطة عشان لو حبيت اذاكرله او احضر له درس من اللي راح يدرسه . يعين هذي بعض الاستفسارات اللي تخطر في بالنا”</p>
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5.3.5 The ICT technician

Just as the three teachers whose lessons I observed had to depend to some extent on each other and on Mariam due to their lack of experience, Mariam herself required the support of Ali, the technician appointed by the regional IT department, to help her cope with the workload that came from everyone else in the project depending on her. Ali's role was to provide the school with technical support for computers and all other technical devices, by making regular fortnightly visits to the school and by responding to calls to come for specific urgent matters. He was often involved, as teachers contacted him regarding the use of tablets and connecting to the internet. In addition to this technical involvement in the tablet project, Ali's role can also be seen to have had a pedagogical dimension.

One aspect of the technical dimension was his role in providing advice to teachers on what programs to install on the tablets. In October 2015, as the school did not yet have internet access, Ali was trying to help teachers in finding alternative solutions to downloading apps from the internet. As Mariam explained, "Ali took one of the tablet with him to check what programs were available to be installed". He was also trying to find ways to connect the tablets to the smartboard in the interactive room, which the head teacher said in interview that she considered to be the priority: "Now the most important thing is to get pupils' tablets connected to the teacher's device or to the smartboard".

On the negative side, Ali's technical advice was not always accurate and on at least one occasion was misleading, which created difficulties for the teachers during a lesson. As detailed in Chapter 4, Section 4.4.9, when in March 2016 the school received three wireless broadband routers, Ali advised teachers that one of these would be sufficient to connect fifteen tablets and that there was no need to waste resources on activating three connections. Because of this bad advice, both Ibtisam and Safia lost time during their lessons that I observed in that month, because as each additional pair of pupils made a connection, another pair lost theirs.

Ali's role was extended to giving teachers pedagogical advice on the use of tablets. Because of his concern with the safety of the devices, he became involved in how they were used and even suggested software that the teachers should use to monitor and control the pupils' screens. His strong personality, as well as the teachers' need for his support, enabled him to persuade the four teachers to change their beliefs as to how they should be using the tablets. Ali brought to their attention the idea of restricting what the pupils were able to do when using the tablets. His insistence on this is illustrated by his use of the word "control" six times in a four-minute conversation with Mariam. While she appeared most concerned with enabling the teachers to obtain maximum benefit from using the tablets, Ali's focus was on directing them to control what the pupils could do and to prevent them doing anything that might interfere with the software installed on the tablets. He discussed with them various procedures for preserving the software and files on the devices by controlling any unnecessary exploration and internet downloads that pupils might attempt. Ali convinced the teachers that their pupils had to be contained when using tablets and promised to source some software that would help them to exercise this control. He explained that there was software available allowing computer teachers to monitor and freeze pupils' screens, preventing them from doing anything without permission.

5.3.6 Supervisors

The final group of agents whose influence should be considered is the school supervisors. Although they were not present during any of the observed lessons and would each visit the school no more than two or three times a month, the teachers' knowledge of their existence and role could be seen to influence the use of tablets in the classroom. In particular, the teachers expressed the worry that using tablets might cause delays in their progress through the curriculum and that they might therefore be subjected to unwelcome scrutiny by a supervisor.

<p><i>"I myself am committed to the curriculum and a plan, as well as being followed up by a supervisor and the school administration."</i></p> <p>Mariam interview</p>	<p>"انا وحدي ملتزمة بمنهج وخطط ومتابعة من المشرف والادارة"</p>
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The head teacher also complained that the school tried to involve the supervisors in implementing the tablet project but had not received the desired support. The school had contacted ICT supervisors and asked for their support with workshops and software, but had had no answer. In all, the head teacher referenced the supervisors thirteen times during her interview.

<p><i>"We contacted ICT supervisors and we asked them for workshops and programs like Elton and so on, but no answer until now."</i></p> <p>Head teacher interview</p>	<p>"تواصلنا مع المشرفين الخاصين بتقنية المعلومات وطلبنا منهم ورش عمل وبرامج مثل التون وهذي الاشياء .. بس لحد الحين ما كثير استجابة."</p>
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The school administration anticipated that the supervisors might not be satisfied with teachers' progress through the curriculum because of changes to their planned timeline caused by using tablets rather than books.

<p><i>"If the visiting supervisor does not know the idea and was asking for something specific, for example, when using tablets, if the teacher went further ahead with her curriculum in a way, a week sooner than when using paper books, the senior teacher will know, but the visiting supervisor might ask 'Why have you got here? You were supposed to have only reached this lesson,' because he does not have the idea."</i></p> <p>Head teacher interview</p>	<p>" لكن المشرف اللي جاي ما عارف الفكرة وبيغى شئ معين يعني يمكن يكون المعلمة قطعت شوط اكبر من الكتاب لان الكتاب ...يعني يمكن توصلت للهدف في اسبوع وهي المفروض اسبوعين فتكون متقدمة .. تجيبها المعلمة الاولى او المشرف .. المعلمة الاولى تكون فاهمة ..يجي المشرف يقول المفروض انتي تكوني هنا واصلة ليش انتي هنا واصلة؟" لأن هو اصلا ما عارف الفكرة.</p>
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On her list of responsibility for suggesting tablet apps to be used in the classroom, the head teacher placed subject supervisors after teachers and on a par with the project manager.

5.4 Tablets and teaching practice

The head teacher twice stated in interview that tablets were intended to be used as electronic replacements for textbooks, thus reducing the weight of the pupils' school bags, and my observation showed that Khawla did use them to replace the Arabic language textbook. For the first of her lessons that I observed (Chapter 4, Section 4.4.6) she had prepared a PowerPoint file reproducing three pages scanned from the textbook, which, following her instructions, the pupils read from their tablets before answering some comprehension questions. However, when she instructed the class to do the same thing during my second observation of her teaching, two girls decided instead to search through the text in the book itself to find the answers to Khawla's questions. This was evident from the flapping of pages as they worked on this task.

The parents appeared to be aware of the problem of heavy school bags and to see the introduction of tablets as providing a remedy:

<p><i>"These devices are useful, especially to get rid of the heavy bags our children carry every day. Why not use electronic books in tablets and one device will carry more books than what a bag can carry, so the weight will be light for the children. If each child had a device this would solve the problem."</i></p> <p>L3, Parents' focus group</p>	<p>" الاجهزة مفيدة خصوصا للتخلص من الشنط الثقيلة التي الاولاد يشيلوها كل يوم. ليش ما نستخدم الاجهزة اللوحية وفي الجهاز الواحد ممكن ننزل اكثر من الكتب التي ممكن الشنطة تشيلها والوزن راح يكون اخف. الجهاز عند الطالب راح يحل المشكلة."</p>
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At the beginning of the project implementation, the teachers faced three challenges, having insufficient software and no internet connection, in addition to lacking the experience needed to deal with the situation they were in. Therefore, they used familiar Microsoft Office programs. However, they still faced the difficulties arising from the fact that using these apps on tablets is different from using them on computer. Each pair of pupils had control of changing their own slides and therefore did not always follow the teacher as she moved from one to the next, particularly as the sensitive touch-screen functionality sometimes caused them to change slides accidentally.

Later, rather than simply displaying information and presenting it to the pupils on the tablets, the teachers instructed them to search for information using tablets. During phase three, internet connectivity enabled them to introduce pupils to performing independent online searches for information in the classroom. Both Safia and Ibtisam now planned parts of their lessons to allow the pupils the time to use their tablets in this way. However, the reliability of the internet connection did not allow these plans to succeed during my observations. As reported in Chapter 4, Sections 4.4.9 and 4.4.10 respectively, Safia and her pupils spent most of the lesson time trying to connect the devices to the internet, while Ibtisam had to abort the activity that she had planned because the internet connection was too weak.

The advice given by the technician also played a role in how the teachers planned their work and on at least one occasion the fact that it was poor advice affected the way the lesson was actually conducted. As noted in Section 5.3.5 and in Chapter 4, Section 4.4.9, Ali's recommendation to use only one router meant that Safia had to work with fewer tablets than planned.

"Earlier when I was planning the topic I thought I would fail. As I was preparing the tablets and none of them got connected, I lowered my expectations, thinking I wouldn't be able to achieve my aim. Thank God four tablets got connected and that was enough for the whole class."

Safia, interview 3

"نعم الحمد لله. مع أنه أنا سابقا لما كنت احضر الدرس، أنه الموضوع راح بوء بالفشل بسبب انه لما جيت احضر التابات ولما جيت اشبكهن بالشكبة ولا تاب منهن التقط الشكبة فخلبت في توقعاتي اني ما راح اقدر احقق هدفي والحمد لله انه تحقق تقريبا في اربع تابات وكفن الصف كامل .."

Although Safia did not achieve any of her original aims for this science lesson, she was happy that the pupils had suggested solutions to the connectivity problem and that some interesting findings had emerged from the brief time during which four tablets were connected.

As to Ibtisam, she did not prepare herself or even think of unexpected results that pupils might encounter when using the internet in class. She thought of

her lesson and how the pupils would search the internet in order to accomplish the task.

<p><i>"Of course there are cautions .. but I did not think about them as the question was obvious about cylinders for which search result will be about cylinders. It is known that search results are linked to search words. I did not expect that unrelated things might appear."</i></p> <p>Ibtisam interview 3</p>	<p>"أكيد شئى محاذير ... لكن انا ما فكرت فيها ... لأن السؤال واضح واستطوانة فالنتائج بتكون اشياء تتعلق بالاسطوانة والمعروف أنه أي عنوان يطلع الاشياء المرتبطة به .. ما توقعت انه ممكن تطلع اشياء مختلفة."</p>
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5.5 Summary

This chapter has presented the findings of the study in relation to each research question. It first identified the contextual factors that mediate tablet use as school location, teachers' experience, time, classroom set-up, internet access and the school's vision for tablets use. Next, it examined the influence on tablet use of the roles and responsibilities of the agents involved, namely the head teacher, the subject teachers, the ICT teacher, the ICT technician, external supervisors and parents. Lastly, the effects of tablet use on teaching practice were explored.

Chapter 6, which follows, concludes the thesis with a discussion and summary of these findings, consideration of the study's limitations, its contributions and implications, suggestions for further research and a closing reflection.

Chapter 6: Discussion and Conclusion

6.1 Introduction

This study was set up to explore the introduction of tablet computers into Omani primary schools for pupils' use, with the aim of determining the effects of their introduction and of various mediating factors on teaching practice in the classroom. In the previous chapter I presented a series of findings in response to the research questions set out in Chapter 1, Section 1.7. This chapter begins by discussing the main findings in relation to the available literature in the field. This discussion proceeds as follows: Section 6.2 considers the most important factors mediating tablet use in the classroom; Section 6.3 discusses the school's vision for the introduction and use of tablets, particularly the organising vision; and Section 6.4 examines the roles and responsibilities of the agents concerned, addressing the planning of the project, the selection and preparation of the teachers and the involvement of the pupils' parents. Section 6.5 then summarises the findings, Section 6.6 lists some limitations of the study, Section 6.7 considers its contributions to research and to education in Oman, Section 6.8 explores its implications and Section 6.9 makes suggestions for future research. The thesis ends with a personal reflection on my research journey.

6.2 Summary of answers to research questions

- 1- What are the contextual factors mediating the use of tablets in the classroom?

The school context impacted on the use of tablets as artefacts mediating the classroom Activity System. The special context of the mountain village school in which the Activity System occurred was one that provided pupils with a basic, traditional teaching and learning experience, where a teacher stands in front of the class maintaining full control of the lesson sequence. Unexpectedly, this context provided good opportunities for tablet use to transform the classroom teaching and learning Activity System. Despite the

challenges and obstacles that existed regarding the use of tablets in classrooms, their introduction created an atmosphere for pupils to actively move from their seats to support each other, creating a space for changing class norms and teachers' rules. The introduction of tablets also had implications for the division of labour, as pupils did not wait for the teacher's instructions but reacted spontaneously, taking the lead in the lesson Activity. This change in the division of labour was manifested when difficulties in connecting tablets to the internet gave pupils a leading role in taking the lesson Activity System forward; they became active participants who supported their teacher in resolving obstacles to teaching.

The school hosting the Activity System was built on a hill to ensure the safety of pupils and teachers during flash floods, but this location appeared to be problematic to the quality of internet services as well as to the appointment of teachers and administrative staff. The remoteness of the geographical location of the school was thus found to affect the use of tablets in the classroom in two ways. First, the poor quality of the internet connection in the classroom was an important contextual factor that restricted teachers' use of tablets. At the beginning of the project, they had to find innovative ways to use the tablets as they were challenged to start using them before the school had an internet connection and without specialised educational apps being provided. Second, the school's location was at least partly responsible for the fact that the head teacher herself had only a few years of teaching experience plus one year as an assistant head teacher and was in her first few months as a school head when the tablet project began. It also had an impact on the teachers' length of experience and on the head teacher's choice of teachers to work on the project, as one criterion was to select teachers whom she expected to stay longer at the school. Their selection according to the school's special circumstances meant that the teachers using tablets were not clear as to why and how they were to use them.

- 2- What are the impacts in terms of the roles and responsibilities of the agents involved in using tablets in the classroom?

Arguing that "if the administration is convinced of the idea, they will be able to utilize the available resources", the head teacher started the tablet introduction project by providing four iPads from the school's own resources, then began to seek external support. Her role was not limited to providing tablets; she had to take decisions on planning and organising the use of tablets in classrooms. She appointed a project manager, selected the classrooms and teachers who would be using tablets in their teaching and supervised the whole implementation process. On the other hand, she also decided not to involve or inform pupils' parents, thinking that they might disagree and stand against the project.

However it was the selected teachers who bore the responsibility for using the tablets in their teaching. They were faced with the challenge of not knowing where to start, since they found themselves provided with tablets that came with no apps installed and no plan for how to utilise them. Their problems were exacerbated by the lack of internet connection, which prevented them from searching for software and downloading it for use in the classroom. To overcome this challenge, they decided to use familiar programs such as Word and PowerPoint until they received electronic PDF versions of textbooks, followed by a limited and inadequate internet connection.

As project manager, the school's ICT teacher was required to supervise the project and provide technical support for the participating teachers. They relied heavily on her support, having no experience of using technology in teaching and limited knowledge of its use in general. Her appointment appeared to be very appropriate, as she had better knowledge of using technology in teaching than anyone else at the school, and she showed initiative by suggesting improvements and solutions to challenges which stimulated the teachers to try novel approaches. However, she was involved in other projects and also had her own teaching duties, the combined demands of which overloaded her.

Finally, although some parents spoke positively about the project and of their children having a chance to use tablets in school, most appeared to have a negative impression of tablets in general, which they tended to communicate

to their children. The pupils spoke of hearing 'horror stories' at home, intended to warn them against using tablets. It was not clear whether there was a causal relationship between parents' negative attitudes and the head teacher's decision not to involve them in the project, or if so, which was cause and which was effect. Parents complained that not only were they not involved in the project, but that they were left unaware of its aims and the procedures for its implementation, as well as being ignorant of any role they might have in the implementation process.

3- In what way does the use of tablets affect teaching practice in the classroom?

When tablets were first introduced, the existing dominant classroom practice was the traditional provision of knowledge, where the teacher stands in front of the class, maintaining full control of the lesson sequence, instructing pupils and imposing rules on what is to be done and what is not. Immediately after the introduction of tablets, teachers continued with the same practice but a change in roles soon occurred, as pupils actively moved around the classroom to show what they had achieved and to support each other. There was a simultaneous change in the division of labour, as the teachers needed their pupils' support, and they welcomed the transformation that happened in the classroom, rather than opposing it. Later, in phase three of the project, both Safia and Ibtisam planned parts of their lessons to allow pupils time to use their tablets to search online; rather than simply displaying information and presenting it to the pupils on the tablets, the teachers instructed them to search for information themselves. As a consequence, although Safia did not achieve any of her original aims in an observed science lesson, she was happy that the pupils had suggested solutions to the connectivity problem and that some interesting findings had emerged from the brief time during which four tablets were connected.

6.3 Classroom Activity System transformation

The use of ICT has always been thought to help with content delivery, creating a space for interactivity and teacher-to-pupil engagement (Osborne and

Hennessey, 2003). However, this study has found that the use of tablets created a transformation in the classroom learning context in at least three different ways. Changes that resulted from tablet use might be seen as normal activities in classrooms in some other schools, such as in the capital city or in another country. However, the school's circumstances, its remote village location and its way of functioning before tablets were introduced made it exceptional and very different in many ways from most urban schools.

In the mountain village where the study took place, not only did the quality of services differ from those in towns and cities, but there were also differences in how people lived and thought, in how they raised their children and in how they wanted them to be educated. Similarly, the teachers had a very different experience from that of their urban colleagues, from their selection to their daily routine of commuting along unpaved mountain roads, which contrasted sharply with the lives of city commuters. All of these factors are part of a teacher's experience that cannot be separated from the way they understand and prioritise their teaching. Therefore, what may be seen as normal for teachers in some contexts, for example to plan to encourage pupils to move around the classroom, are not understood in the same way in schools which differ so markedly in their context.

The introduction of tablets into the classroom Activity System created a contradiction that led to the transformation of the whole Activity System. Thus, in Safia's third observed lesson, when she faced the contradiction of connecting the tablets to the internet, the children played an important role in supporting her during the lesson and took the lead, working actively to find solutions. Although this might be seen as a normal action or activity in other schools, it is totally different when viewed in the context of the hosting school and its special circumstances. These roles were not usual before the introduction of tablets, or even in other parts of the same lesson with the same teacher and pupils before tablets were used. The teacher began the lesson as she usually did, standing in front of the class and telling pupils where to sit and with whom, what to do and how. However, rather than waiting passively for the teacher to teach them in the way she normally did every day, the

children became active participants in the lesson. Tablet use not only enabled them to innovate and to try out their suggestions, but it also presented a change in the division of labour, giving the pupils a leading role in supporting their teacher to overcome the obstacles that had presented themselves. Thus, the tablets were not used simply to deliver knowledge and content, as (Murray and Olcese, 2011) expected, nor were they used for content production (Johnson et al., 2012); instead, they catalysed a transformation in the atmosphere of the learning environment, in people's attitudes and in their understanding of the roles and rules. A transformation could be seen in Safia's attitude: she started the lesson with an authoritarian stance, imposing her seating and pairing decisions, but was later open to pupils' suggestions, giving them a leading role in the Activity. This is consistent with Fullan's (2001) argument that adopting new approaches to teaching can change teachers' beliefs and attitudes. Regardless of what was traditionally viewed in the school as noise, disorganisation and loss of classroom control, after the lesson Safia expressed her satisfaction at having received eight suggestions from pupils in response to the connectivity challenge.

Indeed, listening to these suggestions almost led to a solution, in the form of reducing the number of working devices to four. Here, Safia eased her grip on the lesson, giving pupils part of the lesson Activity and centring this part of the lesson on the pupils, which led to them finding a reasonable solution. Only during this part of the lesson were pupils sufficiently empowered with tablet use to enable them to be the centre of learning activity that (Heinrich, 2012) describes. As for the criticism discussed by Falloon (2013) that such benefits of tablet use are of short duration, it may be true that this change did not last long, but most importantly, it did exist as a transformational opportunity that broke the teacher's sole control, creating a new positive understanding within and between the teacher and her pupils that tablet use changes not only their roles and division of labour but also the way that they see the interaction between them.

In addition, the pupils' Activities and the whole learning environment were transformed without apps being run on the tablets, which contradicts the

assumptions of Murray and Olcese (2011), who based their criticisms of tablets' capabilities on the use of apps, without considering the possibility of the kind of transformation of the Activity System that occurred in this particular context. A similar Transformation occurred in another lesson, affecting Ibtisam's lesson Activity. During the first part of the lesson, before tablets were used, Ibtisam was in full control of the class and did not allow her pupils to do anything without being told to do so. Not a single pupil moved from his/her seat without asking for permission and those who did ask were denied permission. At the same time, pupils' attitudes and behaviour showed that they wanted to start the lesson by using the tablets, but they did not directly ask permission to do so, which shows their knowledge of the rules. However, once tablets were used in the second part, the pupils actively moved around without thinking about permission or rules and Ibtisam expressed her approval of this change of rules by smiling at them.

Ibtisam's pupils also took the lead by introducing Multi-voicedness: they played a role in deciding how the lesson Activity proceeded, rather than waiting for the teacher to decide then following her instructions. Having spent 17 minutes trying to solve the connectivity issue, Ibtisam showed no sign of wanting to stop trying until the pupils raised their voices, shouting "It's not working". They did not ask Ibtisam to change the Activity, but their "voice" was a key factor that led her to amend how the rest of the Activity System would proceed. Engeström (2000) writes, "multi-voicedness is a source of trouble and source of innovation, demanding actions of translation and negotiation". However, Ibtisam did not show any anger, but listened to pupils' views and worked on a different path for the lesson. In other words, the multi-voicedness of the Activity had an effect on the Division of Labour.

Finally, without being told to do so, one of the pupils innovatively raised his tablet and used the camera to take a photo of the table of similarities and differences that Ibtisam had drawn on the board. His action presented a transformational opportunity that was not completely developed because it happened after the bell had rung and Ibtisam had already asked the pupils to put their tablets on their desks and leave the room. The boy's mind was open

to thinking beyond the limitations of the lesson topic and the routine of copying what the teacher wrote on the board. He thought of exploiting the tablet's features in a way that worked perfectly in the context of that lesson, which adds to the observation that there are things going on behind the tablet screen (Falloon, 2014), as many different transformations can happen beyond using tablet devices in classrooms. Again, the transformation mentioned above might sound usual, since it has become normal in schools in other countries and even in city schools in Oman for teachers to plan tasks that encourage pupils to move around the classroom, but this was emphatically not the case in the hosting school, due to the reality of its context, circumstances and environmental factors.

6.4 Factors mediating tablet use in the classroom

This section discusses three broad factors which were found to have an important impact on the use of tablets in the classroom, in the belief that optimising them would make the use of tablets of a better experience for both teachers and their pupils. More specifically, it considers in turn the effects of location, the experience and professional development of the teachers and internet access.

6.4.1 Location

The school's geographical location was found to affect the introduction of tablets by influencing teachers' planning for their use in the classroom. Implementing such a project in a school in the centre of a city would not have been the same as doing so in this case, because the school was located in a mountain village, a location which impacted not only the quality of the facilities provided but also access to the school building and the turnover of teaching staff. Gudmundsdottir (2010) investigated the inequality of access to digital technology resources known as the "digital divide" between schools in urban and rural areas, and found that it had a negative impact on the technological competence of pupils in rural settings. The present study found that on the contrary, the school in question was the first to receive support from the

Ministry of Education for a project to introduce tablets for classroom use, regardless of being in a remote mountainous area of Oman. Despite the challenges of location, a centralised educational system and the number of hierarchical levels through which a letter of request might have to pass, the school administration's belief in the project and determination to bring it to reality overcame the challenge of lobbying the MOE to obtain exclusive support for it. These efforts were not in vain, as the ministry supplied 15 tablets directly to the school.

However, there remained the issue of access to the school building. Previous studies have investigated the internal and external environments of schools. Lu and Overbaugh (2009) explored internal environmental factors and their relation to the use of technology. The location of the school has also been found to affect aspects other than those we initially considered. Various studies have looked into modes of transport and the distances pupils travel to school and have found both distance and location to affect pupils' safety and their choice of travel modes, depending on the school's location (Schlossberg et al., 2006; McDonald, 2008; Ewing et al., 2004). In rural areas, school location also has an impact on motivation for homework and achievement (Xu, 2009). This study found that the geographical location of the school made access difficult, so that it could not be guaranteed that pupils or staff would be able to come to school or return home during heavy rainfall, which disturbed the process of implementing the tablet project. Three of the five teachers participating in the tablet project did not live in the village itself, to which access was not easy during rain, as floods might block the main road to the village, which was still under construction. Rain and floods are more likely in mountainous areas than in other parts of Oman (Kwarteng et al., 2009).

"أنا اخاف وضع الامطار هذي الايام كله مثل ما تشوف. نحن ثلاثة ايام تأجل الدوام في مدرستنا بسبب الامطار وداوموا
أمس يوم الاحد"

"I am worried about rain these days as you can see. The school was closed for three days due to rain." (Mariam, interview ٢)

The school's location thus influenced teachers' and pupils' access, which in turn impacted the introduction of tablets and their use in the classroom. Teachers' plans to use tablets were found to have been disturbed by the uncertainty of the timetable, as there were situations when they were not sure whether they would be able to reach the school or if they did, whether the pupils might not come or might be dismissed early. Thus, even the forecast of heavy rain made teachers unable to plan the progress of their work with certainty, which they needed to do if they were to use tablets. Tablet-mediated lessons needed to be decided well in advance, as teachers need to prepare differently for lessons with tablets when compared with their usual lessons (Frey et al., 2013). Planning and preparing for a tablet lesson requires effort, time, materials development and research resources (Young, 2016). After deciding on the lesson, teachers must prepare digital materials as well as the devices themselves. Therefore, uncertainty regarding access to the school tended to make teachers avoid starting their preparations. This is a complex process, during which teachers may struggle to make sense of tablets and the selected software and then to restructure their lessons (Ruggiero and Mong, 2015) to serve learners' needs and to achieve the learning aims that were set before the introduction of the devices.

The school's location also had a negative effect on internet connectivity, as will be explained in Section 6.2.3, after consideration of the effects of teacher-related factors.

6.4.2 Teachers' experience and professional development

Teachers' experience made a difference to their reactions to the introduction of tablets. In reflecting on the first concrete practice, teachers bring to this their technological competence and previous experience (Abbott, 2016). Therefore, the three teachers varied in their reactions to the first stage of tablet introduction. For Khawla, who had twelve years of teaching experience but limited experience of digital technology, using tablets was a change of tool but not a change in teaching strategies. She saw tablets as an electronic replacement for the textbooks from which her pupils read. Montrieux et al.

(2014) suggest two reasons for teachers not changing their practices in response to the introduction of such devices, which are the workload and the lack of digital materials. However, Khawla did not mention either of these factors, but instead put emphasis on the inadequate training provision.

Teachers' experience and tablet introduction were found to affect each other and both sides of this two-way relationship were found to vary from one teacher to another, as each individual perceived the tablets and their use in her own way. The three teachers thus reacted differently to the process of tablet introduction, which resulted in different accounts emerging. Khawla had twelve years of teaching experience before beginning to use tablets in her classroom, whereas Ibtisam and Safia did so during their first year of teaching. All of them used only Microsoft Office applications on the tablets for the first few months, but the three teachers reacted differently to this experience and it emerged that each had gone through various stages of learning by experience. Their experiences were found to play a role in deciding how they viewed the advantages and disadvantages of using tablets. Although Khawla's use of tablets in class was limited to their simple function as an electronic version of the textbook, she was still afraid of the potential and unknown disadvantages, stating in interview that "we don't know the disadvantages". Ibtisam and Safia, by contrast, being newly qualified teachers, appeared to consider only the advantages of this new technology. This is consistent with the findings of Burden et al. (2012) on experimental learning and on how teachers learn through their experience of using tablets in class. Kolb and Kolb (2009) explain that people go through a four-stage cycle of experimental learning, beginning with concrete experience, after which they reflect on their practices. This reflection leads to the formation of concepts which guide the third stage of active experimentation, as a result of which a newly reshaped concrete experience emerges. Figure 6 depicts this cycle of experimental learning, adapted to the situation of teachers participating in the tablet project. During the first stage of experimental learning, people deal with the situation as a concrete reality, rather than from the perspective of what they think it should be.

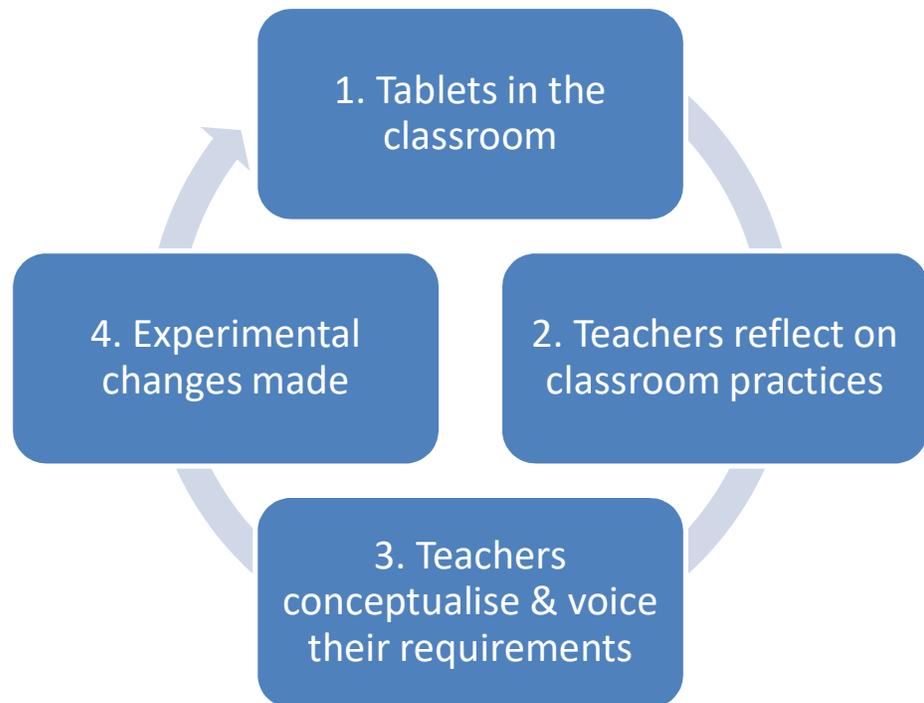


Figure 6: Experimental learning cycle (adapted from (Kolb and Kolb, 2009)

On the other hand, the tablet project offered the new teachers another exploratory chance to building on their experience. During my first round of observations, both Safia and Ibtisam used PowerPoint and Word and both enjoyed this first experience, despite admitting that there were aspects that were in need of improvement. However, after the lessons they gave a month later, it was evident that neither of these young teachers was content with using only Microsoft Office, as both expressed the need for connection to the internet, which would open new doors of tablets use for them (Beauchamp et al., 2015). Safia and Ibtisam were recent graduates who were constructing their experiences by reflecting on their own practices and by observing each other. As they followed the stages of the learning cycle depicted in Figure 6, they made demands for support that would help them to modify their teaching practices and to bring new experiences to their learners. They repeatedly asked the head teacher for an internet connection to be provided.

In addition, the teachers needed to have at least minimum competence in using the tablets but lacked the requisite knowledge, as they had received no proper training on using digital technology in the classroom. Such training is necessary for teachers, especially those who have limited knowledge and skills in using tablets (Beauchamp and Hillier, 2014). In fact, at the beginning of the implementation, the teachers themselves also appeared to be deceived by the false notion that tablets are simple to use and training is not necessary. This failure to take the need for training seriously appears to have been at least partially responsible for the inadequate quantity and quality of the training given to the teachers before the project began to be implemented. Some have argued that teachers' competence in using digital devices is not enough by itself if they do not know how to use their knowledge to help their pupils to learn (Ertmer and Ottenbreit-Leftwich, 2010). Teachers must also know how to use tablets; Ertmer and Ottenbreit-Leftwich (2010) explain that teachers need a certain body of knowledge about technology in order to successfully identify which technology to use to support a given teaching goal and to decide how that technology will be used to help pupils achieve the learning goals and demonstrate their learning. The three teachers participating in the present study did appear to recognise the reality of their limited knowledge, Ibtisam and Safia as novice teachers and Khawla as one with limited knowledge of technology use; therefore they all not only chose to work closely with the ICT teacher, Mariam, in preparing their lessons and setting up the devices accordingly, but also asked her to be present with them in the first two lessons that I observed. The four women provided mutual support for each other in planning and implementing the lessons with tablets.

Ibtisam, Safia and Khawla all lacked confidence to some extent, due to their limited knowledge and experience of digital technology in teaching, leading them to limit their use of software to Microsoft apps. This was a temporary situation, however, which affected phases one and two of my observations but not phase three and which enabled them gain the minimum knowledge and confidence required to use the tablets with their pupils. In another example of early stage experimental learning, the teachers not only limited their use of

software to that which was supplied with the tablets, but even failed to modify the hardware configuration, continuing to present the tablets to their pupils with keyboards attached, despite the deleterious effects on viewing angle and portability. Thus, throughout phases one and two, all of the teachers continued to use only Microsoft Office programs and did not detach the keyboards. They were not confident enough to introduce any changes to the appearance or the content of the tablets, but simply kept using them as they were.

Training is about differences between using tablets for personal use compared to using them as pedagogical tools (Beauchamp and Hillier, 2014). In interview, the head teacher tried to defend the administration's position by referring to a training workshop on Quiz Creator that had been offered. This claim raises two issues: first, both pupils and teachers mentioned the Quiz Creator program to me, which indicates that they had already used it on computers, prompting the question of why it had not been run on tablets during the workshop, if it can be run on them, especially given that the school had taken delivery of the tablets three months earlier. This would have given teachers a chance to learn and discuss the use of the software on the devices they would be using in the classroom. Learning about using an app on a computer and then trying to run it on tablets during lessons would be likely to be subject to similar challenges to those affecting the use of Microsoft Office. Secondly, there is an organisational issue when teachers cannot attend training due to having lessons at the time of the workshop. The head teacher's role in organising the project and in following it up is discussed in Section 6.4.1.

Teachers who are offered insufficient training before being required to use technology in the classroom will find their confidence reduced in general, let alone their confidence in what they can do with the devices. The lack of training at which Khawla expressed her disappointment must have damaged her confidence, as she refused to start the lessons I was to observe without the presence of another participating teacher. Although this was unusual in a teacher with twelve years of experience, at least in the Omani context where only one primary teacher normally teaches a given subject to a class,

Khawla's reaction was entirely consistent with the findings of previous studies that a lack of proper training makes teachers afraid to consider using tablets in the classroom (Erbes et al., 2017). In addition, having described conventional books as indispensable, even if the lessons were all downloaded onto tablets, Khawla was the only one of the three teachers who used tablets as electronic replacements for books. Inadequate training and the consequent lack of confidence prevented Khawla from imagining more creative ways of using tablets. She just wanted to engage in the acceptable minimum of tablet use in a way that would please the head teacher, who held the view, shared by many parents, that the value of tablets in school was simply to replace paper textbooks.

Involving other teachers in a lesson is not common in Omani schools, where one teacher is usually in charge of the whole lesson. However, as none of the three teachers was confident about using the tablets, fearing that technical problems might interrupt their lessons, they tended to work as a teaching team in every lesson and involved Mariam whenever she was available. This arrangement was repeated in five of the lessons I observed and when another member of the team was not present this was because she was unable to do so because of her own teaching timetable. The additional teachers were supposed to attend only to give support when needed with tablet use, but their presence was taken as integral to the lesson. This may well be acceptable in certain contexts, but it is not usual in Omani schools, especially given that the three teachers each taught a different subject. Teachers do exchange lesson observations with each other and this is understood to form part of their professional development, but even this is mostly done by teachers of the same subject. In this case, the three teachers were trying their best to find ways of using tablets in their classes. Teachers need to learn from each other about using technology in the classroom (Younie and Leask, 2013; Beauchamp and Hillier, 2014). However, exchanging classroom visits here went beyond a visiting teacher observing another teacher to learn from her. This can be seen to have led to the teachers becoming unduly dependant on

each other, as illustrated by Khawla's refusal to use the tablets in a lesson which she knew that Mariam was not free to attend.

6.4.3 Internet access

The school's location, in addition to the consequences discussed in Section 6.2.1, also determined its access to the internet, which impacted in turn on how tablets were used. First, the school was not served by a fibre-optic internet cable, which obliged it to depend on daily 3G subscription bundles that provided limited downloads. Without internet access between October 2015 and March 2016, the teachers could use only the pre-installed Microsoft apps in their lessons. During these months they therefore repeatedly requested internet access, which they saw as a means of loading the tablets with materials. Being able to access the internet in a classroom equipped with tablets also allows teachers to deliver lessons which take advantage of mobility and connectivity at the same time (Khalid et al., 2013). Other studies have found that tablets provide wider access to knowledge and resources, as many teachers have noted that their internet use has increased after integrating iPads into their teaching practice (Burden et al., 2012). Researchers also report that tablets are difficult to use in a classroom without internet access, because apps designed for such mobile devices are normally downloaded from the internet (Neumann, 2014). During the lessons that I observed them giving in phase three, Ibtisam and Safia were planning to use the internet but were prevented from completely implementing their lesson plans by an unstable internet connection, which was inadequate for downloading software. Thus, Mariam said that while apps were central to the teachers' plans, the available internet connection was not good enough. This explains the teachers' instructions to pupils to search directly for information using Google and YouTube, rather than planning to run downloaded apps.

Once connectivity was provided, however, Safia and Mariam decided to let the pupils use the internet in lessons regardless of the precautions needed. Children who have access to the internet in class are in danger of being distracted from the lesson and teachers have expressed worries about pupils

being disturbed by social media (Clarke and Svanaes, 2014). Although both Safia and Ibtisam expressed this concern about the use of the internet in their classes, it occurred during one of the two observed lessons, when a pair of pupils were found to be searching for motor racing. Excitement at the introduction of tablets can arouse enthusiasm and enjoyment for learners (Ali, 2013). Other studies have looked into pupils having their own tablets and the influence that this may have on their use of tablets in the classroom (Burden et al., 2012). However, from the teachers' perspective, having tablets for personal use is different from using them for teaching purposes, which is about preparing teaching materials and engaging twenty or more pupils in one learning activity. A study by Mouza and Barrett-Greenly (2015) found that when teachers were given iPads to use in their classes, they did not know how to establish a user account, nor were they able to check connectivity or download apps for teaching purposes. This made them rely on the continuous support of others, including the learners. Similar findings are reported by Erbes et al. (2017), who state that educators in their study depended heavily on the experience of undergraduate students to set up and use tablets in the classroom.

In addition, Safia and Ibtisam jumped into using the internet in classes without first seeking to minimise a danger raised as a source of concern during the parents' focus group discussion, where one mother wanted to be sure that the pupils would not "download unacceptable videos or photos". This fear is justified by an Australian study which revealed that in 33 of 106 responses given by 57 primary pupils, "sexually explicit images" were identified as a danger on the internet (Ey and Glenn Cupit, 2011). Although the Australian study sees this as positive sign that children understand such images to be dangerous, the Omani parents in the present study would have liked to be able to eliminate altogether the danger of the children seeing anything of this kind; one parent argued that "there should be limitations to downloading on the devices". However, in classroom practice, Ibtisam asked pupils to search the Web for pictures using keywords without first trying these herself to see what pictures the pupils might find. Changing from the simple reading and

writing of Word and PowerPoint files to accessing the internet shows that teachers were thinking about tablet-mediated teaching and trying to improve upon their practices because they wanted their pupils to have a better experience by using tablets. However, they constantly faced the problem of not being able to achieve their ideas with tablets.

It is important to note that the delay in internet provision for the tablet project occurred despite the efforts and intentions of the school administration, which considered it a priority and arranged with the Ministry of Education to provide access via three 3G Wi-Fi modems which it supplied to the school especially for the project.

<p><i>"Nothing in my mind except internet, having internet connection in school was one of the most important point to enable us perform tablet introduction at its best. We tried our best but our school is supposed to be located within range of fibre optic and to be included within the budget. Had it happened, it would have been an excellent turn in the project, as it would make things much easier for teachers and their pupils."</i></p> <p>(Head teacher)</p>	<p>"ما فيه حاجة في بالي الا الانترنت... كانت اهم نقطة تواجد الانترنت عشان نأدي الغرض كامل.. تواجد الانترنت في المدرسة وحاولنا قدر الامكان لان نحن مدرستنا المفروض تقع ضمن الالياف البصرية ويكون في ميزانية وعرفنا من الوزارة ولو صارت هذي النقطة بيبكون تحول جدا متميز للمشروع، بيبسهل على المعلم كثير، وبيسهل على الطالب كثير."</p>
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6.5 The school's vision for tablets

The findings of this study confirm the need for clear practical vision to guide teachers in using tablets innovatively in classrooms, which matches the finding of Montrieux et al. (2014) on teachers' role in implementing the introduction of tablets into secondary education. The head teacher stopped at providing tablets for the teachers, which shows that she did not have a strategy for using them. Keengwe et al. (2009) argue that for change to be effective, administrators and organisation managers need to prepare strategies that go beyond providing technological equipment, whether hardware or software, as they also need to plan staff training for effective use

of digital devices in the classroom. The tablet introduction project was not simply a matter of providing tablets and apps, but needed to include guidance on their use and a methodology to be adopted with these devices. Teachers needed guidance, training and technical support as well as software and hardware. Providing tablets appeared to be less difficult than using them in a school located in a mountain village with limited internet connectivity. Here, the teachers' role was manifest in responding to the situation and shaping the implementation (Hattie, 2003; Ertmer, 2005). However, from an institutional perspective, teachers must not simply be responsive to situations in which they find themselves. The introduction of tablets requires good planning so that not only the teachers but all of the personnel involved know their roles in advance, negotiate their expectations and are involved in evaluating the project's outcomes. Here, while working on providing devices or even before this, the head teacher needs to start by devising an organising vision that provides legitimation to what people are doing (Swanson and Ramiller, 1997). For example, when teachers were ready to use the internet in the classroom with their pupils, they needed to have legitimate support in doing this as well as guidance on how it should be done. The following subsection discusses in detail the school's organising vision, whose structure is illustrated in Figure 7.

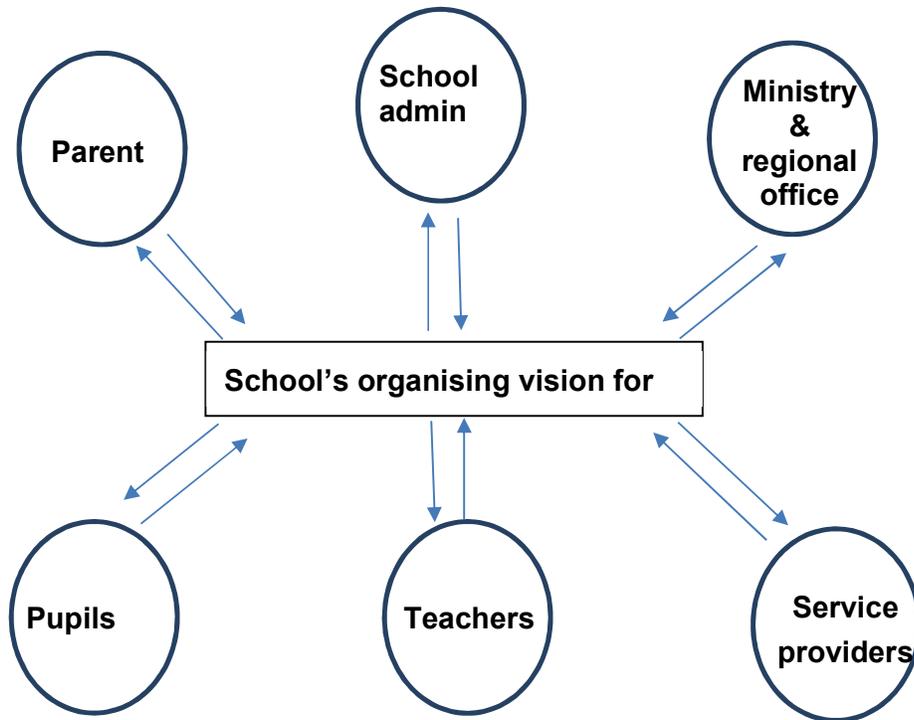


Figure 7: The organising vision for the tablet project

Organising vision

One of the basic functions of an organising vision is to interpret the themes that are associated with the innovation, as the meanings that they carry might not be easily understood and some might be seen as ambiguous (Swanson and Ramiller, 1997). In this case, the reason for introducing tablets into the classroom was not clear at the outset to the teachers who were to use them with their pupils. The head teacher saw the purpose of the project as keeping abreast of educational technology, whereas the parents appeared to think that it was simply intended to replace paper textbooks and thus to reduce the weight of the pupils' school bags. As to the teachers, when they received the tablets they had to find their own purpose for using this new tool that had become available for them to make use of however they could and whether or not they could see a value in doing so, because they were part of a school project on using tablets in the classroom. They were not informed of the school administration's vision behind the project and each teacher had to identify her own purpose for using tablets. One of the reasons for the unsuccessful implementation of previous initiatives to introduce new technology has been a

failure to specify the purpose of its adoption, causing users to see it as supplementary and not essential (Norris et al., 2012).

In addition, the teachers in the case study found themselves having been provided with tablets on which no educational apps had been installed and realised that they had to deal with this situation either by finding a solution themselves or by waiting until they were provided with the resources they needed to solve the problem. They chose to adopt the simple and practical solution of using the familiar and available Microsoft Office apps. This decision not only got them started with using tablets in their classes but also saved them waiting time, as the situation of not having an internet connection continued for four months.

The project of introducing tablets into the classroom was initiated as the fulfilment of an idea from within the school, not imposed from outside. The head teacher said: "Every idea starts with a dream and insha'Allah we will get to the end ... a balanced end." However, when I asked her about the origin of the plan, she replied that "the plan comes from the ministry for all subjects and at the beginning of the school year. Instructions come for each subject with a time frame and we are supposed to follow it." The head teacher had a general idea, but no clear or written plan for implementing the tablet project. The idea was not only to introduce tablets, as it originated four years before their introduction. When institutions decide to adopt a technological innovation, they must generate expectations for the future in order to reduce the uncertainty that might be felt, along with planning, decisions and actions (Clark, 1986). The original idea was to equip a room in the school to provide access to interactive educational technology at its best. The provision of tablets appears to have been a logical continuation of that project and to the credit of the school administration, this was a unique step. The head teacher was the focal point of the project that led to the introduction of tablets. Her role and responsibilities, as well as those of other agents, are discussed next.

6.6 Roles and responsibilities

It was important for the administration to ensure clarity in the different roles and the division of labour within the tablet introduction project. An essential aspect of the vision was to prescribe the roles and responsibilities of all participants. The head teacher limited her own role to providing facilities and overseeing the project. Her understanding of the leadership role was providing the necessary infrastructure for the teachers while leaving the rest to them. However, Whitaker (1993); (Ghavifekr and Hussin, 2011) assert that when implementing change in classrooms the school leadership should work with certain starting points that require management abilities. One is creating sources of ideas to help and guide teachers in the classroom, making available to them various ways of using newly introduced devices that involve the use of their imagination. Another is creating a source of funding to meet their requirements, such as the purchase of apps and the provision of training. In relation to the management abilities identified by Whitaker (Whitaker, 1993; Ghavifekr and Hussin, 2011) this study finds that the school administration needed to take care of three areas in particular when implementing the tablet project: planning the project, the selection and preparation of the participating teachers and the involvement of the pupils' parents.

6.6.1 Planning the project

Planning for the tablet project started with the identification of its aims and the procedures to be followed to achieve them. Teachers, as the key agents who would be putting any plan into practice, needed to be part of the plan. Planning the process of introducing tablets covered three areas in addition to providing the devices themselves: the selection and preparation of teachers, the policy on tablet use and the evaluation of the project's implementation. Planning a project starts with an analysis of the institution's current situation to identify any relevant anticipated future developments (Ghavifekr and Hussin, 2011). In addition, Wedell (2009) calls for the planning of educational change to start with peoples' reality, which can be done simply by speaking to the teachers concerned and observing them closely in real situations to determine what

their needs are in respect of the proposed change. The head teacher in this case refused to accept that using tablets would require extra effort in lesson preparation, arguing that whatever the equipment or materials used, it is part of each teacher's duty to research the available resources while preparing for a lesson. She rejected teachers' complaints while asserting that the steps needed for the success of the project included changing teachers' beliefs and culture. This reference to the desirability of attitudinal change is consistent with calls in the literature to modify people's beliefs so that they will be more likely to accept the change that is being introduced (Zeng 2005 quoted in Wedell, 2009 p22). However, identifying the needs of teachers remains an essential step and must be followed with an action plan which will result in their practices and culture changing appropriately. The head teacher in this case could not achieve the aims of the project by simply imposing her own ideas on the other actors. A change leader should communicate his or her ideas by encouraging the people involved to speak and listening openly to them in order to properly understand their views and needs (Whitaker, 1993). Further, while implementing change the leader must show tolerance of teachers' mistakes and keep them updated in various ways (Ghavifekr and Hussin, 2011).

A successful change plan must be flexible and responsive to unexpected contingencies. The administrators of the change must make decisions and take action immediately when needed to put the plan into practice. For example, the programme leader must be able to organise demands and take hold of difficult situations (Whitaker, 1993) by stepping to the front, ready to take quick decisions according to the situation. There were signs that the tablet project needed major decisions to be taken, but Mariam, as project manager, was not able and did not have the authority to take such decisions. For example, she would have preferred to change the participant teachers, claiming that there were others in the school who had better attitudes and would show greater initiative in delivering what the project required. Appointing the ICT teacher as project manager did not guarantee that the intended change would take place, since a project manager will tend to view

the project as it is on the ground, not in people's minds. Crawford and Nahmias (2010) argue that a project manager and programme manager are different from a change manager and might not have the all competences required to promote the change they are leading or to perform all of the activities required for the change. It is also notable that the head teacher spoke about changing only the teachers' beliefs, whereas Zeng (2005) includes others involved such as leaders, pupils and their parents.

A robust implementation plan should contain elements of continuous evaluation and performance indicators to measure the progress achieved in the project. Change leaders should indeed evaluate their own work as well as that of others and take whatever actions are necessary to keep working towards their goals (Ertmer and Ottenbreit-Leftwich, 2010). They need to compare the outcomes achieved to the original goals (Crawford and Nahmias, 2010). The head teacher in the case study assumed that half of the aims had been achieved, but when I asked her specifically what had been achieved and what remained to be done, she was not able to give a clear response to either part of this question. In fact, the head teacher's actions show her to have had a weak understanding of her own supervisory role, as she appeared to keep herself at a distance from the project rather than following its progress carefully. This was shown by her response when asked about what she had noticed: she mentioned observations of pupils using computers but not tablets, which indicates that she had not personally observed any lessons in which the pupils actually used tablets.

6.6.2 Teachers' selection and preparation

The criteria for selecting teachers to participate in the tablet project impacted their competences and the ways in which they approached the use of tablets in the classroom. The head teacher's decision to base the selection of participating teachers on the proximity of their homes to the school premises affected the use of tablets in the classroom. This inappropriate criterion meant that teachers were selected who had no interest in technology, lacked technological skills and had little teaching experience, all of which Buabeng-

Andoh (2012) describes as barriers to technology use in classrooms. Although the two young, recently graduated teachers were using only Microsoft Office programs which are commonly used by teachers and their pupils, they nonetheless required continuous support from the ICT teacher. The three teachers did not volunteer to participate in the project but were selected by the head teacher, who said that their selection depended entirely on them living close to the school. She justified this as necessary for the sustainability of the project, but it could be objected that in its initial period, the project needed above all to be staffed by people who would take it forward with enthusiasm. It was on this basis that Mariam, who had been appointed to manage the project, was unhappy with the choice of teachers, complaining that those involved in the project showed too little initiative and depended on her telling them what to do, thus adding to her workload and the weight of her responsibility. Fullan (2006) calls upon leaders to balance their long- and short-term goals in order to ensure the sustainability of their projects. The head teacher faced the problem of a rapid turnover of staff, with teachers being transferred each year, which made her prioritise the project's long-term success. She assumed that selecting and training teachers who lived in the same village as the school would guarantee the availability of staff trained and experienced in the use of tablets for the coming years.

However, not only did this inappropriate selection criterion compromise the short-term success of the project, but it did not appear to serve its sustainability either, given that Mariam, as project manager, declared that she was planning to replace the teachers with whom she was unhappy the following year, because their failure to show sufficient initiative meant that the project "doesn't work this way". According to her, it should not in fact have been necessary for the project's long-term goals to be inconsistent with its immediate success, since there were teachers at the school who lived in the village and whom she considered to have "better experience and attitude".

The study found that during the process of introducing tablets the three subject teachers faced challenges that they were not prepared for. One reason for this was that they did not recognise the tablets as new tools with their own

features. The first step that the teachers should have taken was to learn everything they could about the operating system of the devices (Mang and Wardley, 2012). Their failure to do this and to acknowledge the particular features of the tablets meant that their preparation was less effective and that they did not predict avoidable challenges such as time lost in opening the lesson file. Despite using universally familiar software such as Word and PowerPoint, they still faced the challenges arising from the fact that these programs do not run identically on tablets and on larger computers. Having prepared or downloaded materials for every tablet before the lesson began, it was also important for the teachers to try out the prepared lesson on the tablets to anticipate how pupils would cope with using unfamiliar features such as the touch screen and how the much smaller screens would affect their usability.

Teachers depended on their imagined scenarios of how the tablets were to be used in the classroom, as Safia explained: "It is only imagination and when I came to implement it I didn't know whether I'd find answers to my questions or not, but I didn't search the internet." The teachers' preparation was not based on the reality of the classroom, which put them in difficult situations and made them lose time in class. This confirms that teachers discover challenges when they are already in a situation, such as losing control of the class as pupils play games instead of doing the allotted task, which is more likely to happen if the teacher has not prepared the lesson well (Isici and Demir, 2015).

The teachers lacked confidence in the successful use of tablets because they had not received adequate training. Training is an essential determinant of the success or failure of any technology project and it is important for all stakeholders to be involved (Keengwe et al., 2009). In the present case, the teachers complained that they had not had the training they required. They cannot be blamed for their lack of knowledge and awareness regarding tablet use, because teachers can reasonably expect to be given the necessary preparation to use any new devices introduced into the teaching context (Keengwe et al., 2009). Two of the teachers selected to staff the project were in their first year of teaching, so they had no prior teaching experience and

had not lived through the development of the project itself, while the third teacher had more than ten years of teaching experience but had little experience of or competence in technology use. Erbes et al. (2017) found that teachers were able to switch from PowerPoint to a more suitable app suggested by their pupils only because of the training they had received, along with support from the pupils themselves.

The three teachers' requirement for continuous technical support meant that the introduction of tablets was not as simple as it appeared at first. This led the subject teachers to rely too heavily on Mariam's experience of using technology in teaching to help them to plan their lessons, as she was involved in leading the project. Mang and Wardley (2012) recommend working closely with ICT specialists within the institution, but these teachers appeared to be merely acting upon Mariam's suggestions rather than thinking collaboratively about the implementation process. Although they were happy and enthusiastic about using tablets in their lesson, they seemed to have no clear grasp of the requirements for doing so. In addition, Mariam was unhappy at being overloaded with the project work on top of her usual teaching requirements, especially as she saw the subject teachers as passively awaiting her suggestions instead of contributing by producing their own suggestions as to how to go about their own lessons. They did not appear to think about what was needed to use the tablets effectively and what might come with the tablets into the classroom. The root of this shortcoming was the attitude of the school administration, which confirmed the assumption that the teachers would be able to use tablets in their lessons without guidance on how to do so ("Catching on at last" 2013 cited in Smith and Santori, 2015).

This study confirms the role of leadership, in this case the school administration, in ensuring the effective provision of professional development programmes (Psiropoulos et al., 2016). The school administration needed to be specific when asking for training programmes. Using the words 'training' and 'professional development programmes' did not help the staff of the education office to respond to the school's needs. In a letter to the MOE before the project began, the head teacher specified what she wanted in terms of

hardware, asking for ten tablets, but she failed to specify the support that the school needed in training the teachers involved. A review of the literature indicates that failure to deliver the necessary training has been the most frequent challenge cited in published studies (Hu et al., 2003; Erbes et al., 2017; Beauchamp et al., 2015). In addition to providing the required devices, the authorities must ensure that the people involved in the implementation process have access to a suitable development programme as well as resources on best practices for utilising the technology in question (Keengwe et al., 2009). When the project was underway, the head teacher wrote to the regional education office asking for support but did not specify the nature of the support required. In interview for this study, she spoke of a plan for teachers' professional development and referred to the week at the beginning of every semester which is available to the school for professional development, complaining that this time was insufficient to accommodate all of the school's training requirements, which included many topics other than technology. It would indeed appear reasonable to claim that a week would not be long enough to train all teachers on every aspect of technology use, but it is not clear that sufficient time could not be found within this period to train a small number of teachers on specific tablet apps to be used in teaching grade four pupils.

The head teacher made a related claim in interview: that her teachers feared technology and that it was her responsibility to change this negative attitude. However, their own interview responses indicate that the teachers were not afraid of the tablets but were simply not confident about using them without the appropriate training, without suitable apps and without a reliable internet connection. Mang and Wardley (2012) argue that teachers should first decide on the way tablets will be used in class, then need to make sure that their use represents not an additional activity but an integral part of the lesson. They suggest that this should be done by talking to learners about the use of tablets and explaining the benefits. The teachers in the present study were not in a position to adopt this sound advice, being uncertain themselves of the true purpose of using tablets because they were given inadequate guidance on

this. For example, in the early stages of the study, the teachers stated the belief that tablets would help them to save time, but they later complained that they did not have time to use them. If such devices are used in class with no clear purpose, they will tend to become a distraction and a cause of time loss rather than saving (Ali, 2013). On the other hand, changing from a reliance on Microsoft Office files to using the internet shows that teachers were thinking about their teaching with tablets, that they were not satisfied with what they were doing and that they wanted their pupils to have the best possible experience with the tablets. This is consistent with the argument that teachers need to be motivated and inspired to set their own goals, as well as to be provided with sensible challenges that will allow them to recognise their own achievements (Whitaker, 1993).

To overcome their lack of confidence when using tablets, the teachers worked together and supported each other, despite the fact that involving other teachers in one's lessons is not common in Oman, where a single teacher is usually in charge of the whole lesson. The teachers worked together to set up the classroom for lessons with tablets and there was always at least one other teacher who attended each lesson to support the teacher responsible when she needed help with the use of tablets. Indeed, the presence of the additional members of staff was accepted as part of the lesson, with both or all of those present acting as a teaching group. Acknowledging the importance of nurturing teachers' ideas about the technology being introduced, Palmer (2017) suggests that this can be best achieved through the provision of training courses, which will help them not only to welcome the new technology and to make the most of it, but also to explore their inner selves when innovation is introduced to a school.

6.6.3 Parents' involvement

The role of the pupils' parents was not aligned with the school's initiative, as they were not involved in the introduction process. The head had suspected that they would object to the project and might stand in its way, which made her decide not to inform them or involve them in any way. Her concern, though

not justified, could be linked to the reaction of teachers and other members of the community to the mobile phone policy in 2008 (Teachers forum, 2011). This decision not to involve them reduced parents' awareness of the project and of its value. Some parents appear to have given their children a false impression of the balance of advantages and disadvantages by sharing alarming and unsupported rumours about the risks of using tablets, reflecting their own fears and concerns. This is not unexpected, as many parents are worried about the dangers of children having unregulated access to the internet (Ey and Glenn Cupit, 2011). Since the school administration did not explain the project to the pupils' parents, they will have heard about it less directly from potentially unreliable sources and may therefore have obtained a false picture of what was actually happening at the school. A study to evaluate tablet use in a school in Scotland found that parents were becoming increasingly involved their use and engaged with the school in following their children's learning (Burden et al., 2012). In addition, parents have a role to play in providing opportunities for their children to access digital devices, which influences their learning (Stephen et al., 2013; Plowman et al., 2010). Home support may vary, as not all parents have the same exposure to technology use, especially in rural villages, and this diversity may affect parents' understanding of how tablets are to be used in the classroom. Members of the parents' focus group in the present study expressed concerns about the content, especially about not wanting their children to be exposed to pornography and other undesirable material.

Contrary to the head teacher's earlier fears, those parents who participated in this study did not in fact stand against the project, perhaps because their inquiries and questions were welcomed. Most interestingly, they held the shared opinion that the use of tablets could be hoped to reduce the weight of their children's school bags. They also agreed with the head teacher that the introduction of tablets would bring the pupils up to date with digital technology and that pupils needed to learn at school about the right way to use technology, although some feared that using tablets might affect their children's writing skill and would result in poor handwriting. Some parents also

described the project as incomplete and lacking coherence. However, they supported the teachers' position and put the blame on the MOE for introducing the project without providing suitable training for teachers. This reflected the prior experience of many parents in the focus group, all of whom were themselves teachers, which had taught them that the ministry tended to undertake projects without proper consideration of the teachers or the curriculum.

6.7 Summary of findings

Simply providing tablets was found to be less difficult than making good use of them in the classroom, since the project took place at a school in a mountainous region with very limited internet connectivity. Here, the teachers' role was manifest in responding to the situation and shaping the implementation (Hattie, 2003; Ertmer, 2005), as they found themselves provided with tablets on which no appropriate apps had been installed and having to deal with this situation on their own initiative, which they did by relying for the first few months on Word documents and PowerPoint files. As the teachers were not familiar with this newly introduced technology, it was natural for them to replicate the practices with which they were familiar on laptop and desktop computers (Burden et al., 2012). A similar study in the United Arab Emirates found that the availability of software for tablets suitable for classroom use represented a major challenge, because most applications are developed in English (Ali, 2013). The temporary reliance on Microsoft Office apps in the present case provided only a partial solution, since these are primarily designed to run on larger devices with keyboards, while apps for tablets are intended for use with a touch-screen interface (Müller et al., 2012). Pupils therefore struggled to perform the tasks they were given and the teachers responded with due tolerance and understanding of the difficulties that pupils faced in adopting this imperfect solution to the failure to provide suitable software.

The introduction of tablets created situations for teachers and their pupils where they had to take decisions individually in order to overcome the

challenges they encountered. The three subject teachers, being either inexperienced or, in the case of Khawla, unfamiliar with digital technology, often had to wait for support from Mariam, as project manager with considerable experience of using educational technology in teaching, to decide upon planning their lessons. However, rather than following the recommendation of Mang and Wardley (2012) to work closely with in-house ICT specialists, the teachers appeared to follow Mariam's suggestions without thinking about the implementation process. They appeared enthusiastic but uninformed about using tablets in their lessons, whereas Mariam would have preferred her colleagues to show more initiative, as this would have resulted in a less heavy additional workload for her. The teachers also failed to reflect adequately on the consequences of bringing tablets into the classroom, reflected in their poor planning and illustrated during the first lesson I observed with Ibtisam, where Safia and Mariam were present and the three teachers discussed how to go about the lesson.

Mariam became frustrated with her colleagues' dependence on her support and lack of confidence and initiative, despite the training she had given them, arguing that using tablets should not be difficult and that many of the problems arose from the teachers' tendency to use traditional modes of presentation. This is consistent with reports in the literature that teachers tend to teach in the way that they themselves were taught (Vrasidas and Glass, 2005). In Mariam's words, "these tablets don't need programming or anything. The problem is one of initiative".

The authorities should do more than simply provide schools with tablets. In a centralised system where training is centrally funded and managed, and where the MOE intervened to approve the establishment of the project, it should also meet the requirements of schools and teachers associated with the project. In many projects elsewhere, the decision to introduce technology into schools was taken at the initiative of senior educational management and put into practice by a supervising body with expertise. In the present case, there was a clear lack of overall project supervision, as the head teacher admitted having neglected the project at certain times, despite the ICT teacher

having brought various issues to her attention. Mariam summed this up with the words: "I told her and she knows".

Although the general idea for project was initiated within the school and was not imposed by the MOE or even the regional education directorate, as is usual for projects in a centralised educational system, it nevertheless operated from the top down within the school, so that when it reached the teachers it was imposed on them. None of the three teachers volunteered to participate in the project but were selected by the head teacher, who claimed to have based her selection on the need for participants to live close to the school. Insisting on this one criterion left no opportunity for other school teachers to take part in the project. To the extent that Khawla, Safia and Ibtisam were not in other respects ideal candidates, this had the effect of increasing the workload of Mariam, whose ICT expertise was needed to help them in preparing and implementing their lessons. However, appointing as project manager an ICT teacher who live locally ensured the provision of the necessary support for the other teachers and may have been decisive in sustaining the project.

The process of introducing tablets into primary school classrooms requires a set of leadership skills including the ability to take a strategic vision of the project, producing from it a concrete plan and putting it into practice in the school. Such a plan must take account of the school's characteristics in terms of location, available resources and facilities. It must also be aligned with Ministry of Education policies and should involve teachers, parents and feedback from pupils. The success and sustainability of the project will depend on the teachers receiving adequate and appropriate training and professional development. Supervising the project does not mean neglecting its details and putting all of the responsibility for delivery on others. The school leader cannot simply appoint a project manager who is expected to exercise the supervisory function, but must instead remain close enough to take decisions herself when necessary.

The head teacher in this case worked very hard to achieve her dream of obtaining tablets for the school to use in lessons. However, her personal ambition appeared to go no further than this, so that once the tablets had been delivered, she made little further practical contribution and sometimes seemed unable to respond adequately when the teachers asked her for support. It is true that she was able to deliver financial support, such as for modems and internet subscription, but she was not able to provide technical planning and implementation strategies when teachers felt they needed support of this kind.

6.8 Limitations

6.8.1 Setting and sample size

The research comprised the case study of a single school with a small total number of participants, only three of whom were subject teachers participating in the tablet project itself, which means that the scope of the study is limited to the specific educational and geographical circumstances of the school. Therefore, its findings may not necessarily be more widely applicable and cannot reliably be generalised to other schools in different geographical or educational contexts.

6.8.2 Length of study

The data collection took place during a six-month period interrupted by a one-month school closure for exams and the mid-year holiday. The investigation of the tablet project's development was limited to this data collection period. As time is one of the factors highlighted in the study, it is important to acknowledge that this period was so short as to reduce further the scope of potential generalisation.

6.8.3 Administrative engagement and involvement

The data was all collected at the school level and no MOE or regional education office personnel were involved in the study. In such a centralised education system, what happens in schools is directly affected, although not

fully determined, by regional and ministerial policies. However, this study did not aim to investigate central or regional educational policies on the introduction of tablets, but was always concerned only with what happened at the school level, so there was no perceived need for the involvement of regional or ministerial participants. This nevertheless restricts the study's capacity to offer explanations of the amount, quality and relevance of the training given to the teachers or to address the roles of regional supervisors and ministerial officials in providing the school with software for the tablets.

This was a study of the introduction of tablets into a school where the administration had decided that they should be used by grade four pupils in four subject areas. The progress of the project did not support a deep research focus on any one particular subject within the timeframe of the study. In addition, the main study participants were teachers of only three subjects (maths, science and Arabic language) which are all taught through the medium of Arabic in Omani public schools. This restricts the scope of the findings to contexts where Arabic is used as the teaching medium and the scarcity of educational apps in Arabic (Ali, 2013) further limits the ability to generalise these findings.

Finally, the study was conducted at a school within a centralised education system where schools and their leaders have very little freedom to take decisions on the planning and implementation of projects; therefore, the findings cannot be generalised to schools in other systems where there is more freedom for those most immediately involved in such initiatives to make choices and influential decisions.

6.9 Contributions

6.9.1 Contribution to the research field

This study has contributed to the research field by identifying a transformation of the classroom environment that occurred when tablets were introduced in a very uncommon context. The transformations that occurred and the transformation opportunities that arose are specific to this particular context

and might not be applicable to other contexts. Although the uptake of tablets in schools continues to expand and their use is viewed as a normal classroom activity in many schools, the tablet introduction project studied here needs to be viewed in the context of all of the circumstances surrounding it. Therefore, transformation is linked to its context, so that what might be seen as a normal activity in the context of one school may be seen as a transformation of the Activity System in another school context.

Another contribution arises from the use of activity theory. This helped to acknowledge and highlight the complexity of the school and community context, and so identify an expansive transformation of the classroom Activity System. This occurred despite challenges to the tablet introduction process and the use of activity theory made it possible to identify the value of introducing tablets to the classroom. Thus, with the help of the lens of activity theory, the transformations were clarified, whereas without it they might not be easily noticed or identified.

This study has contributed to widening the understanding of the introduction of tablets into a school, seeing it not as an isolated set of actions that happen in classrooms, but as an Activity System that constitutes an ongoing process. It is not only about teachers and their pupils using tablets in classes, because this process brings about changes to the school that require a vision and involve agents such as the head teacher, parents, regional and ministerial officials. Without the coordinated actions and cooperation of these agents, tablets would become an extra burden for teachers in the classroom. The school leadership plays a vital facilitating role in liaising efforts to make the induction process as smooth as possible.

This study also establishes a link between the progress of the tablet project and the school's geographical location, which partially determines the facilities required to enable teachers to use tablets in the classroom. The teachers' planning and use of tablets in their lessons was disturbed by factors related to the school's geographical environment. Implementing such a project in a city centre school would have been quite different from doing so at this school,

whose location in a mountain village affected not only the quality of the facilities provided but also access to the school building as well as the turnover of the teaching staff.

Using tablets in a classroom is not as easy as using one individually for personal purposes. Many contextual factors such as the school's location, time, internet connection and classroom set-up make the experience very different. In addition, engaging around twenty pupils in using tablets in a classroom activity requires teachers to be prepared to ensure that the pupils will be working on their own on individual screens. Using PowerPoint on a smartboard will keep the pupils' attention focused on the front of the room and thus on the teacher, whereas when using tablets, they will tend to stop paying attention to the teacher as they turn their gaze to their tablet screens, as the pupils did in this study, even when PowerPoint was used.

6.9.2 Contribution to education in Oman

A vision for the introduction of tablets into the classroom is required before supplying the devices. The MOE provided the school with tablets but the teachers were not given the means to use them or reasons for doing so. The teachers are thus not to be blamed for depending on others during the process of introducing tablets. The MOE should have been more closely involved in the tablet project, as the education system is managed centrally. The ministry cannot discharge its responsibility merely by providing schools with tablets. In a system of centralised management where the ministry's approval is required for the establishment of projects, it should provide schools and teachers with whatever is required for their successful implementation, such as training which is centrally funded and managed. In addition, this was one of the first schools in Oman to introduce tablets into classrooms with the direct support of the MOE. Therefore, since parents and the head teacher perceived the value of tablets to lie in solving the problem of heavy bags by replacing paper textbooks, this brings a change to the classroom which requires support in implementation as well as in evaluation. In many projects where the decision to introduce technology into schools was based on an idea originating at

senior educational management level, there was a supervising body with expertise.

On the other hand, at school level the circle of involvement in planning the introduction of tablets was too narrowly focused around the school administration and needed to be expanded. The fact that this was a school project should not be taken to mean that parents had no valid role to play. Parents who are aware of such school initiatives are likely to support it, while if they are ignored their participation will be negative.

Teachers also need to be involved in planning the introduction of tablets and school administrations need to discuss their plans with teachers before putting them into practice. Thinking of project sustainability requires the involvement of more teachers and providing them with training on tablets will prepare them to use tablets whenever there is a chance.

6.10 Implications

Beyond simply approving schools' ideas for using tablets in the classroom, the MOE should work with schools and the community on developing a vision for tablet use that will guide schools when planning the introduction of tablets. This vision should create coherence between what different schools do and allow the cascading of experience from one to another.

6.10.1 Implications for teachers

There are two implications for teachers. First, one of the major factors affecting the use of tablets in the classroom is time. Teachers need to show patience with the process of introducing tablets and must be prepared to find ways to overcome the challenges associated with their use in lessons, such as the limited availability of subject-related apps and resources.

The second implication for teachers is that they need to devote time to careful lesson preparation, as getting tablets ready for pupils' use is very different from preparing to use paper books. They must begin by deciding whether the devices are to be used online or offline and must base their preparations and

subsequent decisions on this choice. For offline use, teachers need to download apps or files on each of the tablets that the pupils will use, whereas for online work they must ensure that pupils are accessing only safe educational content. In both cases, teachers must prepare the devices and make sure that their batteries are charged so that pupils can take advantage of their mobility rather than being tethered to chargers and a power supply.

6.10.2 Implications for head teachers

This study draws a number of implications for head teachers. First, they need to balance the long- and short-term goals of tablet introduction. Project sustainability is important, for example, but no project can be sustained if it is not made to work in the first place. The success of a pilot project where tablets are used in the classroom would set a good example to encourage the next generation of participant teachers. Whether the idea of introducing tablets was initiated within the school itself or handed down from MOE level, teachers should be guided and supported through training to use tablets independently with confidence. The head teacher should also closely supervise the project's progress and set indicators for evaluation. Actions must be taken when needed either to support the currently participating teachers or to involve others to ensure the project's immediate success and sustainability.

6.11 Suggestions for future research

This study investigated only one school in a specific context, because it was one of the first in Oman to take the initiative to introduce tablets into the classroom. It is therefore recommended that future studies should include schools with varied circumstances, especially in terms of location, which was found here to be a factor affecting the facilities, the sustainability of the project and the teachers' experiences.

Since time was identified as an influential factor, data for a future study should be collected over a longer period of time, covering at least a full school year. It would be beneficial to follow teachers using tablets over two academic years

to investigate more thoroughly the effect of time on the introduction of tablets and the development of their classroom use by teachers.

Future research should also include administrative personnel employed at the regional and ministerial levels to investigate current policy on mobile technology in schools, their evaluation of its practical implementation in schools and their suggestion for the future development of this policy area. It is particularly important that officials of the MOE's curriculum and ICT departments should be involved.

A fourth recommendation is for research into the use of tablets at private schools in Oman, whose leaders have more freedom of action in staff recruitment, in making policy decisions and in designing and delivering professional development programmes.

Finally, this study examined the introduction of tablets from a general perspective in terms of the skills and subjects being taught. Future studies should focus on how the introduction of tablets affects teaching and learning in specific subject areas or the acquisition of particular skill sets.

6.12 Reflection

During the course of this study I had to take many difficult decisions. For example, while searching for contextual information on the case study I came across websites revealing the identity of the school or the name of the village, which I could not include as sources in order to avoid identification of the school and consequently of the participants.

The original plan was for a teacher of English language to be one of the participants, which I assumed would allow me to observe the use of educational apps in the classroom, since English learning apps are readily available for the Android platform. However, the teacher concerned withdrew from the project, so that the only remaining option was for apps to be used in Arabic, which was the language of instruction for all other subjects.

Although my research journey has been long, I have found that the time available was hardly long enough and that this research has required very careful time management. The research process is not linear (Lichtman, 2006) and the stages of data collection, analysis and writing should ideally be conducted in parallel. On a number of occasions, reflecting on the progress I had made led me to revise the steps I had taken earlier. It is also important to note that real observational analysis did not start until I had finished collecting all of the data. If I had the chance begin the study again, I would collect more data, since I feel that there is a need for a deeper and more detailed analysis and for greater certainty regarding some of the events that I observed. In particular, if I were to run this study again, I would collect more data on the teachers' personal experiences of technology. Such information would have helped me to better explain the participants' practices and reflections on using tablets in the classroom.

List of References

- Abbott, R.C. 2016. Embracing Digital Technologies in Classroom Practice: The Impact of Teacher Identity. *Australian Educational Computing*. **31**(2).
- ABDEL-FATTAH, M., KANTOUSH, S., SABER, M. and SUMI, T. 2016. Hydrological Modelling of Flash Flood at Wadi Samail, Oman. *Annals of Disaster Prevention Research Institute* **59 B**.
- Al-Habsi, S. 2009. Motivating teachers in times of change. In: Wyatt, M. and Atkins, J. eds. *Research perspectives on education in Oman*. Oman: Ministry of Education pp.227-245.
- Al-Rawi, A. 2016. The 2011 Popular Protests in the Sultanate of Oman. *Mediated Identities and New Journalism in the Arab World*. Springer, pp.165-183.
- Al-Sadi, K. 2013. *Developing the Performance of Parents' Councils in Batinah North Governorate's Schools in View of Some Countries' Experience*. Master thesis, University of Nizwa
- Al Zidjaly, N. 2014. WhatsApp Omani Teachers: Social Media and the Question of Social Change. *Multimodal Communication*. **3**(1), pp.107-130.
- Albirini, A. 2006. Teachers' attitudes toward information and communication technologies: The case of Syrian EFL teachers. *Computers & Education*. **47**(4), pp.373-398.
- Ali, S.M. 2013. Challenges and benefits of implementing tablets in classroom for e-learning in a k-12 education environment—case study of a school in united arab emirates. *Research Inveny: International Journal of Engineering and Science*. **3**(4).
- Allen, D., Karanasios, S. and Slavova, M. 2011. Working with activity theory: Context, technology, and information behavior. *Journal of the American Society for Information Science and Technology*. **62**(4), pp.776-788.
- Artemeva, N. and Freedman, A. 2001. "Just the Boys Playing on Computers" An Activity Theory Analysis of Differences in the Cultures of Two Engineering Firms. *Journal of Business and Technical Communication*. **15**(2), pp.164-194.
- Balanskat, A., Blamire, R. and Kefala, S. 2006. The ICT impact report. *European Schoolnet*. **1**, pp.1-71.
- Barker, J. and Weller, S. 2003. Geography of methodological issues in research with children. *Qualitative Research*. **3**(2), pp.207-227.
- Beauchamp, G., Burden, K. and Abbinett, E. 2015. Teachers learning to use the iPad in Scotland and Wales: a new model of professional development. *Journal of Education for Teaching*. **41**(2), pp.161-179.
- Beauchamp, G. and Hillier, E. 2014. *An Evaluation of iPad Implementation Across A Network of Primary Schools in Cardiff*. Cardiff: Cardiff School of Education.

- Beauchamp, G. and Kennewell, S. 2008. The influence of ICT on the interactivity of teaching. *Education and Information Technologies*. **13**(4), pp.305-315.
- Beauchamp, G. and Kennewell, S. 2010. Interactivity in the classroom and its impact on learning. *Computers & Education*. **54**(3), pp.759-766.
- Becker, H.J. and Ravitz, J. 1999. The influence of computer and Internet use on teachers' pedagogical practices and perceptions. *Journal of research on computing in education*. **31**(4), pp.356-384.
- Benton, B.K. 2012. *The iPad as an instructional tool: An examination of teacher implementation experiences*. University of Arkansas.
- Blin, F. and Munro, M. 2008. Why hasn't technology disrupted academics' teaching practices? Understanding resistance to change through the lens of activity theory. *Computers & Education*. **50**(2), pp.475-490.
- Bodker, S. 1989. A human activity approach to user interfaces. *Human-Computer Interaction*. **4**(3), pp.171-195.
- Braun, V. and Clarke, V. 2006. Using thematic analysis in psychology. *Qualitative research in psychology*. **3**(2), pp.77-101.
- Braun, V. and Clarke, V. 2013. *Successful qualitative research: A practical guide for beginners*. Sage.
- Buabeng-Andoh, C. 2012. Factors influencing teachers' adoption and integration of information and communication technology into teaching: A review of the literature. *International Journal of Education and Development using Information and Communication Technology*. **8**(1), p136.
- Burden, K., Hopkins, P., Male, T., Martin, S. and Trala, C. 2012. iPad Scotland evaluation. *University of Hull, [online] Available at: <http://www.janhylen.se/wp-content/uploads/2013/01/Skottland.pdf>*.
- Campante, F.R. and Chor, D. 2012. Why was the Arab World Poised for Revolution? Schooling, Economic Opportunities, and the Arab Spring. *The Journal of Economic Perspectives*. **26**(2), pp.167-187.
- Capper, P. and Williams, B. 2004. Enhancing evaluation using systems concepts. *American Evaluation Association*.
- Charmaz, K. 2006. *Constructing grounded theory : a practical guide through qualitative analysis*. London: SAGE.
- Christensen, P.M. and James, A. 2008. *Research with children : perspectives and practices*. 2nd ed. New York ; London: Routledge.
- Clark, K. 1986. The Interaction of Design Hierarchies and Market Concepts. *Research Policy*. **14**(4), pp.235-251.
- Clark, W. and Luckin, R. 2013. iPads in the Classroom. *What The Research Says*.
- Clarke, B. and Svanaes, S. 2014. An updated literature review on the use of tablets in education. *Tablets for Schools. UK: Family Kids & Youth*.
- Clements, D.H. and Sarama, J. 2005. Young children and technology: What's appropriate. *Technology-supported mathematics learning environments*. **1**, p51.
- Cohen, L., Manion, L. and Morrison, K. 2000. *Research methods in education*. 5th ed. London: Routledge.
- Cooper, B. and Brna, P. 2002. Supporting high quality interaction and motivation in the classroom using ICT: the social and emotional learning and

- engagement in the NIMIS project. *Education, Communication & Information*. **2**(2-3), pp.113-138.
- Couse, L.J. and Chen, D.W. 2010. A tablet computer for young children? Exploring its viability for early childhood education. *Journal of Research on Technology in Education*. **43**(1), p75.
- Crawford, L. and Nahmias, A.H. 2010. Competencies for managing change. *International journal of project management*. **28**(4), pp.405-412.
- Creswell, J.W. 2005. *Educational research: planning, conducting, and evaluating quantitative and qualitative research*. 2nd ed. Upper Saddle River, N.J: Pearson Merrill Prentice Hall.
- Creswell, J.W. 2008. *Research design : qualitative, quantitative, and mixed methods approaches*. 3rd ed. Los Angeles, Calif. ; London: SAGE.
- Cviko, A., McKenney, S. and Voogt, J. 2014. Teacher roles in designing technology-rich learning activities for early literacy: A cross-case analysis. *Computers & education*. **72**, pp.68-79.
- De Lucia, A., Francese, R., Passero, I. and Tortora, G. 2009. Development and evaluation of a virtual campus on Second Life: The case of SecondDMI. *Computers & Education*. **52**(1), pp.220-233.
- Demetriadis, S., Barbas, A., Psillos, D. and Pombortsis, A. 2005. Introducing ICT in the Learning Context of Traditional School In: Vrasidas, C. and Glass, G.V. eds. *Preparing teachers to teach with technology* Greenwich, Conn.: Information Age Pub., pp.xviii, 397 p.
- Dhir, A., Gahwaji, N.M. and Nyman, G. 2013. The role of the iPad in the hands of the learner. *J. UCS*. **19**(5), pp.706-727.
- Doolittle, P.E. 1995. Understanding Cooperative Learning through Vygotsky's Zone of Proximal Development.
- Drever, E. 1995. *Using Semi-Structured Interviews in Small-Scale Research. A Teacher's Guide*. ERIC.
- Dwyer, D.C. 1995. Changing the conversation about teaching learning and technology: A report about ten years of ACOT research.
- Education, M.O. 2004. *National Report on: Quality Education in Oman*
- Eng, T.S. 2005. The impact of ICT on learning: A review of research. *International Education Journal*. **6**(5), pp.635-650.
- Engestrom, Y. 2000. Activity theory as a framework for analyzing and redesigning work. *Ergonomics*. **43**(7), pp.960-974.
- Engeström, Y. 1987. Learning by expanding: An activity-theoretical approach to developmental research.
- Engeström, Y. 1993. Developmental studies of work as a testbench of activity theory: The case of primary care medical practice. *Understanding practice: Perspectives on activity and context*. pp.64-103.
- Engeström, Y. 2001. Expansive learning at work: Toward an activity theoretical reconceptualization. *Journal of education and work*. **14**(1), pp.133-156.
- Engestrom, Y., Kerosuo, H., Engeström, Y. and Kerosuo, H. 2007. From workplace learning to inter-organizational learning and back: the contribution of activity theory. *Journal of workplace learning*. **19**(6), pp.336-342.
- Engeström, Y. and Sannino, A. 2010. Studies of expansive learning: Foundations, findings and future challenges. *Educational research review*. **5**(1), pp.1-24.

- Erbes, S., Myers, J. and Lesky, S. 2017. Teachers Exploring Mobile Device Integration: A Case Study of Secondary Teachers' Responses to iPads in the Classroom. *Journal of Information Technology Education*. **15**, pp.503-516.
- Ertmer, P.A. 2005. Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational technology research and development*. **53**(4), pp.25-39.
- Ertmer, P.A. and Ottenbreit-Leftwich, A.T. 2010. Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of research on Technology in Education*. **42**(3), pp.255-284.
- Ewing, R., Schroerer, W. and Greene, W. 2004. School location and student travel analysis of factors affecting mode choice. *Transportation Research Record: Journal of the Transportation Research Board*. (1895), pp.55-63.
- Ey, L.-A. and Glenn Cupit, C. 2011. Exploring young children's understanding of risks associated with Internet usage and their concepts of management strategies. *Journal of Early Childhood Research*. **9**(1), pp.53-65.
- Falloon, G. 2013. Young students using iPads: App design and content influences on their learning pathways. *Computers & Education*. **68**, pp.505-521.
- Falloon, G. 2014. What's going on behind the screens? *Journal of Computer Assisted Learning*. **30**(4), pp.318-336.
- Frey, N., Fisher, D. and Gonzalez, A. 2013. *Teaching with Tablets: How do I integrate tablets with effective instruction?*(ASCD Arias). ASCD.
- Fullan, M. 2001. *The new meaning of educational change*. 3rd ed. New York London: Teachers College Press ;
RoutledgeFalmer.
- Fullan, M. 2006. The future of educational change: system thinkers in action. *Journal of Educational Change*. **7**(3), pp.113-122.
- Fullan, M. 2008. *The new meaning of educational change*. 4th ed. London: Routledge.
- Ghavifekr, S. and Hussin, S. 2011. Managing Systemic Change in a Technology-Based Education System: A Malaysian Case Study. *Procedia - Social and Behavioral Sciences*. **28**, pp.455-464.
- Gimbert, B. and Cristol, D. 2004. Teaching curriculum with technology: Enhancing children's technological competence during early childhood. *Early Childhood Education Journal*. **31**(3), pp.207-216.
- Goodison, T. 2002. Enhancing learning with ICT at primary level. *British Journal of Educational Technology*. **33**(2), pp.215-228.
- Grbich, C. 2013. *Qualitative data analysis : an introduction*. 2nd ed. London: SAGE.
- Gudmundsdottir, G.B. 2010. From digital divide to digital equity: Learners' ICT competence in four primary schools in Cape Town, South Africa. *International Journal of Education and Development using Information and Communication Technology*. **6**(2), p1H.
- Hargis, J., Cavanaugh, C., Kamali, T. and Soto, M. 2014. A federal higher education iPad mobile learning initiative: Triangulation of data to determine early effectiveness. *Innovative Higher Education*. **39**(1), pp.45-57.

- Hartas, D. 2010. *Educational research and inquiry : qualitative and quantitative approaches*. London: Continuum.
- Hatch, J.A. 2002. *Doing qualitative research in education settings*. SUNY Press.
- Hattie, J. 2003. Teachers Make a Difference, What is the research evidence? In: *Australian Council for Educational Research Conference, October 2003, Melbourne*. Camberwell, Vic.: Australian Council for Educational Research.
- Hayes, D.N. 2007. ICT and learning: Lessons from Australian classrooms. *Computers & Education*. **49**(2), pp.385-395.
- Heinrich, P. 2012. The iPad as a tool for education: A study of the introduction of iPads at Longfield Academy, Kent. *Nottingham: NAACE: The ICT Association*.
- Henderson, S. and Yeow, J. 2012. iPad in education: A case study of iPad adoption and use in a primary school. In: *System Science (HICSS), 2012 45th Hawaii International Conference on: IEEE*, pp.78-87.
- Hermans, R., Tondeur, J., van Braak, J. and Valcke, M. 2008. The impact of primary school teachers' educational beliefs on the classroom use of computers. *Computers & Education*. **51**(4), pp.1499-1509.
- Hobson, J.A. and Townsend, A. 2010. Interviewing as Educational Research Methods. In: Hartas, D. ed. *Educational Research and Inquiry*. London: continuum International Publishing Group.
- Hsieh, S.-W., Jang, Y.-R., Hwang, G.-J. and Chen, N.-S. 2011. Effects of teaching and learning styles on students' reflection levels for ubiquitous learning. *Computers & Education*. **57**(1), pp.1194-1201.
- Hu, P.J.-H., Clark, T.H. and Ma, W.W. 2003. Examining technology acceptance by school teachers: a longitudinal study. *Information & Management*. **41**(2), pp.227-241.
- Ifenthaler, D. and Schweinbenz, V. 2013. The acceptance of Tablet-PCs in classroom instruction: The teachers' perspectives. *Computers in human behavior*. **29**(3), pp.525-534.
- Isci, T.G. and Demir, S.B. 2015. The Use of Tablets Distributed within the Scope of FATIH Project for Education in Turkey (Is FATIH Project a Fiasco or a Technological Revolution?). *Universal Journal of Educational Research*. **3**(7), pp.442-450.
- Issan, S. and Gomaa, N. 2010. Post Basic Education reforms in Oman: A case study. *Literacy Information and Computer Education Journal (LICEJ)*. **1**(1), pp.19-27.
- Jahnke, I. and Kumar, S. 2014. Digital didactical designs: Teachers' integration of iPads for learning-centered processes. *Journal of Digital Learning in Teacher Education*. **30**(3), pp.81-88.
- Johnson, L., Adams, S. and Cummins, M. 2012. *NMC Horizon Report: 2012 K-12 Edition (Austin, TX: New Media Consortium, 2012)*.
- Johnson, L.F., Adams, S. and Cummins, M. 2012. Horizon report: 2012 higher education edition.
- Kaptelinin, V. 1996. Activity Theory: Implications for Human-Computer Interaction In: Nardi, B.A. ed. *Context and consciousness: activity theory and human-computer interaction*
Mit Press.

- Karanasios, S., Thakker, D., Lau, L., Allen, D., Dimitrova, V. and Norman, A. 2013. Making sense of digital traces: An activity theory driven ontological approach. *Journal of the American Society for Information Science and Technology*. **64**(12), pp.2452-2467.
- Karsenti, T. and Fievez, A. 2013. The iPad in education: uses, benefits, and challenges—A survey of 6,057 students and 302 teachers in Quebec, Canada. *Montreal, QC: CRIFPE*.
- Keengwe, J., Kidd, T. and Kyei-Blankson, L. 2009. Faculty and technology: Implications for faculty training and technology leadership. *Journal of Science Education and Technology*. **18**(1), pp.23-28.
- Khalid, M.S., Jurisic, O., Kristensen, H.S. and Ørngreen, R. 2013. Exploring the use of iPads in danish schools. In: *13th European Conference on e-Learning*, pp.264-272.
- King, N. 2010. *Interviews in qualitative research*. London: SAGE.
- Kolb, A.Y. and Kolb, D.A. 2009. Experiential learning theory: A dynamic, holistic approach to management learning, education and development. *The SAGE handbook of management learning, education and development*. pp.42-68.
- Korpela, M., Soriyan, H.A. and Olufokunbi, K.C. 2000. Activity analysis as a method for information systems development: General introduction and experiments from Nigeria and Finland. *Scandinavian Journal of Information Systems*. **12**(1), p8.
- Kucirkova, N., Messer, D., Sheehy, K. and Fernández Panadero, C. 2014. Children's engagement with educational iPad apps: Insights from a Spanish classroom. *Computers & Education*. **71**, pp.175-184.
- Kuutti, K. 1996. Activity Theory as a Potential Framework for Human-Computer Interaction Research. In: Nardi, B.A. ed. *Context and consciousness : activity theory and human-computer interaction* Cambridge, Mass. ; London: MIT Press, pp.xiii, 400 p.
- Kwarteng, A.Y., Dorvlo, A.S. and Vijaya Kumar, G.T. 2009. Analysis of a 27-year rainfall data (1977–2003) in the Sultanate of Oman. *International Journal of Climatology*. **29**(4), pp.605-617.
- Lamy, M.-N. and Hampel, R. 2007. *Online communication in language learning and teaching*. Basingstoke.
- Law, E.L.-C. and Sun, X. 2012. Evaluating user experience of adaptive digital educational games with Activity Theory. *International Journal of Human-Computer Studies*. **70**(7), pp.478-497.
- Lichtman, M. 2006. *Qualitative research in education : a user's guide*. Thousand Oaks: Sage Publications.
- Lu, R. and Overbaugh, R.C. 2009. School environment and technology implementation in K–12 classrooms. *Computers in the Schools*. **26**(2), pp.89-106.
- Luckin, R. and Du Boulay, B. 1999. Ecolab: The development and evaluation of a Vygotskian design framework. *International Journal of Artificial Intelligence in Education*. **10**(2), pp.198-220.
- Lutz, S. and Huitt, W. 2004. Connecting cognitive development and constructivism: Implications from theory for instruction and assessment. *Constructivism in the Human Sciences*. **9**(1), pp.67-90.

- Mang, C.F. and Wardley, L.J. 2012. Effective adoption of tablets in post-secondary education: Recommendations based on a trial of iPads in university classes. *Journal of Information Technology Education*. **11**(1), pp.301-317.
- Manouselis, N., Drachsler, H., Vuorikari, R., Hummel, H. and Koper, R. 2011. Recommender systems in technology enhanced learning. *Recommender systems handbook*. pp.387-415.
- Mason, J. 2002. *Qualitative researching*. 2nd ed. London: Sage.
- Mathison, S. 1988. Why Triangulate? *Educational Researcher*. **17**(2), pp.13-17.
- McDonald, N.C. 2008. Children's mode choice for the school trip: the role of distance and school location in walking to school. *Transportation*. **35**(1), pp.23-35.
- McManis, L.D. and Gunnewig, S.B. 2012. Finding the education in educational technology with early learners. *YC Young Children*. **67**(3), p14.
- McWilliam, D. 2012. *Augmented reality in the wood shop*. *Calgary Science School*. Retrieved July 24, 2012.
- Melhuish, K. and Falloon, G. 2010. Looking to the future: M-learning with the iPad. *Computers in New Zealand Schools*. **22**(3), pp.1-16.
- Meyer, B. 2014. iPads in Learning: The Web of Change. *International Association for Development of the Information Society*.
- Miller, W. 2012. iTeaching and learning. *Library Technology Reports*. **48**(8), p54.
- Milman, N.B., Carlson-Bancroft, A. and Boogart, A.V. 2012. Ipads in a prek-4th independent school-year 1-enhancing engagement, collaboration, and differentiation across content areas. In: *ISTE conference*. San Diego, CA.
- MOE. 2006. *From Access to Success Education for All in the Sultanate of Oman 1970-2005*. Oman.
- MOE. 2008. *Inclusive Education in the Sultanate of Oman*.
- MOE. 2009. *ICT and Education in the Sultanate of Oman*.
- MOE. 2012. *The Final Report for Comprehensive Indicators Survey in Educational Sector Grades (1-12)*.
- MOE. 2014. *National Education For All Report: The Sultanate of Oman* Oman
- MOE. 2015. *The Annual Education Statistics Book*. Oman: Ministry of Education
- Montrieux, H., Vanderlinde, R., Courtois, C., Schellens, T. and De Marez, L. 2014. A Qualitative Study about the Implementation of Tablet Computers in Secondary Education: The Teachers' Role in this Process. *Procedia-Social and Behavioral Sciences*. **112**, pp.481-488.
- Mouza, C. 2005. Using technology to enhance early childhood learning: The 100 days of school project. *Educational Research and Evaluation*. **11**(6), pp.513-528.
- Mouza, C. and Barrett-Greenly, T. 2015. Bridging the app gap: An examination of a professional development initiative on mobile learning in urban schools. *Computers & Education*. **88**, pp.1-14.
- Müller, H., Gove, J. and Webb, J. 2012. Understanding tablet use: a multi-method exploration. In: *Proceedings of the 14th international conference on*

Human-computer interaction with mobile devices and services: ACM, pp.1-10.

Murphy, E. and Rodriguez-Manzanares, M.A. 2008. Using activity theory and its principle of contradictions to guide research in educational technology. *Australasian Journal of Educational Technology*. **24**(4).

Murray, O.T. and Olcese, N.R. 2011. Teaching and learning with iPads, ready or not? *TechTrends*. **55**(6), pp.42-48.

Nardi, B.A. 1996. Studying Context: A comparison of Activity Theory, Situated Action Models, and Distributed Cognition. In: Nardi, B.A. ed. *Context and consciousness: activity theory and human-computer interaction*. Mit Press, pp.69-90.

Nelson, C.P. 2002. *Contradictions in learning to write in a second language classroom: Insights from radical constructivism, activity theory, and complexity theory*. thesis.

Neumann, M.M. 2014. An examination of touch screen tablets and emergent literacy in Australian pre-school children. *Australian Journal of Education*. **58**(2), pp.109-122.

Newby, P. 2010. *Research methods for education*. Harlow ; London: Longman.

Nicholas, H. 2010. Ubiquitous computing does not guarantee ubiquitous learning in schools: the case of handheld computers. *Mobile Technologies and Handheld Devices for Ubiquitous Learning: Research and Pedagogy: Research and Pedagogy*. p30.

Niederhauser, D.S. and Stoddart, T. 2001. Teachers' instructional perspectives and use of educational software. *Teaching and teacher education*. **17**(1), pp.15-31.

Norris, C., Hossain, A. and Soloway, E. 2012. Under what conditions does computer use positively impact student achievement? Supplemental vs. essential use. In: *Proceedings of Society for Information Technology & Teacher Education International Conference*, pp.2021-2028.

Osborne, J. and Hennessy, S. 2003. Literature review in science education and the role of ICT: Promise, problems and future directions.

Palmer, P.J. 2017. *The courage to teach: Exploring the inner landscape of a teacher's life*. John Wiley & Sons.

Patton, M.Q. 1990. *Qualitative evaluation and research methods*. SAGE Publications, inc.

Pelgrum, W.J. 2001. Obstacles to the integration of ICT in education: results from a worldwide educational assessment. *Computers & education*. **37**(2), pp.163-178.

Plowman, L., Stephen, C. and McPake, J. 2010. Supporting young children's learning with technology at home and in preschool. *Research Papers in Education*. **25**(1), pp.93-113.

Psiropoulos, D., Barr, S., Eriksson, C., Fletcher, S., Hargis, J. and Cavanaugh, C. 2016. Professional development for iPad integration in general education: Staying ahead of the curve. *Education and Information Technologies*. **21**(1), pp.209-228.

Rogers, Y. 2008. 57 varieties of Activity Theory. *Interacting with Computers*. **20**(2), pp.247-250.

- Rossing, J.P., Miller, W.M., Cecil, A.K. and Stamper, S.E. 2012. iLearning: The future of higher education? Student perceptions on learning with mobile tablets. *Journal of the Scholarship of Teaching and Learning*. **12**(2), pp.1-26.
- Roth, W.M., Lee, Y.J. and Hsu, P.L. 2009. A tool for changing the world: possibilities of cultural-historical activity theory to reinvigorate science education. *Studies in Science Education*. **45**(2), pp.131-167.
- Ruggiero, D. and Mong, C.J. 2015. The teacher technology integration experience: Practice and reflection in the classroom. *Journal of Information Technology Education*. **14**.
- Russell, D.L. and Schneiderheinze, A. 2005. Understanding innovation in education using activity theory. *Educational Technology & Society*. **8**(1), pp.38-53.
- Saldana, J. 2009. An introduction to codes and coding. *The coding manual for qualitative researchers*. pp.1-31.
- Schlossberg, M., Greene, J., Phillips, P.P., Johnson, B. and Parker, B. 2006. School trips: effects of urban form and distance on travel mode. *Journal of the American Planning Association*. **72**(3), pp.337-346.
- Schuck, S., Aubusson, P., Kearney, M. and Burden, K. 2013. Mobilising teacher education: A study of a professional learning community. *Teacher Development*. **17**(1), pp.1-18.
- Selwyn, N., Potter, J. and Cranmer, S. 2010. *Primary schools and ICT : learning from pupil perspectives*. London: Continuum.
- Smith, C.A. and Santori, D. 2015. An Exploration of iPad-Based Teaching and Learning: How Middle-Grades Teachers and Students Are Realizing the Potential. *Journal of Research on Technology in Education*. **47**(3), pp.173-185.
- Smith, F., Hardman, F. and Higgins, S. 2006. The impact of interactive whiteboards on teacher—pupil interaction in the National Literacy and Numeracy Strategies. *British educational research journal*. **32**(3), pp.443-457.
- Smith, H. 1999. *Opportunities for ICT in the primary school*. Stoke-on-Trent: Trentham.
- Stephen, C., Stevenson, O. and Adey, C. 2013. Young children engaging with technologies at home: The influence of family context. *Journal of Early Childhood Research*. **11**(2), pp.149-164.
- Stevenson, I. 2008. Tool, tutor, environment or resource: Exploring metaphors for digital technology and pedagogy using activity theory. *Computers & Education*. **51**(2), pp.836-853.
- Swanson, E.B. and Ramiller, N.C. 1997. The organizing vision in information systems innovation. *Organization science*. **8**(5), pp.458-474.
- Teachers forum. 2011. *Teachers forum*. [Online]. Available from: <http://forum.moe.gov.om/vb/forum.php>
- The Ministry of National Economy. 2008. *Long-term Development Strategy (1996-2020) Vision for Oman's Economy-2020*. Oman: The Ministry of National Economy
- The New Zealand Education Consortium. *Evaluation of The Sultanate of Oman Education System*. Unpublished.
- Thomas, G. 2009. *How to do your research project : a guide for students in education and applied social sciences*. Los Angeles, Calif. ; London: SAGE.

- Thomas, G. 2010. *How to do your case study: A guide for students and researchers*. Sage.
- Traxler, J. 2010. Students and mobile devices. *Research in Learning Technology*. **18**(2).
- Traxler, J. 2012. Sustaining mobile learning and its institutions. *Refining Current Practices in Mobile and Blended Learning: New Applications*. pp.1-9.
- Unesco. 1972. *Present Situation of Education in The Sultanate of Oman* Paris: Unesco.
- Valstad, H. and Rydland, T. 2010. *iPad as a pedagogical device*. Master thesis, Norwegian University of Science and Technology.
- Venkatesh, V., Morris, M.G., Davis, G.B. and Davis, F.D. 2003. User acceptance of information technology: Toward a unified view. *MIS quarterly*. **27**(3).
- Vrasidas, C. and Glass, G.V. 2005. Achieving Technology Integration in Classroom Teaching In: Vrasidas, C. and Glass, G.V. eds. *Preparing teachers to teach with technology*. Greenwich: IAP.
- Vygotskiĭ, L.S. and Cole, M.p. 1978. *Mind in society: the development of higher psychological processes*. Cambridge, Mass: Harvard University Press.
- Vygotsky, L.S. 1980. *Mind in society: The development of higher psychological processes*. Harvard university press.
- Walker, A. and White, G. 2013. *Technology enhanced language learning : connecting theory and practice*. Oxford: Oxford University Press.
- Wedell, M. 2009. *Planning for educational change : putting people and their contexts first*. London: Continuum.
- West, D.M. 2013. Mobile learning: Transforming education, engaging students, and improving outcomes. *Brookings Policy Report*. pp.1-7.
- Whitaker, P. 1993. *Managing change in schools*. Buckingham: Open University Press.
- Williams, J. and Easingwood, N. 2007. *Primary ICT and the foundation subjects*. London, England ; New York: Continuum.
- World Bank. 2013. *Education in Oman : the drive for quality (Vol. 2)*. Washington DC: World Bank.
- Worrall, J. 2012. Oman: The "Forgotten" corner of the Arab spring. *Middle East Policy*. **19**(3), pp.98-115.
- Xu, J. 2009. School location, student achievement, and homework management reported by middle school students. *School Community Journal*. **19**(2), p27.
- Yin, R.K. 2009. *Case study research: Design and methods*. sage.
- Young, K. 2016. Teachers' Attitudes to using iPads or Tablet Computers; Implications for Developing New Skills, Pedagogies and School-Provided Support. *TechTrends*. **60**(2), pp.183-189.
- Younie, S. and Leask, M. 2013. *Teaching with technologies: the essential guide*. Maidenhead: Open University Press.

Appendices

Appendix A Ethical Approval

Performance, Governance and Operations
 Research & Innovation Service
 Charles Thackrah Building
 101 Clarendon Road
 Leeds LS2 9LJ Tel: 0113 343 4873
 Email: ResearchEthics@leeds.ac.uk



UNIVERSITY OF LEEDS

Hamood Al-Huneini
 School of Education
 9.91 EC Stoner
 University of Leeds
 Leeds, LS2 9JT

**ESSL, Environment and LUBS (AREA) Faculty Research Ethics Committee
 University of Leeds**

11 June 2014

Dear Hamood

Title of study: AREA 13-097
Ethics reference: The Impact of introducing Tablet PCs in Cycle1 Basic Education Classrooms in Oman

I am pleased to inform you that the above research application has been reviewed by the ESSL, Environment and LUBS (AREA) Faculty Research Ethics Committee and following receipt of your response to the Committee's initial comments, I can confirm a favourable ethical opinion as of the date of this letter. The following documentation was considered:

Document	Version	Date
AREA 13-097 Responds to comments 1.doc	1	29/05/14
AREA 13-097 Ethical Review form after correction .docx	1	29/05/14
AREA 13-097 Ethical Review form.docx	1	04/03/14
AREA 13-097 fieldwork-assessment-form-low-risk-2013.doc	1	04/03/14

Please notify the committee if you intend to make any amendments to the original research as submitted at date of this approval, including changes to recruitment methodology. All changes must receive ethical approval prior to implementation. The amendment form is available at <http://ris.leeds.ac.uk/EthicsAmendment>.

Please note: You are expected to keep a record of all your approved documentation, as well as documents such as sample consent forms, and other documents relating to the study. This should be kept in your study file, which should be readily available for audit purposes. You will be given a two week notice period if your project is to be audited. There is a checklist listing examples of documents to be kept which is available at <http://ris.leeds.ac.uk/EthicsAudits>.

We welcome feedback on your experience of the ethical review process and suggestions for improvement. Please email any comments to ResearchEthics@leeds.ac.uk.

Yours sincerely

Jennifer Blaikie
 Senior Research Ethics Administrator, Research & Innovation Service
 On behalf of Dr Andrew Evans, Chair, [AREA Faculty Research Ethics Committee](#)
 CC: Student's supervisor(s)

Appendix B Letter to Pilot School

School of Education

University of Leeds
Leeds LS2 9JT

T 0113 343 4545
F 0113 343 4541



UNIVERSITY OF LEEDS

27th June 2014

Blenheim Primary School
Lofthouse Place
LS2 9EX

Dear Mo Duffy

Hamood Ahmed Al-Huneini is a Research student at the School of Education, University of Leeds. His research is on ICT and education; he will investigate the use of iPads in classroom in Omani primary schools. We appreciate your cooperation with him to pilot his study in your school which will surely have an impact on improving the final study tools used afterwards. It is also important to emphasise that the purpose of piloting is only to try tools out and data collected at this stage will not be used or published.

This letter is provided to the student upon his request to assist him in getting on with his study. We would be very grateful if you could support his project.

Yours faithfully

Handwritten signature of Dr Aisha Walker in black ink.

Dr Aisha Walker

Handwritten signature of Dr Richard Badger in black ink.

Dr Richard Badger

Appendix C Pilot Interview Transcript

ME	First I would like to thank you for giving me the chance to attend your class ...
T	Ahh no worries no worries ... more than welcome
ME	I really enjoyed the lesson.. and lots of questions came through my mind... first who took the decision to introduce iPads into the class?
T	It was taken before I came and it was probably taken by a teacher in the ICT technician resource .. it's probably a TC TESOL ship team decision to make that.
ME	So, how do you feel teaching with iPads?
T	I think the kids love them, absolutely love them. I think they get enthused by them and excited and they .. it is modern technology and summary job and it depends on how do you use tablets and thing and yeah.. they really enjoy it.
ME	How does it affect your teaching?
T	Sometimes ... I think sometimes it's hard to find in the right applications or the right way of using them in tablets we've had had for lessons. It certainly makes things a lot easier in term of ... if children have to research something.. it just there at a press of a button.. Rather than having a laptop where you have to load it up starting it .. it takes time ... and I baddish it instant . . just instant access really to internet.
ME	Can the pupils go online?
T	MMh Yes, they can do, there is a filter to stop them watch or see anything inappropriate. Yeah just do it online straight away.
ME	As a teacher, do you feel that iPad has changed something in your teaching?
T	AAAh... I probably.. truthly probably don't know but that's because I realise the importance of them for the children and the future and they have to learn them AAh... but, I... I don't think you can get a wild factor without an iPad.. but I do realise how important they are for children to use.
ME	What about the Curriculum? Do you think the curriculum might be affected by introduction of iPads in the class?
T	Yeah, I think... the great thing about the iPad it opens up ... for example we have to teach world war 2 or ancient Egypt which could be hard concept for the children to understand or it could be quite hard to resource .. with an iPad you've got it all though, you've got the apps you've got the internet it's there a touch of a button ... if the child asks you a question in the class that's you don't know the answer to... it's there a touch of button .. they can

	the very kind of.... they can work independently... It is really useful in that scene. They need lots of skills teaching really... to use it .. properly
ME	From pupils side? What change does it bring to the students?
T	I think it brings excitement bringing it back to time where it takes the barriers of no having to write ... not have to do ..a lot of the apps are built so they got access straight away they don't have necessarily get out a book .. write the date and it takes away a lot of the barriers in terms of reading and writing that they just get straight into it and the children do love the iPads and get excited and a lot of them don't have iPads at home, so it really gets them going enthused.
ME	How often do they use it in class?
T	They don't use them anyway probably as much as they should. But as from next year when new curriculum starts in September, they will be using them often a lot and that's why we bought another thirty iPads and there will be 44 in school and they will be using them a lot more. At the moment no they don't use them.... mainly use them for the internet because it is easier than going to the computer suite ... logging on and wait for 5 minutes to upload just to get them out.
ME	Are they using them in all subjects?
T	Ahh, I would say mostly .. they are using them more in foundation subjects such as geography or history or Arts something like that really. Maybe sometime in literacy for research, I haven't seen them using them much for math, yeah generally more foundation subjects that you can Art.
ME	Do you think that iPads may have any side effect or an unfavourable effect on pupils?
T	Yeah, I think they can sometimes make children a little bit lazy in their research. When I was in school and need to research you get yourself into the library and you would go up to where you would get all that research information together, now children have gone to that, have gone to Google and what every they read they believe and there is quite a lot stuff there inaccurate (not true) ahh and so Yeah I think it takes away that skills really of researching through books and can make children .. sometimes when you set homework all they do just copy of the internet so it makes them a little bit lazy.. it's too easy
ME	As a teacher, does it ... change the preparation you do ... and do you have to modify your preparation?
T	AAh, It does modify it in a scene I can look up what apps and websites and what can fit so well. It does take a bit of time because unless you really know the internet or the Apple

	apps inside out it takes awhile to figure it out what is best for your children so it does take little more preparation than a normal lesson would.
ME	In Class, do you think that you would require any support technical support?
T	In terms of Somebody coming in? Yeah, I think that's brilliant. There a guy... because of the new curriculum, there is quite lots of people who are coming to school for lots of training. Yeah definitely, I think as a school, as a staff we really like.
ME	Speaking about training Have you... Do teachers get specially training on using iPads?
T	It depends from school to school... some schools have really gone far and give you lots of training other schools don't.
ME	As a teacher in this school would like to go on training?
T	Yeah, definitely ..Yeah, definitely
ME	Pupils movement in Class. Do you notice any change on their movement in class?
T	In terms of how they move around the class? Ahh Not really with the iPads no, I think, ideally what you would love to have is a class side every class that is always there on the go, because it's so much money ... No I didn't notice any difference in terms of movement no.
ME	What about.. some people think that iPads will replace text books what do you think of this idea?
T	Yeah, I can see it Yeah, probably happening but I think it's actually a tragedy to be honest. I thing there is something tangible about reading a book where is... ok don't get me wrong, I bought a kindle as well and I read from the kindle but for children there is something much more exciting about getting a book (that vibroring excitinging that is yours). I think it will go that way. I think it will go that way. There is a high school in Leeds where all children have been bough iPads and so they do all their homework all their books in there.
ME	Having their own iPads or school iPads, do you think children can take care of their devices?
T	Ahh children No, not at the moment. Though the high school that does in Aflo and Aflo is in rich area so they don't really have any problem with that.I would call some of the children On Monday to look after the Afalo .. (not clear voice because of children noise)
ME	Any anticipated problems about for example children bring their own iPads? Do you think that there will be Broken iPads? or stealing each others iPads?
T	Yeah definitely, definitely
ME	Any management problems in class? Students go to play? Children going off task?

T	Yeah... the only thing really is at the moment we don't have enough devices. Of course children at any age sometime find it difficult to share with some children other children are fine. But now as we are getting more iPads that should resolve the issue. The only the real thing is probably they get a bit enthused because they don't get to see them at home always get them in class always get very excited, sometimes they get too excited to use the iPads. I think the More they use them the less that will. There is nothing else.
ME	Actually I noticed that they were sharing happily and they were talking to each others.
T	Yeah mostly most of them share really well and it's just that they get frustrated from the fact that they have to sit and watch somebody else do it but with the 30 iPads that we've got to go with it should we....
ME	At the moment, Is there any domination? a student dominates the use and the other will ..
T	I think we some had ... (not clear) I could be that, I've canna move hopefully where that doesn't happen too much .. but there is always that Yeah there is always that issue of one dominates of being stronger than the other ... things to take in consideration
ME	Thank you than you Mr. T
T	You're welcome, nothing at all, is there anything else I can do to help
ME	Thank you

Appendix D Teachers Information Sheet (English)



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Teacher Participant information sheet for the study

Dear Teacher,

As part of my PhD I am conducting a study to explore the impact of introducing tablets in Omani primary schools. This is the first time Tablets have been introduced into Omani school context. This study will explore how pupils use these devices and how teachers help pupils to learn using tablets. I would like to invite you to participate in this study as I will be observing lessons where you will be naturally working with your tablets in the classrooms. Also, I will be videotaping some lesson which you will be informed about in advance. Individual interviews will be conducted with some volunteering teachers. Information gathered will be used exclusively for the study and will be regarded as confidential, no personal details of any participant will be mentioned in the findings, nor will any of the results be related to any particular teacher or to the school. Participation in this study is totally voluntary .I would like to stress that this is not a test. There are no "right" or "wrong" answers. I am interested in your reflection on the work you do with tablets in the classroom and your opinion so please give your answers sincerely as only this will guarantee the success of the study. Please be sure that you can withdraw for the study at any point of the study without giving any reasons or having to worry about consequences. Also please be sure have you decided to withdraw none of your data will be used or disclosed though videos and recording will be kept safely until the end of the study. It is important to know that if you decided to withdraw after audio and video recording are done that your recoding will remain safe but none of your participations will be used in the study. If you are interested in participating in this please confirm by signing the informed consent form and return it to school administration within one week. Has the form not been returned it will be assumed that you opt out. You may contact me for further questions about the study through my email below.

Thank you very much for your time and cooperation.
The researcher

Name: Hamood Al-Huneini
Email: Huneini@moe.om
Position: PhD Student
University: University of Leeds



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Research project – Exploring the Impact of Introducing Tablets in Oman Primary Schools
I wish to invite you to take part in this research project. Please take time to read the following information to help you decide if you wish to take part. If you have any questions, please get in touch.

What is the purpose of the research?

The purposes of the project are

- To explore the impact of introducing tablets in classroom context
- To explore how pupils use tablets in classroom for learning.
- To explore how teachers support pupils learning with tablets

Why have I been chosen?

You have been chosen because you are teaching in the first school to choose to introduce tablets into classroom in Omani school context.

What will happen if I agree to take part?

If you agree to take part, I will ask you for permission to carry out the research in your classroom through observations. You will also be interviewed twice, at the beginning of the semester and towards the end. You will be invited to schedule some meetings with me to make sure you get adequate information about my research; what I am doing in your classroom and what is involved on your part.

Will I be recorded, and how will the recordings be used?

With your permission, I will video one of your lesson during observation and I will also use an observation schedule to take notes about teaching practices using tablets in the classroom. I will show you the observation schedule immediately after the observation. I will also record the interview so that I have a good record of what you have said. I will be the only person to listen to the recording and to watch the video of the lesson, and I will transcribe them so my supervisors can read it shall they need to. I will change all the names so that no-one else will be able to identify you or your school. Before I share the transcripts, I will check with you that you are happy for me to do this. If there are any things you are not happy about, I will not share them. After I have finished doing the research, the recordings will be kept safely in a file at the university.

During the lesson videotaping and interview recording process, if you would like to say something that you don't feel comfortable to record, please signal and I will switch off the video camera or the recorder and will only switch it on again later when you think it is fine to continue recording.

Your participation in this study is absolutely voluntary and that you are free to withdraw at any time without giving any reason and without being there any negative consequences. It is important to know that if you decided to withdraw after audio and video recording are done that your recording will remain safe but none of your participations will be used in the study. Also, should you not wish to answer any particular question or questions, you are free to decline.



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Who is organising and funding the research?

This research is being organised by myself, Hamood Al-Huneini, under the supervision of Supervisors, Dr. Aisha Walker and Richard Badger in the School of Education at University of Leeds and is funded by the Ministry of Higher of Education.

Appendix E Teachers Information Sheet (Arabic)



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ورقة اعلام بمشروع دراسة الأجهزة اللوحية للمعلمة

أختي المعلمة

اقوم حاليا بدراسة تأثير استخدام الأجهزة اللوحية في مدارس الحلقة الأولى وكيفية استخدامك لهذه الأجهزة في التعليم والتعلم واستخدام الطلبة لهذه الأجزاء وكيفية مساعدتك للطلبة في استخدامها للتعلم. حيث أن هذه الدراسة هي جزء من دراستي للحصول على درجة الدكتوراة، لذا ادعوك للمشاركة في هذه الدراسة حيث سيقترن عملي على مشاهدت الدروس وانتم تعملون على هذه الأجهزة وقد احتاج الى تسجل بعض المشاهد من الحصة الصفية. كما سأحرص على الجلوس معك لأجراء مقابلات للاستماع الى آرائك حول استخدام هذه الأجهزة في الغرف الدراسية. وهنا أود التأكيد على ضمان سرية المعلومات التي تدلي بها حيث سيتم استخدامها للأغراض البحثية فقط ولن يكون بإمكان اي شخص الاطلاع عليها. كما واود أن أوضح لك ان هذا ليس اختبارا وليست هناك اجابة صحيحة أو خاطئة في المقابلات حيث أن لكل ما تدلي به من معلومات قيم ومهم.

وتأكدوا أنه يمكنكم إيقاف مشاركتكم في هذه الدراسة دون اي قلق حيث لن تكون لايقاف مشاركتكم أي نتائج عكسية ولن تكوني مضطرة الى ابداء اسباب الانسحاب من المشاركة في الدراسة. ومن المهم أن تعلمي انه في حال انسحابك من المشاركة في الدراسة فإن كل التسجيلات ستكون محفوظة في مكان آمن ومشفرة وأن مشاركتك لن يتم استخدامها. واذ اشكر لكي تعاونك معي بالمشاركة في هذه الدراسة فأرجوا التوقيع على هذه الوثيقة واعادتها الى ادارة المدرسة خلال اسبوع واحد. عدم ارجاع الموافقة الخطية يعد على انه عدم الموافقة.

شاكرا لكم حسن تعاونكم

الباحث: حمود بن أحمد الحيني

طالب دكتوراة

جامعة ليدز

المملكة المتحدة

للتواصل: Huneini@moe.om



UNIVERSITY OF LEEDS

المشروع: دراسة استخدام الأجهزة اللوحية لأغراض التعليم والتعلم في صفوف الحلقة الأولى من التعليم الأساسي

أدعوك للمشاركة في مشروع الدراسة لذا ارجو قراءة المعلومات التالية عن هذه الدراسة كما ويسرني الإجابة عن أية استفسارات حول موضوع الدراسة.

ما هو هدف هذه الدراسة البحثية؟

- استكشاف تأثير ادخال الأجهزة اللوحية على البيئة الصفية
- استكشاف كيفية استخدام الطلبة للأجهزة اللوحية للتعلم في الغرفة الصفية
- استكشاف كيفية دعم المعلمة للطلبة للتعلم باستخدام الأجهزة اللوحية وما هية هذا الدعم

لماذا تم اختياري للمشاركة؟

تم اختيارك للمشاركة في هذا المشروع لأنك إحدى المعلمات المشاركات في مشروع استخدام الأجهزة اللوحية في الغرف الصفية في مدارس الحلقة الأولى من التعليم الأساسي في سلطنة عمان.

ما الذي يحدث بعد الموافقة؟

بعد الموافقة سأستأذنك للقيام بجمع البيانات البحثية من الحصص الصفية التي تعملين بها مع طلبتك باستخدام الأجهزة اللوحية. كما سأقوم بإجراء مقابلة معك (حوار مسجل) مرتين على الأقل في الأوقات المناسبة لك والتي تختارينها انت. كما سأطلب منك اختيار حصص للمشاهدة الصفية التي سأحضر بها لمشاهدة كيفية استخدام الأجهزة.

ما الذي سستم تسجيله وكيفية استخدام هذه التسجيلات؟

بعد الحصول على موافقتك سأقوم بتسجيل (فيديو) إحدى حصص المشاهدة وسأقوم باستخدام دليل المشاهدة الذي تم اعداده لهذه الدراسة وأخذ الملاحظات الصفية. يمكنك الاطلاع على دليل المشاهدة الصفية بعد الحصص مباشرة. كما سأقوم بتسجيل (صوتي) للمقابلات التي سأجريها معك لضمان الحفاظ على افكارك وعبارتك دون تدخل او تعديل الباحث. علما أنني سأكون الشخص الوحيد الذي سيطلع على هذه التسجيلات وسأقوم بكتابة محتوياتها لعرضه على المشرفين على الدراسة مع التأكيد على المحافظة على سرية ملفات التسجيلات وحفظها بأسماء مستعارة بحيث لا يمكن الوصول الى المعلمة المشاركة في الدراسة.

كما وأود ان اذكرك انه اثناء التسجيلات يمكنك طلب إيقاف التسجيل (إذا رغبتني في قول امر لا تودين أن يتم تسجيله). يمكن طلب إيقاف التسجيل بالإشارة الى جهاز التسجيل. والعودة للتسجيل فيما بعد.

تطوعك بالمشاركة مهم وهي إحدى أساسات هذه الدراسة وأود أن اذكرك مرة أخرى انه يمكنك الانسحاب من هذه الدراسة في أي وقت من دون القلق من أية نتائج سلبية للانسحاب من الدراسة. وسيتم حفظ الملفات بسرية تامة ولن يتم استخدام ما تدلون به من بيانات ومعلومات اذا ما قررت الانسحاب من الدراسة. كما واذكركم بأنه يمكنكم الامتناع عن الإجابة عن أي سؤال تشعرون بالحرج في الإجابة عليه.

Appendix F Pupils' Assent Sheet (English)



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Pupils' Assent Sheet (combined with oral explanation)

Dear Pupil,

I am looking into the impact of using tablets in Omani primary schools. I will study how you use tablets and how teachers help you to learn using tablets. I would like to invite you to participate in this study and I will be observing lessons with you working with your tablets in the classrooms. Also, I will be videotaping some lessons. I will also sit to speak and listen to some of you in groups (group interview). Everything you say will only be used for my study and no one else will know about it or about anything you say to me. I would like you to understand this is not a test and there are no "right" or "wrong" answers. I am mostly interested in what you think of and what you do with tablets in the classroom.

Also, please be sure that you can stop your participation in the study any point of the study without having to worry about anything and you don't have to give reasons. It is important to know that if you decided to stop participating after audio and video recording are done that your recording will remain safe but none of your participations will be used. If you are interested and willing to participate in this study please sign the assent form and return it to school administration within one week. If the form not been returned it will be assumed that you are not willing to participate.

Thank you very much for your time and help.
The researcher

Name: Hamood Al-Huneini
Email: Huneini@moe.om
Position: PhD Student
University: University of Leeds

Appendix G Pupils' Assent Sheet (Arabic)



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ورقة اعلام بمشروع الدراسة للطالب/الطالبة (مع الشرح الشفهي)

عزيزي الطالب/عزيزتي الطالبة

اقدم حاليا بدراسة تأثير استخدام الأجهزة اللوحية في مدارس الحلقة الأولى وكيفية استخدامك لهذه الأجهزة في التعلم واستخدام المعلم لهذه الأجزاء لمساعدكم في الدراسة. لذا ادعوك للمشاركة في هذه الدراسة حيث سيقصر عملي على مشاهدت الدروس وانتم تعملون على هذه الأجهزة وقد احتاج الى تسجل بعض المشاهد من الحصة الصفية. كما سأحرص على الجلوس معكم في مجموعات لأجراء مقابلات للاستماع الى ارائكم حول استخدام هذه الأجهزة في الغرف الدراسية. وهنا أود التأكيد على ضمان سرية المعلومات التي تدلوا بها حيث ستستخدم للأغراض البحثية فقط ولن يكون بإمكان اي شخص الاطلاع عليها. كما واود أن أوضح لكم ان هذا ليس اختبارا وليس هناك اجابة صحيحة أو خاطئة في المقابلات حيث لكل ما تدلوا به من معلومات ذو قيمة ومهم.

وتأكدوا أنه يمكنكم إيقاف مشاركتكم في هذه الدراسة دون اي قلق حيث لن تكون لايقاف مشاركتكم أي نتائج عكسية ولن تكونوا مضطرين الى ابداء اسباب الانسحاب من المشاركة في الدراسة. ومن المهم أن تعلموا انه في حال انسحابكم من المشاركة في الدراسة فإن كل التسجيلات ستكون محفوظة في مكان آمن وأن مشاركتكم لن يتم استخدامها. واذ اشكر لكم تعاونكم معي بالمشاركة في هذه الدراسة فأرجو التوقيع على هذه الوقة واعادتها الى ادارة المدرسة خلال اسبوع واحد. عدم ارجاع الموافقة الخطية يعد على انه عدم الموافقة.

شاكرا لكم حسن تعاونكم

الباحث: حمود بن أحمد الحنيني

طالب دكتوراة

جامعة لينز

المملكة المتحدة

للتواصل: Huneini@moe.om

Appendix H Parents Information Sheet (English)



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Parents' information sheet for the study

Dear Parent,

As part of my PhD I am conducting a study to explore the impact of introducing tablets in Omani primary schools. This is the first time tablets have been introduced into Omani school context. This study will explore how pupils use these devices and how teachers help pupils to learn using tablets. I would like to invite your child to participate in this study as I will be observing lessons where your child will be naturally working with your tablets in the classrooms. Also, I will be videotaping some lesson which they will be informed about in advance. Group interviews will be conducted with some volunteering children. Information gathered will be exclusively used for the study and will be regarded as confidential, no personal details of any participant will be mentioned in the findings, nor will any of the results be related to any particular pupil or to the school. Participation in this study is totally voluntary. I would like to stress that this is not a test. There are no "right" or "wrong" answers. I am interested in pupils' reflection on the work they do with tablets in the classroom and in their opinion so only their sincere answers will guarantee the success of the study. Please be sure that your child can withdraw for the study at any point of the study without giving any reasons or having to worry about consequences. It is important to know that if you or your child decided to withdraw after audio and video recording are done that the recording will remain safe but none of his/her participations will be used in the study. With all thank, your child has volunteered to participate in the group interviews if you agree in your child participating in the study please confirm by signing the informed consent form on your child behalf and return it to school administration within one week. Had you the form not been returned to school within two weeks it will be assumed that your child opt out. You can contact the school administration or contact me for further questions about the study through my email below.

Thank you very much for your time and cooperation.
The researcher

Name: Hamood Al-Huneini
Email: Huneini@moe.om
Position: PhD Student
University: University of Leeds

Appendix I Parents Information Sheet (Arabic)



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اعلام بمشروع دراسة لولي أمر الطالب/ الطالبة

أخي ولي أمر الطالب/ الطالبة

جزء من برنامج دراستي (دكتوراة) هو دراسة تأثير استخدام الأجهزة اللوحية (التابلت) في مدارس الحلقة الأولى من مدرسة التعليم الأساسي في سلطنة عمان. حيث ان المدرسة التي يدرس بها أبنائكم من أوائل المدارس التي بادرت في ادخال هذه الأجهزة لغرفة الصف في السلطنة. تعمل هذه الدراسة على استكشاف كيفية استخدام الطلبة لهذه الأجهزة وكيفية دعم المعلمات للطلبة في التعلم باستخدام هذه الأجهزة. هنا أوجهه الدعوه لأبنائكم للمشاركة في هذه الدراسة حيث سأقوم بزيارات صفية للاطلاع على استخدام الأجهزة في الواقع وبشكل لا تؤثر هذه الزيارات على سير الدراسة المعتادة للطلبة. كما سأقوم بتسجيل (فيديو) بعض الحصص وذلك لتحليل محتوياتها وسيتم ابلاغ الطلبة مسبقا عن موعد استخدام اجهزة التسجيل. كما سيتم اجراء مقابلات جماعية للطلبة وأود أن أكد لكم أن جميع البيانات التي تجمع لن تستخدم لغير اغراض الدراسة وستكون محفوظة بسرية تامة ولن يتم الأدلاء بأية بيانات شخصية عن المشاركين وسيتم عرض النتائج بأسلوب جماعي. كما وأكد ان هذه الدراسة ليست اختبار ولا توجد اجابات صحيحة او خاطئة وليس لها أي تأثير على نتائج الطلبة الدراسية. كل ما نحتاجه في هذه الدراسة هي الاطلاع على كيفية استخدام الطلبة لهذه الأجهزة في الصفوف الدراسية والاطلاع على آرائهم حولها. ويمكن لأبنكم الانسحاب من هذه الدراسة في أي وقت من دون مطالبكم بتوضيح اسباب الانسحاب. مع العلم أنه في حل قرار الانسحاب ولصعوبة عزل مشاركة ابنكم عن مشاركة بقية الطلبة الاخرين فإن التسجيلات ستظل محفوظة بشكل سري تام ولكن لن يتم استخدام مشاركة ابنكم في الدراسة. وفي النهاية اتقدم لكم مقدما بالشكر الجزيل على الموافقة بمشاركة ابنكم في هذه الدراسة وارجو منكم التوقيع على هذه الورقة واعادتها الى ادارة المدرسة خلال اسبوعين حيث تطلب الجامعة الموافقة الخطية من ولي أمر الطلبة المشاركين في الدراسة. وادعوكم للتواصل مع ادارة المدرسة للاستفسار والحصول على مزيد من المعلومات عن المشروع والدراسة البحثية أو معي مباشرة. شاكرا لكم حسن تعاونكم

الباحث: حمود بن أحمد الحيني

طالب دكتوراة

جامعة ليدز

المملكة المتحدة

للتواصل: Huneini@moe.om



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ما هو هدف هذه الدراسة البحثية؟

- استكشاف تأثير ادخال الأجهزة اللوحية على البيئة الصفية
- استكشاف كيفية استخدام الطلبة للأجهزة اللوحية للتعلم في الغرفة الصفية
- استكشاف كيفية دعم المعلمة للطلبة للتعلم باستخدام الأجهزة اللوحية وما هية هذا الدعم

لماذا تم اختيار أبني/أبنتي للمشاركة؟

تم اختيار أبنتكم للمشاركة في هذا المشروع لأنه يدرس إحدى المدارس المبادرة في مشروع استخدام الأجهزة اللوحية في الغرف الصفية في مدارس الحلقة الأولى من التعليم الأساسي في سلطنة عمان.

ما الذي يحدث بعد الموافقة؟

بعد الموافقة سأستأذنتكم للقيام بجمع البيانات البحثية من الحصص الصفية التي يتعلم بها أبناؤكم باستخدام الأجهزة اللوحية. كما سأقوم بإجراء مقابلة مع مجموعات من الطلبة (حوار مسجل) مرتين على الأقل في الأوقات المناسبة والتي لا تؤثر على سير الدراسة المعتادة. كما سأطلب من المعلمات اختيار حصص المشاهدة الصفية التي سأحضر بها لمشاهدة كيفية استخدام الأجهزة.

ما الذي سستم تسجيله وكيفية استخدام هذه التسجيلات؟

بعد الحصول على موافقتكم سأقوم بتسجيل (فيديو) إحدى حصص المشاهدة وسأقوم باستخدام دليل المشاهدة الذي تم اعداده لهذه الدراسة وأخذ الملاحظات الصفية. يمكنك الاطلاع على دليل المشاهدة الصفية بعد الحصص مباشرة. كما سأقوم بتسجيل (صوتي) للمقابلات التي سأجريها معك لضمان الدفء على افكارك وعبارتك دون تدخل او تعديل الباحث. علما أنني سأكون الشخص الوحيد الذي سيطلع على هذه التسجيلات وسأقوم بكتابة محتوياتها لعرضه على المشرفين الأكاديميين للدراسة مع التأكيد على المحافظة على سرية ملفات التسجيلات وحفظها بأسماء مستعارة بحيث لا يمكن الوصول الى المعلمة المشاركة في الدراسة.

كما وأود ان اذكرك انه اثناء التسجيلات يمكن لأبنتكم طلب إيقاف التسجيل (إذا رغب في قول امر لا تود أن يتم تسجيله). يمكن طلب إيقاف التسجيل بالأشارة الى جهاز التسجيل. والعودة للتسجيل فيما بعد.

مشاركة أبنتكم مهمة وهي إحدى اساسات هذه الدراسة وأود أن اذكرك مرة أخرى انه يمكن الانسحاب من هذه الدراسة في أي وقت من دون القلق من أية نتائج سلبية للانسحاب من الدراسة. وسيتم حفظ الملفات بسرية تامة ولن يتم استخدام ما يدلون به من بيانات ومعلومات اذا ما قررت الانسحاب من الدراسة. كما واذكركم بأنه يمكنهم الامتناع عن الإجابة عن أي سؤال عند الشعور بالحرج في الإجابة عليه.

من يعمل في مشروع الدراسة ومن يموله؟

هذه الدراسة هي جهد فردي جزء من دراسة الدكتوراة للباحث حمود بن أحمد الحيني وبإشراف د.ريتشارد بادجر و د.عائشة ولكر وهما أكاديميان في كلية التربية في جامعة ليدز. والبحث ممول من قبل وزارة التربية والتعليم بسلطنة عمان.

Appendix J Participant Consent Form (English)



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PARTICIPANT CONSENT FORM FOR THE OBSERVATIONS AND INTERVIEWS

Title of the research: Exploring the Impact of Introducing Tablets in Oman Primary Schools

Name of Researcher: Hamood Al-Huenini

Tick the box if you agree with the statement

1. I confirm that I have read and understand the information explaining the above research project and I have had the opportunity to ask questions about the project.
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason and without being there any negative consequences. In addition, should I not wish to answer any particular question or questions, I am free to decline.
3. I give permission for the research to have access to my anonymised responses. I understand that my name will not be linked with the research materials, and I will not be identified or identifiable in the report or reports that result from the research.
4. I agree for the data collected from me to be used in future research.

If you are willing to participate in the research, please sign the form below.

Name of participant

Date

Signature

Appendix K Participant Consent Form (Arabic)



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أستمارة تأكيد المشاركة في حصص المشاهدة الصفية والمقابلات لدراسة استخدام الأجهزة اللوحية

عنوان البحث: استكشاف تأثير ادخال الأجهزة اللوحية (تايلت) في الفصول الدارسية لمدارس الحلقة الأولى من التعليم الأساسي بسلطنة عمان

الباحث: حسود بن أحمد الحيني

يرجى وضع اشارة (✓) في المربع بجانب كل عبارة للاشارة على الموافقة.

- ١- قرأت وفهمت المعلومات الواردة في الصفحات السابقة والموضحة لمشروع دراسة الأجهزة اللوحية
- ٢- اعلم ان المشاركة في مشروع الدراسة هو عمل تطوعي وأعم ان لي مطلق الحرية في الانسحاب من مشروع الدراسة من دون الخوف او القلق من أية نتائج سلبية تنتج عن الانسحاب. كما وأعلم ان لي مطلق الحرية في رفض الاجابة عن اية سؤال
- ٣- أعلم ان للباحث مطلق الحرية لاستخدام المعلومات للأغراض البحث والدراسة وأعلم أن انه سيتم اخفاء هوية المشاركين للحفاظ على سرية البيانات
- ٤- اوافق على استخدام البيانات المدلى بها للأغراض البحثية المستقبلية

أسم المشارك

التاريخ

التوقيع

Appendix L Transcription of Parents Focus Group Interview

Me	Form the experience your children have been through, what happens when tablets are introduced in classroom?	من خلال معرفتكم وملاحظتكم ... ما الذي يحدث عن ادخال الأجهزة اللوحية الى غرفة الصف؟
L1	What do you mean?	كيف يعني؟
Me	You have your son or daughter in the class where tablets are introduced... what are ... what happened? Any your comments	عندك ابنك في الصف اللي ادخلت عليه الاجهزة اللوحية .. ما هي ملاحظتكم؟ وش صار
M1	I think pupils concentration increased	اتوقع يزيد تركيز الطالب
M2	At the beginning pupils get curious with this new thing. How could we make use of it and who is going to use it. In cycle one there is more competition on who will get a chance to work on the new device	يصير فضول في البداية لدى الطلبة .. هذا الشيء الجديد كيف ممكن نستفيد منه. أو من راح يستخدمه ، خصوصا في الحلقة الأولى التنافس معهم أكثر، او من اللي راح يعطى الفرصة يشتغل في هذا الجهاز
Me	As parents have you notice anything on pupils? Things happened in relation to tablets introduction?	كولي أمر .. لاحظت شي من هذا على ابنك؟ او في .. أي ملاحظات واقعية
M2	When my daughter was given the form.. There was a special form for the project.... she showed it to me as I arrived home and she was saying" agree" ,, "agree without reading I want to be in thins" I told her let me see it.. When I read it I told her "excellent" that such area is open for you to be involved in.	بنتي لما عطوه الاستمارة .. كان في استمارة خاصة بالمشروع وعرضتلي اياها فلما وصلت كانت تقولي .. باباه وافق وافق أني اكون في هذا الموضوع .. فانا ما عارف الموضوع اصلا.. قائلتي لا وافق وافق من دون ما تقرا أريد اكون في هذا الموضوع.. فقلتلها اعطيني اشوف.. فلما قرئت قلتلها ممتاز انه انفتحك المجال انك تكوني من ضمن المشروع.
L4	In my daughter's case I feel it will expand the horizon for her. I mean that I feel the use of ipads or small hand held devices in classroom will get her out of school routine. She will	همه النسبة لبنتي حاسة انه هوا حيوسع الافق عندها شويه.. يعني انه هي تستعمل التاب او الأيباد او الاجهزة المحمولة الصغيرة دي داخل الفصل حاسة انه هي ح تبعد عن الروتين بتاع الدراسة .. حيبقي انه ليها حاجة خاصة بيها خصوصا لما تيجبي تنفذ

	<p>have something of her own that she can use for projects and it will help in creating competition between her and other pupils. Everyone wants to see how others have used this device. Even pupils who have no previous experience except though ICT lessons now are curious to learn from their pairs or their groups.</p>	<p>فيها مشروع ولا شيء بخلق روح تنافس بينها وبين باقي الطلاب.. كل واحد عاوز يشوف مشروع زميله .. كل واحد عاوز يشوف زميله استخدم الجهاز ازيائي .. حتى الطلاب اللي هم معندهم مش دراية باستخدام الأجهزة بس غير من خلال حصص التقنية .. باه عنده فضول يتعلم من زميله أو زميلته اللي جنبه في المجموعة</p>
L2	<p>Of course the use of tablets always attracts young pupils in cycle one. I mean that children in this age are attracted by tablets. Especially with games that have educational side. I think it will have an effect on them. It will create competitive environment between pupils and it will enable them to be creative because with their use of these devices they will have wider space to use technology and apps.</p>	<p>طبعا استخدام الألواح بشكل عام بالنسبة للفئات العمرية الصغيرة خصوصا الحلقة الأولى دائما استخدامهم مشد. يعني هم الأطفال في مثل هذه الاعمار يشدوهم استخدام الألواح. خاصة في الألعاب لكن في الجانب التعليمي باعتقادي انه راح يآثر عليهم أكثر. انه راح يخلق بيئة تنافسية بين الطلاب كذلك راح يمكن الطالب انه بيدع لانه هم باستخدامهم لهذه الألواح يكون عندهم مجال واسع لاستخدام التقنيات والبرامج</p>
L3	<p>In addition to that, most pupils have tablets at home and their parents download educational apps to their tablets. This means it's connected together at school and at home.</p>	<p>بالإضافة الى ذلك معظم الطلاب الحين معاهم في البيت تحصل ايباد فهم يستخدمون اصلا الوالدين ينزلولهم برامج تعليمية في الأيباد الخاص بيهم. ف يعني مرتبط مع بعض في المدرسة وفي البيت</p>
Me	<p>Connected at school and home. . .</p>	<p>...يكون ارتباط بين المدرسة والبيت</p>
L1	<p>Maybe it is not the same sorry for interrupting ...</p>	<p>ممكن ما يكون نفس... اسفة استاذ</p>
Me	<p>It is ok ... you may carry on ..</p>	<p>تفضلني .. استاذة كملني</p>
L1	<p>It may not be with the same educational lessons, but for example they will download (chapter 30 of holy quran) or (how I learn my language) or English alphabet ... it is</p>	<p>يمكن ما يكون نفس الدروس التعليمية .. لكن مثلا ينزلولهم جزء عما ، كيف اتعلم لغتي.. اشياء خاصة .. مثلا حروف اللغة الانجليزية.. بالنسبة لهم سهل .. تعلم الألواح تسهل بالنسبة لهم التعلم</p>

	easy for them to learn tablets make learning easy	
Me	Ok... we will get back to this point later, any comment on the teachers?	انزين...بنتكلم عن هذا الموضوع فيما بعد.. من خلال ملاحظاتكم هل لاحظتوا شي على المعلمات؟
L4	Surely the teachers will get out of the usual board and pen frame going to e-learning .. situation will be easier. It will be easier for the teacher	اكيد المعلم ح يخرج من اطار الصبورة والاقلام والكتابة للتعليم الالكتروني فحيقئى الموضوع اسهل.. يعني ح يبقى اسهل حتى على المعلم
Me	Any real life comment? Have you notice anything happened?	هل من ملاحظات واقعية اذا ممكن؟ هل لاحظتوا حاجة في الواقع؟
L4	I have a real comment and I will be honest with you. Most teachers .. or I would say some not all don't have enough knowledge about using tablets in classroom. She is given a class to teacher with tablets and if she herself does not know how to use it how will she teach with it? How will she download apps? How will I implement this with children in cycle one? This is an important point. Children in cycle one are affected by the teacher more than those in cycle two. I mean if the teacher is incompetent in something pupils will take this incompetency from her. Children are naturally naughty and acquire negative things. Have they found their model teacher is unable to deliver enough information through the tablets which the teacher is unable to use well, children will take this part	هيه في ملاحظة واقعية وحكون بالنسبة لك صريحة جدا.. ان معظم المعلمات او بعض المعلمات مش حقول معظمهم..ما عندها دراية كافية في استخدام الالواح داخل الفصل..دي محتاجة ... انتي مكلفة بتدريس الفصل كذا باستخدام الالواح.. اذا كان هي نفس اللي ح يدي المعلومة.. فاقد الشئ لا يعطيه..ما عندي دراية ب كيفية استخدامها.. كيف انا استخدمها... كيف انزل برامج ..كيف اطبق ده واوصل المعلومة لطفل في الحلقة الاولى وخذ بال حضرتك من نقطة مهمة جدا.. طفل الحلقة الاولى بيتأثر من الأطفال طلاب الحلقة الثانية بالمعلم.. يعني اذا كانت المعلمة عندها قصور في شئ ما ..خلاص الطفل اخذ القصور ده منها.استيعابة كمان لانه الطفل بطبعه فوضوي. يكتسب السلبية اكثر من الايجابية.. فلو حصل معلمته كقدوة بالتنسبة له ما عندها دراية كافية اوما قادرة توصل المعلومة الكافية عن طريق الالواح اللي هي مش عارفة تستخدمها بالتالي الطفل عمره ما ياخذ الجزئية ده
Me	I would like to connect this point with another one...	هذي النقطة اريد اربطها بنقطة اخرى

L4	Ok	او كيه
Me	Can pupils ability exceed teacher's ability?	هل ممكن ان تفوق قدرة الطالب قدرة المعلم؟
L2	For sure	اكيد
L4	This is what is happening	ده بيحصل على فكرة
Me	What is the impact of that?	وش تأثير هذا الشيء؟
L4	It has negative impact on both... because a teacher will always find that pupils have better competence than her or they always draw her attention to things, children are innocent ... teacher this is not right ... her reaction will be disappointment . .. because she also doesn't want to appear incompetent in class in front of her pupils as that will also disappoint the pupils.	تأثيره سلبي على الطرفين .. لأنه دايم العلم أو المعلمة لما بتلاقي الطالب اللي أمامها قدرته أكبر أو بينبها لشيء .. الاطفال بيرائتهم بتتكلم .. يعني استاذة لا هذا كذا .. استاذة غلط في ده ... المعلم احيانا أو المعلمة لا تقبل هذا .. فيكون رد فعلها لطفل احباط .. لانه هي برضة مش عايزة تظهر في الفصل امام الطلاب انه هي عندها قصور . او تقليل من شأنها .. وبالتالي بتعمل احباط للطفل
L1	I don't blame the teacher here. I blame the ministry ... they say a project X in e-project... before setting this in a school you need to qualify trainers and prepare the curriculum and workshops for every teacher.. An example is the interactive board .. one day workshop is not enough for the teachers. Teachers are tide with school work and workshops... how can they divide themselves in this case? A teacher should be dedicated...for example, may be one teacher from 8:00 until 2:00 working with the interactive board.	هنا ما الوم المعلم .. الوم مثلا الوزارة ..يقولك مشروع معين الالكتروني .. اول لا تدخل هذي في اي مدرسة لازم تعد مدربين وتعد اي منهج بيكون وتعد ورقة عمل لكل مدرس ..تسويلهم ورش عمل .. ما كفاية يوم واحد ..مثال الصبورة التفاعلية ما تكفي ورشة عمل يوم واحد للمعلم .بعدين رابطين المعلم بمدرسة ورابطينه بمشاغل . يعني المعلم وين ايقسم نفسه في هذي الحالة . يعني لازم يكون مثلا متفرغ . معلم واحد يمكن من الساعة ٨ الى الساعة ٢ مع الصبورة التفاعلية
L4	We need technicians	محتاجة تقنين
L1	Yes.... there should be specified days (for technicians) and teachers should	هيو لازم ايام مقننة ويجي المعلم فاهم كيف يستخدموا هذي .. ما بس الصبورة التفاعلية .. أي

	understand how to use these devices not only interactive board, I can't get any e-project to school where no one knows how to use.	عمل الكتروني ينزل للمدارسة ما اروم انا انزل عمل الكتروني وما حد فاهم كيف يستخدمه.
Me	You got to topics at the same time.... in order not to forget, lets get back to teacher-pupil relation, can it be seen from a different angle?	دخلتوا في موضوعين .. عشان ما ننسى نرجع لموضوع علاقة الطالب بالمعلم. هل ممكن ننظر لها من زاوية أخرى؟
	Teacher-pupil relation is very important	علاقة الطالب بالمعلم مهمة جدا.
Me	Teacher-pupil relation when using tablets? Can we see something else?	علاقة الطالب بالمعلم في استخدام الأجهزة؟ هل ممكن ننظر لها من زاوية أخرى؟
	There is only one angle we can look through...if pupils' ability is higher than teacher's there will be a gap between the pupils and the teachers	هي الزاوية الوحيدة اللي احنه حننظر له منها أنه لو الطالب تفوق على الأستاذ او على المعلم حصلت فجوة بين الطالب وبين المعلم
Me	This is one angle ... any other angles?	هذي زاوية .. انا أسئل البقية هل ممكن ننظر من زاوية أخرى؟
M2	The other angle is that the teacher will have to improve his competence so s/he will not be embarrassed in every class when pupils ask about thing he can't answer.	الزاوية الأخرى انه المعلم ممكن يضطر يطور من مستواه عشان ما يخرج في كل حصة انه الطالب يستفسر منه في جوانب معينة وهو ما قادر يرد عليها
L4	Again we will get you back and say time .. where will the teacher get time from.. We need to specify time,, manage time ,, we need to know how teachers have to improve themselves. As you know we spend most of our time in school	بس ح نرجع حضرتك ونقول الوقت زي ما قالت الأستاذة وين الوقت؟ لازم نخصص وقت .. ندير الوقت لازم نعرف الزاوية الأستاذ يكون متفرغ بحيث انه هو يطور نفسه. لان حضرتك عارف انه الوقت احنه بنقضيه معظمه في المدرسة
Me	You are looking from a teacher point of view ... I'm looking for parent views.	انتي تنظري من منظورك كمعلمة .. انا اريد منظورك كولي أمر الان

L3	Ok .. We are teachers and parents ... how many parents are employees? Don't employees have the right to education their children as well?	انزين استاذ هي يعني كمعلمة وكولي امر.. كم ولي امر موظف .. وبين الموظف؟ يعني الموظف ما يحق لأبناءه يعلمهم بعد؟
Me	Sure.. I am not disagreeing with her ..	لا . اكيد انا ما جالس اعارضها طبعاً
	No no no	لالالا
Me	I am just asking her to speak from parents prospective	اريدها تنظر من زاوية اخرى .. من زاوية ولي الامر
L3	A parent is an employee	ولي الامر موظف
L4	I just want to say one thing .. some teachers don't accept pupils views even if they were more competence. She sees herself as a teacher who got to a certain position and pupils are not allowed to discuss with her. Also , such situations sometimes may create psychological gap with the child. I mean we need to consider children psychology in all these points.	بس انا عاوزة اقول لحضرتك حاجة... بعض المعلمين لا يقبلوا وجهة نظر الطالب حتى لو هو تفوق عليهم.. هي شايفة انها معلمة وصلت لوضع معين ما يحق للطالب انه يراجعها. واجانا الطالب برضه يعمل فجوة في نفسية الطفل حتى.. يعني نفسية الطفل احنه لازم نراعيها في كل هذي النقاط
Me	We will get back to the teacher later, now as you are all teachers and parents as the same time I would like to ask you about the classroom environment, will the introduction the tablets have effect on the classroom environment ?	بنرجع للمعلم فيما بعد .. الحين استغل كونكم معلمين واباء في نفس الوقت وانتقل للسؤال عن موضوع البيئة الصفية .. مثل ما قلنا انتوا معلمين وتعرفوا عن البيئة الصفية بشكل كبير جدا.. ادخال الأجهزة الصفية للبيئة الصفية هل يؤثر على البيئة الصفية؟
L1	A pupil is attracted to these things .. getting new things other than pens and books will attract the pupils .. in fact if you make a power point show you will see them attracted to the lesson more than usual lessons. Sometimes using flash cards or Word cards you find them attracted to	الطالب تشده هذي الاشياء .. انك دخل اشياء جديدة غير عن الكتاب وغير عن الدفتر وغير عن القلم يشد هذا الطالب.. اصلا حتى لو كنت تسويله اي برنامج مثلا بوربويت تحصل انه الطلب مشدود حال هذي الاشياء في الحصّة اكثر من الحصص العادية. احيانا حتى تستخدم الفلاش كاردس أو وورد كاردس تحس انه الطلاب منشدن اليها يعني غيرت شئى حتى اشياء ثانية نحن نسويها في الفصل

	<p>them. I mean When you change things even other things we do in >>>> lessons the get attracted to it. But when we say open you book page. So and so pupils are not with you.</p>	<p>نموذجية ينشد اليها .. بس لما افتح الكتاب الصفحة الفلانية تحصل الطالب ما معك</p>
M2	<p>Pupils questionnaire that we distribute as part of the school performance development programme (National Program) some pupils point out that they want teachers to get them out of the class even for one lesson a day. Today when I asked them where do you want to go? They said even if we sit in the shade outside and teachers teach us there. They speak about just going out of the class and the environment has changed even if the teacher is using the same teaching methods and the same discussion that he uses in the class, what about when he takes them to interactive board room or Learn Resource Centre</p>	<p>هو احيانا الاستبيان اراء الطلبة اللي نطبقه في نظام تطوير الاداء من ضمن الطلبة كانوا شايريين ضمن الاشياء اللي يكتبوها انه نريد المعلمين يخرجونا من الصف حتى على الاقل حصة وحدة نطلعنا من الصف في اليوم ولما رحنا اسئلهم دخلت بعض الصفوف انتو تريدوا تطلعوا وين تريدوا تروحوا؟ فهم كانوا يقولوا اهم شي نطلع من الصف حتى لو نجلس تحت المظله والمعلم يدرسنا .هم يتكلموا عن خروجه وتغيرت البيئة الصفية حتى لو كان المعلم متبع نفس اسلوبه ونفس النقاش اللي يتبعه في الصف . فما بالك لما يروح لغرفة الصبورة التفاعلية او مثلا لمركز المصادر.</p>
Me	<p>In this matter, escaping class routine and the class, what is the tablets role in this?</p>	<p>في هذا الموضوع .. الهروب من الروتين والصف وش دور الاجهزة حاليا؟</p>
L2	<p>Change the classroom environment</p>	<p>تغير البيئة الصفية</p>
Me	<p>How do they change classroom environment?</p>	<p>كيف تغير البيئة الصفية؟</p>
L2	<p>When you teach pupils using books and board or paper realia, it is different when you change the whole environment and it becomes e-environment with tablets. Here you move and change from usual things</p>	<p>يعني شوف الطلاب لما تدرسهم على كتاب وصبورة وحتى لو مجسمات ورقيات . غير لما تغير البيئة الصفية بالكامل تتغير وتصبح كله الكتروني والواح . فهنا تنتقل وتتغير من البيئة الاعتيادية اللي تعود عليها الطالب على مرور سنوات الى بيئة أكيد بيحسوا فيها بتغيير باستخدام الالواح . وطبعا</p>

	that pupils are used to over the years to an environment that will surely feel the change with the tablets. Of course the use of tablets is another (World/story) it is an environment they can use many things in.	الالواحواستخدامها وحده عالم ثاني هي بنفسها بيئة يقدروا يستخدموا فيها الكثير من الاشياء
L4	In stead of pupils are going down to computer lab or Learning Resource Centre or the interactive room .. Now devices will come to the class, the environment has changed and he is sitting in his place, only his feeling will change. For example part of the lesson time usually lost for pupils moving between rooms but now devices go to classes and the class shape change.	يعيني حضرتك بدل ما ينزل الطالب لمركز الحاسوب او غرفة المصادر أو الغرفة التفاعلية . خلاص الاجهزة ح تجيله لحد الفصل . اتغيرت البيئة الصفية وهو جالس مكانه بس احساسه مثلا كان بيضيع من الحصة جزء لحد ما الطالب ينزل من الصف يروح للمكان دلوقت الاجهزة جباله لحد الصف. فتغير الشكل
Me	In school reality now pupils still move to interactive room where the tablets are kept.	بس واقع المدرسة حاليا هم بييجوا للغرفة اللي فيها الاجهزة
L4	However, it has been better had they been in their classes even if there were not enough devices for everyone and they share, it can be in groups they will feel they change as well	بس على فكرة هو افضل انهم يكونوا في نفس صفهم وحتى لو ما كنتش في اجهزة للكل يشتغلوا في ثنائيات مش لازم مجموعات برضه ح يحسوا بتغيير
Me	What is the nature of activities used with tablet device? Do you have any idea?	ما نوع وطبيعة الانشطة المستخدمة في الاجهزة اللوحية؟ هل عندكم فكرة عنها؟
M3	Does it have to be in class?	هل شرط داخل الحصة؟
Me	Yes in class. .	نعم داخل الحصة .هل اطلعتم عليها؟
L2	We have no idea	ما اطلنا عليها
L4	As a class activity for sure there will be change from paper and board.. But the idea is that all activities that	لك نشاط داخل الحصة هو اكيد في تغيير عن الورقي او عن الصبورة بس الفكرة هي انه لام النشاط اللي

	will be implemented have to be loaded by the teacher to all devices and this is one of the drew back	ح يطبقه المعلم يكون نازل على كامل الاجهزة. دي حاجة من السلبيات.
Me	In what way it is a drew back	من اي ناحية سلبية؟
L4	In a way the teacher has 20 device to be used in class, he has to find time to load activities to all these devices. And as it was said before, from where will teachers get this time? Should they just use only 3 or 4 devices and leave the rest?	يعني لازم المعلم لو عنده عشرين جهازح يشتغل بيهم الحصة هل العشرين جهاز هو عنده وقت زي ما بتقول هل الوقت كفاه انه هو لحق ينزل النشاط في عشرين جهاز؟ ولا نزل على ٣ او ٤ اجهزة والباقي لا؟
L1	Have we had a network things will have been easier... you just load things on the main device and it will appear on the rest of the devices. Or for example have we had internet we could use Frontpage programme at least for True or False questions and if they get the right answer they move to the next question and so on. I feel the environment will change and the activities will be more interactive with such programmes and activities	بس لو عندنا شبكة كانت تسهل.. يعني تنزل على الجهاز الرئيسي البرنامج وبقية الالواح راح ينزل . اول مثلا لو عندنا نت نحطه اون لين او مثلا نحطه برنامج بالفرونت بيج على الاقل اسئلة مثلا صح ام خطأ فمثلا اذا كانت الاجابة صحيحة ينتقل للسؤال اللي بعده وهكذا. احس البيئة راح تتغير وحتى النشاط راح يكون اكثر تفاعل مع مثل هالبرامج والانشطة
L4	With all respect to you had this been implemented to most schools you will find specialised person as we say specialised in journalism there should be someone responsible for all these devices loads activities on all devices for so and so teacher one day before the lesson. Next day the teacher comes confident that all devices are loaded with activities he wants to use. No time to be wasted from the lesson .	حتى مع احترامي لحضرتك لو اتطبقت هذه الطريقة على معظم المدارس ممكن يكون في حد مختص زي ما بنقول في حد مختص في المدرسة مسؤول عن الصحافة يكون في شخص مسؤول عن كامل الاجهزة ينزل كامل الانشطة على جميع الاجهزة للمعلم الفلاني او المعلمة الفلانية قبل الحصة بيوم . يقوم المعلم جاي وهو عارف انه كامل الاجهزة جاهزة بالانشطة اللي هو عوزها. ما يضيع وقته في انه ينزل او من وين يحصل وقت

Me	As parents what do you think you should have known before implementation of the project? What should have you been informed with?	تمام. كأولياء امور .. وش تعتقدوا انه كان من المفروض تعرفوه قبل تطبيق المشروع؟ وش اللي كان ينبغي اطلاعكم عليه قبل تطبيق المشروع؟
M1	In short, the overall idea of the project and how will it be implemented and the criteria for implementation in the school and my role as a parent. For example, usual activities with curriculum and homework are clear, lessons I need to study with my son, if he wants to prepare for next day lesson things are clear for me. But with these tablets things are not clear for me. For example what activity are there in their tablets and what follow up to be done at home can I give. Do I need to buy a tablet and the school will help me in finding content and activities for follow up, to study at home or prepare for next day lesson. These are some of questions that come to our minds	هي بصورة مختصرة .. الفكرة العامة المشروع كيف راح يتم تطبيقه والالية الى راح يتطبق بها المشروع في المدرسة ودوري انا ك ولي امر. مثلا انا في الانشطة العادية في المنهج واضح الواجبات الدروس اللي اريد اذكارها مع الطالب واذا يحتاج تحضير لبكرة فهو واضح بس في الاجهزة اللوحية انا ما واضح معي مثلا الانشطة نازلة في الاجهزة وهل يحتاج مني متابعة في البيت واي نوع من المتابعة ممكن انا اقدم. هل يحتاج انا اشترى جهاز والمدرسة تساعدني في ايجاد المحتوى الانشطة عشان لو حبيت اذكارله او احضر له درس من اللي راح يدرسه . يعين هذي بعض الاستفسارات اللي تخطر في بالنا
L4	There is another point, has my daughter been working on a tablet at school and I don't have the ability to buy her one as he just said, how will she be working at home? What if she was given a task to be done at home on a tablet? Here come social differences	وفي نقطة ثانية حضرتك أنا لو بنتي ح تشتغل على الجهاز ده داخل المدرسة لو انا معنديش الامكانية اشتريلها زي ما الاستاذ بقول كيف حتكون هي في البيت؟ يعني لو عندها نشاط لازم بتطبع على الجهاز وانا ما عندي في البيت. كيف وضعها؟ اهي دي الفوارق الاجتماعية
Me	Ok.. As parent what is expected from the school?	طيب . كأولياء أمور ما هو المتوقع من المدرسة؟
L4	The school will provide what is available form ministry , unless the idea is given to investors	هي المدرسة ح توفر المتاح من الوزارة .. الا اذ طرحنا الفكرة على مثلا مستثمرين

Me	Ok. Lets start with what is happening in real situation	خلينا نبدأ بالواقع
L4	The reality in the school nothing will happen, we got these and we are content and we have to cope the available number of devices in the school. I mean we don't expect to get any more devices. If the school has 16 tablets and three classes in year 4 have 80 pupils how can 16 device serve 80? In what way ? If a teacher will prepare an activity and use devices in class what about the activities pupils will take home? Will they be working on tablets in the school and on paper at home... in this way pupils will be distracted, and how can parents follow up?	ما هو الواقع هنا في المدرسة مش حيكون. حيكون اكتفاننا أو انه لازم نتأقلم مع عدد الاجهزة الموجودة في المدرسة. يعني ما نتوقع انه احنه ح يجيلنا زيادة. يعني اذا كان المدرسة فيها ١٦ جهاز وطلاب صف رابع بثلاثتهم ٨٠ ف ١٦ يخدموا ثمانين بأي ألية؟ معلمة المادة لو هي ح تسوي نشاط وحتفعل اللوحة داخل الفصل الانشطة الثانية اللي حيشيلها الطالب البيت حتكون ورقية.. بيبقي احنه عملنا للطلاب تشتيت انا في المدرسة بشتغل على جهاز وفي البيت بشتغل ورقي. كيف انا ك ولي امر حتابع ابني بقة
M1	Maybe there is another point which is the school could look for offers from certain companies. For example it says we have about 50 or 70 or 100 pupils may want to buy tablets how much will the price be and is it possible to pay in instalment ? Then it may give the offer to parents, As a school I have provided you good prices for tablets and you pay in instalment for 3 or 5 months and as a school we are ready to load activities to pupils.	ممكن في نقطة ثانية هي انه المدرسة تبحث عن عروض اسعار مثلا انا عندي فرضا ٥٠ او ٧٠ أو ١٠٠ طالب ممكن يستفيدوا من هذي الخدمة وتشوف عروض اسعار من شركات معينة لو انا جيت الزبائن بكم ممكن يكون سعر هذا الجهاز وهل ممكن بالتقسيت مثلا؟ وتعرض هذي الخدمة لأولياء الامور انا كمدرسة وفرت لكم مدرسة تباع الاجهزة بسعر منخفض وبالاقساط لمدة ٣ أو ٤ أو ٥ شهور ونحن كمدرسة ممكن نتبني انه ننزل الانشطة للطلاب
L4	It can also be by allowing pupils who don't have the ability to buy to go to the teacher responsible for to the tablets at school so they use tablets during school break or any free time.	هو ممكن كمان السماح للطلاب اللي هم ما عندهم امكانية انه هو يشتري انه هو يلجا للمعلمة المسؤولة عن الالواح او الاجهزة داخل المدرسة انه هو يعمل في الانشطة ماله داخل المدرسة في الفسحة ممكن في حصة احتياطي ، في حصة نشاط ميكونش

	The will make use of the available devices and the teacher will be there to help.	فيها حاجة جديدة يستفيد من وجود الجهاز وفي معلمة تساعده في ده كون هو ما عنده امكانية يكون عنده جهاز في البيت
Me	Now lets go back to pupil-pupil interaction, how do you see tablets role in that?	نرجع لنقطة تفاعل الطلبة مع بعضهم البعض كيف تتظنوا لدور الاجهزة ؟
L2	With these devices I think there will be no interaction between the pupils. Social interaction with us as a community is almost over.	مع الاجهزة الالكترونية اعتقد لا يوجد تفاعل بين الطلبة . اذا كان التواصل الاجتماعي معنا كمجتمع تقريبا انقطع
L4	Even if two or three work on one device, this may created a type of conflict or disagreement in opinion because everyone wants to impose his opinion and implement his idea, S/he will not give chance to his pair, so they will disagree on different points of views and this will created conflicts and disagreements.	حتى اذا اشتغلوا اثنين او ثلاثة على جهاز..ممكن يخلق نوع من انواع النزاع او اختلاف الرأي لأن كل واحد عاوز يفرض رأيه أو ينفذ فكرته ما يعطي فرصة لزميله بالتالي ح يتخلق بينهم وجهات نظر مختلفة وحتخلق نزاعات وحتخلق اختلافات
Me	Have you received complains from your children regarding this matter? I mean that they don't get a chance to work on the devices? Or So and So pupil is controlling the device use?	هل جاتكم من ابنائكم شكاوى في هذا الموضوع؟ انه ما محصل فرصة يشتغل على الجهاز ؟ أو زميله فلان مسيطر على الجهاز او من هذا القبيل؟
L3	Group work. Conflicts arise if you give them group work in a tablet you will always find a certain pupil controlling the rest of the group and doesn't give them turn for that they complain.	عمل المجموعات. دائما تحصل نزاعات انه اذا اعطيتم نشاط جماعي في لوح فدائما تحصل طالب معين هو المتحكم في المجموعة والبقية مثلا ما معطنهم دور فتحصل الشكاوى
Me	of course this will lead us to other aspects such as the importance of teacher's role. Anyhow, as I heard here in this school that pupils use tablets in pairs not in groups. From	هذا طبعا يقودنا الى أمور اخرى من اهمها دور المعلم وحسب ما سمعت انه عمل الطلبة حاليا ثنائي وليس في مجموعات . طيب كيف وجهة نظركم الحين تجاه كفاية الاجهزة في المدرسة؟

	your point of view how do you see this working ratio in class?	
L4	It is better to have one device per child, so his ideas remain in his tablets. The child puts his ideas in the tablet and when you have two working on a device the ideas disagree. Everyone has his ideas and his point of view even if they were 3 or 4 they will not agree.	من الافضل لكل طالب جهازة .. عشان يبقى فكره في الجهاز. هو الطالب بينقل فكره داخل الجهاز لما يكونوا ٢ اختلفت الفكرة . كل واحد له فكرة كل واحد ليه وجهة نظر حتى لو ٣ حتى لو ٤ ما يتفقوا
Me	Any other comments?	طيب الاخوان اي اضافة؟
L2	I agree with her. It is important to have one device per child	اتفق انا مع الاستاذة ... لازم كل واحد وجهازة
L4	So they can compare what I have done and you have done	حتى عشان يكون جدول مقارنة انا عملت ايه
M1	Competition will be more have devices been available.	التنافس راح يكون اكثر لو توفرت الاجهزة
Me	Ok.. What if we looked at it from another angle few minutes ago you spoke about when every pupil works on his device they social interaction is disconnected. When two are working on one device there will be interaction between them at least.	طيب لو نظرنا للموضوع من زاوية اخرى .. كل شي ننظره من عدة زوايا. نحن قبل شوي قلنا لما يكون كل طالب بجهازه قطعنا التواصل. فلما يكون كل طالبين في جهاز على الاقل يكون فيه تواصل بينهم
L3	yes	ايوا
Me	Can't the conflict you spoke about be positive conflict? Taking turn and so? But when each on a device we could be participating in what you call "social disconnection". what do you think?	الصراع اللي نحن نسميه صراع .. ممكن يكون صراع ايجابي في انه الطلبة يتبادلوا الادوار وخلافه بس لما يكون كل طالب بجهازه نكون ساهمنا في قطع التواصل. وش رايكم؟

L2	Still. We would have given the pupil freedom zone as he will be controlling everything	بعده. نكون عطينا الطالب مساحة من الحرية لانه هو ايكون متحكم في كل شي
L4	Haven't you restrained him with his colleague?	ما قيدته بزميله اول بزميلته
Me	In conclusion, which is better?	الخلاصة ايها افضل وليش؟
L2	From my point of view it is better to have each on a device, so a teacher can identify the ability of every pupil.	من وجهة نظري كل طالب بجهازه عشان المعلم يتعرف على امكانية كل طالب
M1	It is also so they take responsibility .. S/he is responsible for achieving the job. We know that working in groups for example when there are 6 in a group maybe 2 or 3 are working and at the end those who take the initiative will answer and there are 2 or 3 are just observing.	نفس الشئ عشان يتحمل المسؤولية .. هو المسؤول عن انجاز العمل .. نحن نعرف انه العمل في مجموعات مثلا لما يكون 6 موجودين ممكن 2 او 3 اللي يشتغلوا وفي النهاية الشخص نفسه الي يبادر انه يجاوب وفيه 2 او 3 متفرجين
L4	Yes ... true	ايوا صح ايوا
M1	However, when every pupil is working on his own and he knows that he has to talk about his work.. . . .	بينما لما يكون الطالب بنفسه وعارف انه هذا العمل مطلوب منه وعارف انه هو راح يتكلم عنه راح يكون...
L4	And this will explode their innovation and creativity. When he has someone with him this will limit his thinking and innovation.	وحتى راح يكون تجبير لابداعاتهم وابتكاراتهم وهو لوحده لكن لما يكون معاه حد، ح يحد من تفكيره او ابداعه
M1	Under one condition that every pupils gets a chance to present what he did, not only he has a task	بشرط انه كل طالب ياخذ فرصه انه يطرح الشئ اللي نفذه او يعرض ما مجرد انه بس عنده نشاط
L4	Yes so they share experiences	ايوا عشان يكون فيها تبادل خبرت
L3	Real competitive	تنافس حقيقي
M3	This dependency will reflect on many things in his life ... and when he	ممکن هذي الاتكالية تنعكس على اشياء كثير في حياته ولما يكون معتمد على نفسه يكون في استقلالية

	depends on himself he will always be independent	
L4	He will feel the responsibility	ح يحس هو بالمسؤولية لوحده
Me	Ok .. Let us go back to another matter, will the tablets impact pupil-teacher interaction? How?	طيب نرجع لموضوع اخر.. تفاعل الطالب مع المعلم هل للأجهزة تأثير على هذا التفاعل وما نوعه ان وجد؟
L2	For sure this interaction will get less. .. because the pupil will be busy with the device .. just taking few orders from the teacher and the rest of the conversation the pupil will be busy with his device.	اكيد يقل التفاعل .. محدود لان الطالب راح يكون مشغول بالجهاز بس يتلقى امامر بسيطة من المعلم وبقية الحوار الطالب ا يكون مشغول بالجهاز
Me	Is this negative or positive ?	هل هذا امر ايجابي ام سلبي؟
L4	It is possible that the pupil will limit his interaction with the teacher inside the classroom to the use of the device. Previously, when we used papers, books and curriculum there was interaction. Especially that they pupil will not take the device with him home, there will be no interaction with the teacher until he gets to class next day. But when he takes the book home when he just look at the book or topics he will go to the class with questions in mind to the teacher, this what create interaction. For that what my colleague just said the interaction between the pupil and the teacher is very limited which is negative because pupil connection to the school should be longer. Longer because he does not only acquire	هو ممكن الطالب ح يحد من التفاعل بينه وبين المعلم داخل الصف في حدود استعمال الجهاز لكن قبل لما كنا نستعمل الورقي وكتاب ومنهج كان في تفاعل بين الطالب. خاصة انه هو مش ح يشيل الجهاز معاه البيت ف مش ح يكون فيه تواصل بينه وبين المعلمة لما يجي ثاني يوم. لكن لما يشيل الكتاب او المنهج الورقي حتى لو هو فر الكتاب في البيت وذاكر او قرا درس بيحي ثاني يوم عنده سوال للمعلمة عايز يتناقش معاها يبقى هو التفاعل بينه وبين المعلمة في حدود زي ما قالت المعلمة حدود قليلة جدا وده يعتبر سلبي لان ارتباط الطالب بمعلمه في المدرسة المفروض يكون ليه فترة اطول .. وقت اطول لانه بيكتسب من المعلم اشياء كثيرة غير الدرس يعني

	lessons from the teacher he acquires many things.	
Me	What about skills that pupils acquire? Will these skill be influenced by tablets introduction?	المهارات التي يكتسبها الطالب؟ هل تتأثر هي المهارات بادخال الأجهزة للغرفة الصفية؟
M1	Maybe what we call personal skill. Those that will benefit him as a person such as thinking skills, language use skill, and skill that are important for jobs. Individual skills are such as competition skills will increase. However, other skill such as cooperation skill, group work skills, leadership to lead his group such things will be negative, he will not be acquiring them much. He will acquire things that I want to be first in my group. But not thinking that there are 4 or 5 in the group and I want to be the leader or representative of the group	ربما المهارات التي احنه نسميها المهارات الشخصية ، التي تفيده نفسه كتحصص مثل مهارات استخدام اللغة ومهارات التفكير ، المهارات التي تفيده في العمل، المهارات الفردية التي هو ينافس فيها مهارات التنافس تزيد عنده، بس في مهارات ثانية مثل مهارات التعاون والعمل الجماعي والقيادة انه يقود مجموعته مثلا هي الاشياء بتكون سلبية ما كثير يكتسبها. أكثر يكتسب اشياء انه انا اريد انافس عشان اريد اطلع الاول على مستوى المجموعة . بس ما تفكيره انه انا في المجموعة ٤ او ٥ اريد اكون القائد انا اريد التي اكتب أنا اريد التي امثل
L4	Selfishness will increase	حتزيد عنده الانانية
M1	Competitive willingness will increase	تزيد عنده الرغبة التنافسية
L4	... No, he will acquire individual skills that are between him and the device but as my colleague just said he will lose group skills. In marking there was group competitive skill who get No1 but now it is over, they used to fight I stood up first, I got up first, but now it is over.	لا هو الطالب ممكن يكتسب المهارات الفردية التي بينه وبين الجهاز بس زي ما قال الاستاذ حيفقد المهارات الجماعية . يعني حتى في التصحيح كان في مهارة تنافسية جماعية من بياخذ رقم واحد ، دي الوقت خلاص. وكانوا بيتضاربوا لا انا وقفت الاول لا انا قبل دي الوقت خلاص
Me	Ok ... what about learning skills such as reading and writing .. will they be influenced by tablets?	نجي لمهارات التعلم مثل مهارة القراء ومهارة الكتابة كيف تاتير الجهاز عليها؟
M2	Hand writing and drawing ?	والخط والرسم وو

Me	Different skills	المهارات المختلفة
L4	All this will be lost	كل ده ح يفقده
L1	Just the opposite, from my view reading skill and listening will improve with tablets. There are audio apps, apps for learning writing, tablets can help pupils to improve their abilities in these areas.	بالعكس، انا من منظور مهارات القراءة والاستماع راح تتحسن بالالواح. في هناك برامج صوتية . برامج كيف تتعلم الكتابة ، الالواح تقدر تساعد الطلاب على التحسين في قدراته في هذا المجال
L4	But he will lose pen use. Everything will be electronic and pen will be an old thing (fashion), so if his hand writing was poor now it will be poorer because he has lost the skill of "improve you hand writing"	لكن هو ح يفقد استخدامه للقلم ، هو خلاص بقي عنده الكتروني ، القلم بقي بالنسبة له حاجة قديمة ، بالتالي اذا كان خطه رديئ بقى اردي لانه هو فقد المهارة بتاع حسن خطك
L1	But for example he knows Word programme, if a pupil is using Word programme to write the programme has auto correction and spell ... and when a pupil write a word incorrectly and get it corrected I think her will learn more because if he had weakness in writing and spelling for some words his use of a certain programmes for a period of time will help him learn new words and even spelling mistakes will	بس مثلا يعرف برنامج الورد.. اذا مثلا كان الطالب يستخدم برنامج الورد للكتابة فالبرنامج فيه التصحيح الاملائي والتصحيح التلقائي اللي لما الطالب يكتب كلمة خطأ يطلع له الصحيح. فأنا اعتقد انه الطالب راح يتعلم اكثر لانه اذا كان عنده ضعف في الكتابة والاملاء لبعض الكلمات فإنه من خلال استخدامه لبرنامج معين لعدة مرات فراح يتعلم ... كلمات جديدة وحتى انه الاخطاء الاملائية راح
L4	He is still writing electronically	هو برضه كده بيكتب الكتروني
L1	He is writing electronically but I think when he writes he will not repeat the mistakes. I mean for example if I write and (Arabic example) writing flower and Word underlines it and I choose the correct option to get rid of the red underline. I think when I	هو يكتب الكتروني بس باعتقادي انه لما راح يكتب ما راح يكرر الغلط.. يعني لو انا مثلا اكتب الاسم وأحط همزة هو مثلا في الورد عدة كلمات للتصحيح وهو يختار الكلمة الانسب فينشال الخط الاحمر اللي يظهر فأعتقد انه لما يجي يكتبها مرة ثانية ما راح يكتبها بنفس الخطأ

	come to write it again I will not make the same mistake	
L4	I'm taking about his abilities to use the pen... as we say (used parts get stronger and grow but neglected parts get weaker and die) his hand got used to tablets and will find it easier to use a tablet but not to write. How many pupils do we have in a class who don't write and their hand writing is very poor.	انا بتكلم على قدراته في استخدام القلم .. يعني احنه زي ما بنقول العضو المستخدم ينمو ويكبر والعضو المهمل يضعف ويضمحل استخدام القلم في ايده .. هي ايده خلاص اخذت على اللوح لكن انه يستخدم قلم هو خلاص ح يستسهل انه يستخدم اللوح وما يكتب .. يعني حضرتك في الصف عندك طالب ما يكتب وخطه وحش
L1	I view it from a different prospective	انا انظرله من منظور اخر
Me	I want o say something, do we differentiate between hand-writing and writing? I mean a pupil many have a beautiful hand writing but he doesn't have writing ability	اريد ادخل هنا بدخل شوي .. يعني نفرق بين الخط والكتابة .. يعني ممكن الطالب خطه جميل لكن ما عنده القدرة على الكتابة
L4	Ohh yes.. I want to get to this point that his ability to use the pen as the teacher is saying will be useful and positive to learn word with mistakes he had already overcome, but he will still have some sort of laziness .. he will be lazy to use the pen	ايوووة .. مهو انا عاوزة اوصل للنقطة دي انه هو قدرته على استخدام القلم اللي بتقوله الاستاذة حيكون مفيد او ايجابي انه هو يتعلم الكلمات فيها اخطاء هو خلاص تداركها لكن هو بعد كده ح يبقى عنده نوع من انواع الكسل انه هو يستخدم القلم
Me	Will he be able to write his essays?	هل بالامكان انه هو يكتب التعبير؟
L4	Essays? He will be able to write correctly but "electronically" but have we given him a pen you will find he is making mistakes	التعبير أهه ح يكتبها بشكل صحيح "الالكتروني" لكن لو مسكناه القلم حتلاقي حضرتك عنه اخطاء
M1	By the way, this system is now being set in cycle one is meant for later, because we notice that most pupils who fail they fail because the don't know how to write the answers.	على فكره هذا نظام اللي الحين بأسسله في الحلقة الاولى للمراحل اللي بعدها .. لانه نحن نلاحظها ان اغلب الطلبة اللي يرسبوا يرسبوا لانهم ما عارفين يكتبوا الاجابة

L4	yes	ايوة
M1	For example islamic teacher studies says that he had listen to the pupil reciting the required verse of holy quran for memorisation and he already memorised it but he did not write in on the test. This same pupil has a mobile phone and texts his colleagues.	انت يجيك معلم تربية اسلامية مثلا يقول انا سميت للطالب الاية وهو حافظنها بس في الامتحان ما كتبها لانه ما عارف يكتب.. نفس الطالب معه تلفون ويراسل زملائه
L4	That's it	الله ينور عليك يا استاذ
M1	Has the exam started with type your answers.. He would have typed it because he has a mobile phone and he texts. But he doesn't know how to write in exam paper, this is a foundation to change examination system at least for those who are unable to answer.	فلو كان الامتحان بدا اطبع الاجابة.. كان بيطبعتها لانه هو عنده تلفون يكتب رسائل بس ما عارف يكب في ورقة الامتحان يمكن هذا بأسس لتغير نظام الامتحانات على الأقل اللي ما قادرين يجيبوا
L4	Just like another point, it could be out of the topic but it may serve it, it is easier for a pupil to search a information in a book in the library or search the internet? I want to say that we have lost the use of books. Pupils in schools, I am suffered this with my elder children ... "son you have book , open your book for information ... ohh why getting information from book ... I'll get to the internet just copy an paste and I'm done end of story" in this we lost that pupils look originality, now they look for what is easier.	زي نقطة معينة يمكن خارج الموضوع حضرتك هي يعني ممكن تخدمه .. هو اسهل للطالب يبحث في كتاب في المكتبة عن معلومة أو اسهل انه يخذها من ع النت؟ أنا بقول لحضرتك انه احنه قدنا انه احنه نستعمل الكتاب يعني لو حضرتك عندك طالب في المدرسة انا عانيت ده مع اولادي الكبار.. بابني انه عندك كتب افتح الكتاب وطلع المعلومة .. ياستي اطبعها من الكتاب ليه ما انا ادخل على النت اعملها كوبي وبيست واحطها وخلص انتهينا حكاية نقل ليه .. ف احنه كده فقدنا انه الطالب يدور على الاصل.. بقى بيدور على الاسهل

Me	Ok .. let us tie it together as we move to another point, what is your role as parents?	طيب نربط المواضيع وننتقل لنقطة اخرى .. ما هو دور ولي الامر؟
L4	Follow up is very important, it is more important at home more than in school. I mean I have to follow up with my so or daughter, what have you taken today? Ok you worked on a tablet in the classroom what are you required to do at home? If she has no tablet at home how can she work? And what if she has?	المتابعة دي ضرورية في البيت اكثر من المدرسة طبعاً. يعني انا لازم اتابع ابني في البيت أو بنتي .. انتي اخذتي ايه النهارده.. طيب اللوح اللي الاستاذة شغلتك عليه داخل الصف.. مطلوب منك تعملي ايه في البيت؟ لو هي معندهاش يبقى حتعمل الزاي؟ أو ولو عندها ؟
Me	The current question now is your daughter/son in the class that uses tablets what is your role ? directly	السؤال انتي ك ولية امر عندك بنت في هذا الصف اللي يستخدم فيه الاجهزة اللوحية.. وش دورك؟ بشكل مباشر
L4	As I told you I have to follow up, what have you taken today with your teacher on the tablet? What has the teacher asked you? I have to be informed what the teacher wants her to do... and does the teacher knows if I have tablet or not... and other if they have or not.. Activities will differ at home for those who have from those who don't .	مهو حضرتك بقول لحضرتك لازم اتابع يعني انتي النهاردة اخذتي ايه مع المعلمة في اللوح او في الجهاز طيب .. المعلمة طلبت منك ايه؟ انا لازم ابقي عندي فكرة المعلمة طلبت منها ايه تنفذه بقي؟ وهل هي المعلمة عرفة انا عندي او لا .. او غيري عنده ولا معندوش هل اختلفت الانشطة في البيت مع اللي عنده و اللي معندوش
L2	In reality, let us be realistic my son uses tablets in classroom when he get home who will follow up with him? In fact parents don't have any idea about the topic and don't know how to use them so on what base will they follow up? In reality most parents don't have any idea on how tablets are used in classroom. And what makes it worse that pupils don't take tablets home, tablets are in school,	استاذ... كواقع .. كواقع .. نكون واقعيين انا ابني يستخدم اللوح في الصف.. يرجع البيت من يتابعه... أصلاً ولي الامر ما عنده فكرة عن الموضوع .. وما يعرف كيف يستخدمه على اي اساس يتابع؟ ك واقع .. معظم اولياء الامور ما عندهم فكرة عن طريقة استخدام اللوح الالكتروني في الصف ما عنده فكره استاذ.. وبعد المشكلة الزيادة انه الطالب ما يشل اللوح.. موجود في المدرسة .. وهذا الواقع يعني.. في المدرسة حالياً .. نصف اولياء الامور .. حتى يمكن معظمهم ما بس

	this is the reality half parents or maybe most not only half don't know, few people know who to use tablets.	نصفهم اللي يعرفوا واحد او اثنين كيفية استخدام اللوح الالكتروني
L3	From my point of view as a parent, I don't think that I need to know everything about tablets, this if current curriculum were linked to tablets serve curriculum. It is enough for parents to follow up with the curriculum, I don't have as a parent to know everything about tablets or I don't have to try it out or use it. I think it's use is easy for all pupils .. they do understand . Just have we linked curriculum and they will be served in this way. I can follow up with my son or daughter only with curriculum that are linked to the tablets.	من وجهة نظري انا كولية امرلو نظرت للأمر .. ما اعتقد اني محتاجة اعرف كل شي عن اللوح الالكتروني هذا اذا ربطنا المناهج الموجودة ... يخدم المناهج فانا .. يكفي ولي الامر انه يتابع الطالب لمناهج .. اذا كان اللوح يخدم المناهج.. ما بالضرورة انا ك ولي امر اعرف كل شي عن اللوح أو بالضرورة أجربه كيف استخدمه..اعتقد انه استخدام اللوح مسهل وميسر لكل الطلاب.. الكل يفهمه.. بس لو ربط اللوح بالمناهج وخدمهم في هالحالة انا اقدر اتابع ابني او بنتي فقط في المناهج المرتبطة باستخدام اللوح
Me	How can we improve parents role?	كيف ممكن نظور دور ولي الامر؟
L4	Awareness, raising awareness to all parents as it happens in meetings or workshops for them	التوعية ممكن حضرتك تعمل توعية لكامل اولياء الامور زي ما بيحصل اجتماع أو ورشة تدريبية حتى ليهم
Me	Ok, how can parents improve their role?	طيب كيف ممكن ولي الامر يطور دوره؟
L2	Use internet	يستخدم النت
L4	Try to learn	يحاول هو يتعلم
Me	And then? How will their role be after they learn?	وبعدين ؟ كيف راح يكون دوره بعد ما يتعلم ؟
L4	He learns and buys a tablet sits with his son and follow up	ماهو يتعلم حضرتك وبشتري واحد ويقعد مع ابنه ويقعد يتابع
Me	Again follow up	رجعنا للمتابعة مرة اخرى
L4	They have to follow up	مهو لازم يتابع

Me	Can we look at things from another angle	ممكن ننظر من زاوية اخرى غير المتابعة؟
L4	Do you have an angle you want us to look from?	عندك حضرتك زاوية معينة عاوز تدخل منها يعني؟
Me	I want to listen to you	انا اريد اسمع منكم
L4	Believe me for parents the most important thing at home is follow up.. They don't have academic knowledge to give	صدقني ولي الامر بالنسباله في البيت اهم شي هو المتابعة.. هو ما عندوش مادة علمية يديها للطالب.. ...معدوش دراية ب
Me	Why do we always view parents as if they were not educated	أليش احنه ننظر لولي الامر دائما على انه انسان غير متعلم
L4	no	لا
Me	If not all of them are educated a group of them are... they may give things more than follow up	اذا ما كلهم متعلمين في منهم فئة من أولياء الامور متعلمة .. ممكن يكون الها اسهام اكثر من المتابعة
M1	At the beginning any new things ... at the end will become community culture ... take computers as an example, when they were introduced to schools at the beginning parents were forced to buy computers as their say all my friends in class know how to type, so and so have computer. Parents had to buy and learn so the can teach their children. 16 device are for a class and at the end when the school gives tablets importance and believes it is useful and implement it at the end parents will be forced by pressure from their children to buy tablets and the come to school to ask about the implementation. In this way it will become a community culture within	هي .. يعني اي شئ جديد .. في النهاية مصيرة يكون ثقافة مجتمع .. انت مثلا الحواسيب لما دخلت في البداية وبدأو يدرسوهم .. اولياء الامور انجبروا يشتروا حواسيب في بيوتهم بسبب ابائهم يقولوا انا زملائي في الصف كلهم يعرفوا يطبعوا لان فلان عنده وفلان عنده .. ما يخفيوا شي عن زملائهم. فيضطر ولي الامر يشتري وهو يكون يعرف عشان يعلم ولده في هالمدرسة ١٦ جهاز عدد صف معين في النهاية ولي الامر لما المدرسة تعطي اللوح واللي تدرسه الاهمية واذا امنة ان هذا صح وبفيد الطالب وطبقته في النهاية مجبرين اولياء الامور عن طريق ضغط ابائهم انهم يشتروا الالواح ويجوا المدرسة يسألوا عن الية تفعيلها. بذي الطريقة في النهاية تصبح ثقافة مجتمع خلال سنة سنتين ثلاث لازم انا تنطبق

	two or three year. But we have to implement	
Me	Just before we carry on, have you learn anything about tablets use form you children?	قبل ما تكمل .. هل تعلمت شي في استخدام الاجهزة من ابنائكم؟
M1	For me I haven't learned because honestly the idea is not clear for me.	بالنسبة لي ما تعلمت ... لان بأمانة اطلعت ما واضحة لي الفكرة
L4	Because there are no devices... will she be able to tell me "come mum I learn this come and see"? No device. And all those who have tablets you will find half of it games, but no stuff that is used in school. Unless we implement distance education system.	لانه مفيش اجهزة ... يعني هي ما تقدرش تقول لي يا ماما انا تعلمت كده تعالي شوفي ... لا ما فيش جهاز. يعني كل اللي عنده اي باد تلاقي نصه العاب.. اما كمادة علمية اللي بتخدها في المدرسة لا. الا اذا طبقنا نظام التعلم عن بعد
Me	Can we ask parents to participate with school administration in different ways of implementation ?	الا يمكن لولي الامر ان يسهم مع ادارة المدرسة في الية التنفيذ والتتفيذ؟ يناقش ويقترح كيف ممكن تفعيل هذي الاجهزة في المدرسة؟
L4	In our school discussion doors are open to parents, it is ok. .. but the idea that parents who have any idea or has a new idea has to be with enough knowledge with the topic from A to Z and until now the idea is not clear to the majority. How will they be implemented. Maybe just simple idea not grasp it all, so how can I come and present new things.	هو احنه باب المناقشة مفتوح في المدارس لولي الامر عادي .. بس الفكر هو انه وولي الامر عنده فكرة معينة او عنده شئ جديد لازم يكون على دراية كافية بالموضوع من الالف للياء ولحد الحين الصورة غير واضحة للمعظم يعني.. كيفية والية استخدامه كل ده يمكن بس فكرة مبسطة مش فكرة راسخة او قوية عشان انا اجي ادي شي جديد فيها
M1	Again as I told you it is my point of you ...for example had they for the first step started with survey to the class they want to implement in so they know parents and study the class well. Then bring them to a meeting and specify time for that	مرة اخرى .. مثل ما خبرتك هي وجهة نظري لو مثلا كانت ك خطوة اولية لو عملنا احصائية للصف اللي يريدن يطبقن فيه وعارفات اوليا الاوامر اللي عندهم ودارسين بعد الصف ... وعملهم اجتماع وحدلهم اياه قبل اسبوعين او ثلاثة عشان يكيفوا ضرورهم وبعدين وضحلهم الصورة واذا وضحلهم الصورة وهو لاحظ انه اللي وضحله مقتنع وهذا

	<p>three weeks in advance so parents can arrange to attend. Then give them clear picture and if they see a clear picture and could convince them that this will be implanted, I tell you that there will be no objection. I still don't know the price of this tablet, have they made it clear for me that my son will benefit more with the tablet and it will be implemented when you buy him one, I am sure that most parents will... they will do anything so their children learn better, especially after this last period in which the education level was down. Everyone is looking to do something.</p>	<p>النشئ راح يطبق انا اقولك ماشي مانع انا شخصيا ما اعرف اللوح كم قيمته فاذا وضحتلي انه ولدك راح يستفيد اكثر باللوح اللي راح يدرس فيه وراح يطبق فعليا لما تشتريلهم انا اقولك اغلب اولياء الامور راح ... بالامكان يسووا اي شي عشان اولادهم يطلعوا زينين خاصة بعد الفترة الاخير هذه اللي كان فيها المستوى التعليمي نازل كل حد يبحث انه يعمل حاجة</p>
L4	<p>I will tell you a personal experience,,, when they started using tablets my daughter came to her father asking for a tablet. He replied let the school provide you one. They want to implement ... do you know how much is it? The girl was silent as she couldn't talk.. . She said that one teacher said who can buy one should buy... he replied if she can buy let her buy you one.</p>	<p>انا حاقول لحضرتك تجربة شخصية بس.. اول ما بدؤوا يستخدموا الالواح ده جت بنتي لبيها عابزة لوح. قالها خلي المدرسة توفرك ياماما .. مش همه اللي طبقوا؟! انتي عارفه قيمته بكم ده؟ فالبنت سكتت ما قدرتش تتكلم .. قالتلوه انه احد المعلمات قالت اللي تقدر تشتري تشتري... قالها خلاص اذا كانت هي تقدر تشتري تشتريك</p>
M1	<p>We don't even know how much is it..</p>	<p>حتى سعرهم ما نعرفه بكم</p>
L4	<p>I heard from the technician who came to set them at first that these ones at the school cost 400 OR each.</p>	<p>انا سمعت من الفني اللي اجي يضبطهم اول مرة انه سعرهم ٤٠٠ ريال هذي الأجهزة اللي عندنا قيمة الواحد ٤٠٠</p>
Me	<p>As a parent are you ready to participate with this amount to buy you son a tablet if the school asked you to do so?</p>	<p>ك ولي امر .. هل انت مستعد للمساهمة بهذا المبلغ لشراء جهاز لابنك لو طلبت منك المدرسة؟</p>

L4	To be honest... forgive me.. I can't	انا بصراحة اعذرنى ما اقدر
Me	Just give your opinion .. don't worry	وهذا راي طبعا
L2	It depends .. I will look how is my son going to benefit from it .. has there been great benefit for sure I will participate but if I from my point of view see it just (phrase means for the not used well)	على حسب ... انا انظر على مدى استفادة ابني او بنتي فاذا كان تكمن فيه فائدة كبيرة بالفعل اساهم بس اذا انا من وجهة نظري اشوف بس مال مشي حالك ما
M1	Yes.. This is it seriousness should be present in the topic. Secondly what I spoke about in the beginning which is the school gets offers from companies so parents pay in instalments over 4 or 5 months. I say that parents may pay monthly 100 OR instead of paying 400 at once and this comes with seriousness. Seriousness in implementing and seriousness in spreading tablets culture.	ايوا تراه هذي هي الجدية تكون موجودة في الموضوع وثاني شيء اللي انا طرحته في البداية وهي لو انه المدرسة خذت تشوف عروض أسعار ويكون من ضمنها انه الشراء بالاقساط لمدة 4 او 5 شهور انا أقول بسهولة انه أولياء الأمور ممكن يدفع 100 ريال شهريا بدل ما يدفع 400 مرة واحدة .. وهذي تجي في جانب الجدية .. الجدية في التطبيق والجدية في نشر ثقافة هذي الالواح
Me	Let us move to another point.. How do you see roles related to tablets.. What are the roles?	ننتقل الى نقطة أخرى وهي القوانين المرتبطة باستخدام الالواح .. ما هي القوانين ؟ لما أقول قوانين ما بالضرورة تكون قوانين مكتوبة
L3	That pupils don't download unacceptable videos or photos	انه ما ينزل في هذا اللوح مقاطع او صور تكون خارجة عن الاداب
L4	There should be limitations to downloading on the devices. .. there should be a responsible on following these devices from time to time .. could the child be sitting in a space where he gets a network... even if he was playing ...he doesn't mean to download bad stuff. I mean from time to time there has to be clean process to the devices before getting	انه يكون فيه قيود على اللي ينزل في الأجهزة .. ويكون في مسؤول عن متابعة الأجهزة دي كل فترة ممكن يكون الطالب جالس في مكان ما واتيحت له الشبكة وزى ما قال الأستاذ نزل شي صورة مقطع حتى لو الواحد بيلعب بدون قصد بس لازم كل فترة يكون فيه عملية كلين للأجهزة ونشوف من مسؤول ويتابع الأجهزة ده قبل ما يمسكوها الطلاب

	into children hands. We need to see someone responsible	
L3	Of course the use of tablets is with permission and it is monitored what exactly will they use in. But if for example a pupil needs to use the device in times like break there should be observation to what has been loaded on the device.	طبعا استخدام الالواح بأذن وتكون الأجهزة مراقبة في ايش يستخدموا بالضبط .. اما مثلا لو احتاج الطالب يستخدم الجهاز في أوقات مثلا الفسحة فلا بد ان تكون هناك متابعة لك ما يدرج في هذا الجهاز
M ¹	Maybe there is another point we have seen it in one of the private schools that we visited... I mean we notice in our school that for example in Learning Resource centre if a teacher book it as he want to teach a lesson there.. The (librarian) would leave the room just as the teacher arrives with his pupils.. A chance as someone else is there and you will not fid him there. This also happen in computer labs with ICT teachers. In the school we visited it was a private school in Muscat, the librarian was there and she was responsible.... the teacher comes and teach but she is there observing ...if a teacher is unable to control his pupils in their work with equipment in the room she takes note and my not allow him to use it again. Tablets needs something like this, someone responsible about them and teacher are allowed to use them but if they can't work in an organised way, he is warned or even not to be allowed later.	ربما هناك في نقطة أخرى...شفناها في احد المدارس الخاصة زرناها من فترة .. يعني نحن نلاحظ معنا في مدارسنا فرضا مركز مصادر التعلم لو معلم حجز يريد يدرس حصة .. ما يصدق اخصائي المركز اول ما يوصل المعلم هو وطلابه طلع الاخصائي .. فرصة في احد موجود في المركز وما تحصله هو موجود هناك حتى لو في غرفة حاسوب .. معلمة الحاسوب استعارة معلمة المختير منها تدرس فيه ربما اول ما توصل المعلمة تخرج معلمة الحاسوب.. في المدرسة اللي زرناها مدرسة خاصة في مسقط كانت امينة المركز موجودة .. هي المسؤولة .. المعلم يجي ويدرس وهو يراقب .. اذا مثلا المعلم ما قدر يسيطر على طلبته في استخدامهم لمقتنيات القاعة يأخذ ملاحظات ..يمكن يمنعه مرة ثانية من الدخول للمركز ..فهذا يحتاج لمثل هذي القاعة يكون احد مسؤول عنها يكون موجود داخل القاعة .. والمعلم يتاح له يستخدم لكن اذا ما استطاع يسيطر على العمل او ما منظم بطريقة مناسبة .. حتى يوجه له انذار بعدين ما يسمح له

Me	What about number of time the devices are use? Do you have any idea.. For example how many times a teachers uses tablets in a week? And how many time are pupils are exposed to tablets use in different subject in a day or a week?	كيف بالنسبة لعدد مرات استخدام الجهاز؟ هل عندكم اطلاع؟ مثلا المعلم كم مرة في الاسبوع يستخدم الاجهزة؟ والطالب كم مرة يتعرض لاستخدام الجهاز من عدة مواد في اليوم او الاسبوع؟
L4	In reality maybe pupils are exposed to tablets once a week.	في الواقع يمكن الطالب مع يتعرض للجهاز غير مرة وحدة في الاسبوع
Me	What about in theory?	وك تصور؟
L4	In theory it should be daily ... in fact in all lessons and we should load tablets with curriculum ... as my colleague said we are applying e-learning theory .. it is over no more paper	كنظرية وواقع المفروض يوميا ... المفروض كامل الحصص كمان احنه ننزل المناهج عليه زي ما قالت الاستاذة .. خلاص احنه بنطبق نظرية التعليم الالكتروني وخالص نلغي الورقي
L2	If they initially start with one grade for example grade four or grade thee so it will be easy to load curriculum and there will be no pressure on class booking. It is always easier in cycle one because the are not bind to exams from the ministry or from the region directorate.	هن لو يطبقن مبدنيا على مرحلة وحدة مثلا الرابع او الثالث عشان يكون اسهل تنزيل المناهج وما يكون في ضغط على الحصص.. هي دائما في الحلقة الأولى اسهل لانهم ما مرتبطين باختبارات وزارية او من المديرية
L3	I fee these are not appropriate for the age groups in cycle one. These are young pupils who always work with things they can touch and feel. For them learning is more difficult have we used tablets. However, have we used tablets with older pupils for example (high school) following the same system used in collages, I mean that curriculum is loaded on tablets and projects and researches students do. Submission is electronic this will be easier for teachers and pupils	احسها ما تتناسب مع الفئة العمرية لانه في الحلقة الأولى طلبة صغار ودائما تتعامل مع المحسوسات فالتعليم بالنسبة لهم اصعب لو استخدمنا الالواح بينما لو طبق هذا على طلبة اكبر مثلا الثانوية بنفس نظام الكليات يعني تكون المناهج على الاجهزة حتى المشاريع والأبحاث اللي يعملوها الطلاب يكون التسليم الالكتروني وهذا بالطبع ايسر للمعلم واسهل للطلاب سواء في التعلم وسواء في دور المعلم .. اما بالنسبة للحلقة الأولى باعتقادي انه يكون صعب لانه في البداية لازم تغرس فيهم اساسيات بالتعامل مع المحسوسات

	whether in learning or in teachers' role. But for cycle one I think it will be difficult because e need to install in them basics of working wit touchable.	
Me	In your point of views,,, how can we make the most of these available devices in the school with current school situation?	من وجهة نظركم كيف ممكن نحقق الاستفادة القصوى من هذه الأجهزة المتوفرة في المدرسة؟ بالضرورف الحالية للمدرسة
L2	Of course we implement it on one class and we don't implement on the whole cycle one from grade one to grade four.. We just take one class and we implement on .. so they benefit and every two work on one device	طبعا نطبقه على صف معين ما نطبقه على الحلقة الأولى كامل من الأول الى الرابع .. ناخذ صف ونطبق عليه .. عشان الاستفادة وكل اثنين في لوح
Me	This is what the school is doing right now... implementing on once class of grade four... the next question is How can this class make the most of these tablets?	هذا واقع المدرسة الحين.. المدرسة مطبقة على صف واحد من صفوف الرابع .. كيف ممكن انه هذا الصف يستفيد الاستفادة القصوى من هذي الاجهزة؟
L2	Load all curriculum on the devices and use them daily as the teacher said... if it is possible of course.	ننزل كل المناهج عليه ونستخدمه بشكل يومي مثل ما قالت الاستاذة. اذا فيه إمكانية طبعا
Me	Where to get apps from and who suggest appropriate apps?	التطبيقات المستخدمة ... من وين تجاب؟ من يقترح البرنامج المناسب
L4	The teacher of each subject.. She decide her curricula can be taught with which app	معلمة كل مادة .. هي اللي حتقول المنهج بناعها ح ينفذ باي برنامج
Me	An who will provide the apps?	ومن يوفر البرنامج
L4	ICT teachers are here they will download the apps to the tablets	معلمات الحاسوب والتقينة الموجودين ينزلوا البرامج في الأجهزة
Me	For example a teacher suggested a paid for app who would pay for it?	مثلا المعلمة اقترحت برنامج مدفوع .. من يتكفل بالدفع؟
L4	The ministry	الوزارة

L3&٢	The ministry	الوزارة
L4	You see when you implement an idea implement it well from all financial side	حضرتك لما بطور فكرة او انفذ فكرة انفذها بكامل جوانبها ماليا
Me	I asking about reality ... I asked you to look at the matter from real prospective.. For example the school administration took the initiative and though about a project to implement tablets and with all effort it was able to provide these devices .. now this is reality there are some obstacles .. how can we as parents participate in making the most of these available devices.	انا أتكلم بالواقع .. فلتكلم ننظر للموضوع من الواقع مثلا إدارة المدرسة بادرت وقالت انا اريد اطبق مشروع وهي تريد تكون مبادرة ... استطاعت بجهودها توفير هذي الأجهزة .. الحين في عندها واقع وفي عقبات .. كيف احنه كأولياء أمور ممكن ان نسهم للاستفادة القصوى من هذي الأجهزة
L4	Has there been paid for apps and the school can't pay ... teachers can donate and every teacher pays something	يعني اذا كان في برنامج مدفوع .. وخلص يعني كانت المدرسة مش قادرة ..ممكن يعمل كتبرع ذاتي وكل معلمة تساهم
L١	For you knowledge they made a special room for the LCD projector .. teachers paid by themselves to get LCD projectors in every class	لعلمك أستاذ ... عملوا غرفة خاصة حال البروكسيما وهدهن المعلمات جهود ذاتية سون على كل صف بروكسيما
Me	And now we are back to teachers.. I am asking you to speak from parents prospective .. will parents participate ?	رجعنا للمعلمات ..نتكلم من وجهة نظر ولي الامر .. هل ممكن ولي الامر يسهم
L1	For sure they will	يسهم اكيد
L4	Not all parents	بس مش كل أولياء الأمور
Me	How can the school administration ask parents ? Sometimes when parents are asked for anything the involves money they have different point of view	وكيف ممكن لادارة المدرسة ان تطلب من ولي الامر .. احيانا أولياء الأمور لما يطلب منهم شي فيه فلوس تكون الهم وجهة نظر مختلفة

L4	With all respect ... the school administration when it wants to ask for donation it does not ask from everyone they know the ability of different parents and they ask parents who can participate. But not otherwise	مع احترامي لحضرتك .. ادارة المدرسة لما تجي تطلب تبرع لاي مشروع ما بتطلبش من الكل لان هي عارفة إمكانيات أولياء الأمور يعني حتطلب من ولي الامر اللي يقدر يسهم .. اللي عنده القدرة ..مقدرة مالية لكن غير كدة مش حتطلب
L2	Yes they don't ask	ما تطلب ابوا
L3	May we leave now?	ممکن نستأذن
Me	This the final and most important question .. why tablets in classroom?	اخر واهم سؤال .. لماذا الأجهزة اللوحية في الغرفة الصفية؟
L4	From my point of view because it is difficult to find any other place to keep them in because..	من وجهة نظري لانه صعب تحصل مكان اخر تحظ فيه الأجهزة لسبب
Me	In order not to get it long... the question not about why we keep them in classroom , rather why do we want to introduce tablets into classroom and use them for teaching and learning?	عشان ما نطول أستاذة .. السؤال ليس لماذا نضع الأجهزة في غرفة الصف .. لكن لماذا نسعى لادخال الأجهزة للصف وتطبيق اسخدامها في التدريس؟
M1	Improvement	التطوير
L4	Yes ... instructional media and educational curriculum improvement and to keep up with	ابوا تطوير المناهج التعليمية والوسائل التعليمية ومواكبة
M1	to keep up with the new technology	لمواكبة التقنية
M2	it is good to learn things in schools so they keep up with the new trends and they know what is going on in the world, so they are not left behind.	زين أنهم يتعلموا في المدارس ويواكبوا التوجهات الحديثة ويعرفوا اللي يصير حولهم في العالم، بدل ما يضلوا متأخرين
L1	schools use technology and it is good to make use of these devices and surely they will be useful	المدارس تستخدم التقنية الحديثة واستخدام هذي الأجهزة زين وبالتأكيد أنها راح تكون مفيدة

L4	<p>these devices are useful especially to get rid of the heavy bag our children carry every day. Why not to use electronic books in tablets and one device will carry books more than what a bag can carry and the weight will be light for the children. Had each child had a device this will solve the problem.</p>	<p>الاجهزة مفيدة خصوصا للتخلص من الشنط الثقيلة اللي الاولاد يشيلوها كل يوم. ليش ما نستخدم الاجهزة اللوحية وفي الجهاز الواحد ممكن ننزل اكثر من الكتب اللي ممكن الشنطة تشيلها والوزن راح يكون اخف. الجهاز عند الطالب راح يحل المشكلة.</p>
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Appendix M Conference Presentation



Appendix N Discussion Group Presentation



Appendix O School letter to IT Department at the MOE

سلطنة عمان
وزارة التربية والتعليم
المديرية العامة لتربية والتعليم لمحافظة [REDACTED]
مدرسة [REDACTED] لتعليم الاساسي (1-12)

المحترم /الفاضل [REDACTED]
مدير عام تقنية المعلومات
وزارة التربية والتعليم

تحية طيبة وبعد ،،،

لاشك انكم تدركون أهمية استخدام التقنية الحديثة في التعليم كأحد الوسائل المهمة التي تسهم بشكل فعال في سهولة التعلم ، إلى جانب صقل مهارات الطلاب في مختلف المراحل الدراسية ومنحهم المجال للإبداع والابتكار التعليمي ، الأمر الذي سينعكس بطبيعة الحال على مستوى التحصيل الدراسي المستقبلي لهؤلاء الطلاب .

وبناءً عليه فإنه يسرنا افادتكم بأن مدرسة [REDACTED] الاساسي للصفوف من (1- 12) بولاية [REDACTED] تعكف حالياً على تطبيق مشروع استخدام الاجهزة الرقمية الكفية (الأياد التعليمي) لطلاب المدرسة لمن هم في الصفوف من (الصف الأول إلى الصف العاشر) وبجهود المدرسة الذاتية تم توفير حتى الآن عدد (5) أجهزة للطلاب ، حيث يهدف هذا المشروع الى رفع مستوى التحصيل الدراسي للطلاب ، الى جانب تغيير بيئة التعلم لتجعل الطالب أكثر شوقاً للتعلم ، فضلاً عن مواكبة التطورات التكنولوجية في المعرفة (مرفق نبذه عن تفاصيل المشروع) .

عليه فقد ارتأينا مخاطبتكم للكرم بالنظر في امكانية توفير عدد (15) جهاز لبقية الطلاب وذلك عن طريق القطاع الخاص مساهمة منكم في تحقيق الهدف الذي نسعى اليه جميعاً في استخدام التقنية الحديثة في التعليم .

شاكرين لكم سلفاً صادق تعاونكم واهتمامكم .

وتفضلوا بقبول فائق الاحترام والتقدير ،،،

مديرة المدرسة: [REDACTED]
هاتف رقم: [REDACTED]
مساعدة المديرية: [REDACTED]
هاتف رقم: [REDACTED]



Appendix P: Translated Sample Extract of a Teacher Interview

Me: How do you see your lesson today as you used tablets with pupils?

T1: Today the lesson was limited to the use of PowerPoint and Word. We were supposed to add some other programs (apps) that it would have been better to use. For example as you have seen. Word... When we give pupils an activity on Word document some parts of the activity get deleted and they come asking 'where has it gone?' They accidentally delete things. Had I used the Quiz Creator program it would have been better. The question is clear and they only have to answer it and the answer is automatically submitted. There will be no deleted question or any part of the activity. Hopefully, if I have the chance in the future I will try to use different types of programs other than PowerPoint and Word documents.

ME: I notice that pupils' eyes are on the devices when they come into the class.

T1: This is it. Very quickly. I might be thinking to start with something else before using the devices but this is true. What can you do? I have to try to deal with it.

ME: I noticed that you prepared the devices and put them on the desks before letting the pupils into the room. What is the idea behind this?

T1: We are supposed to let the pupils get used to bringing the devices themselves. That would have been better and saved time, but today they came a bit late and we put the devices on their desks for them. They were also supposed to take the devices back after they finished, but we thought they might not have turned them off, so we had to check and make sure.

Me: Any advantages or disadvantages of putting devices on pupils' desks before they come in?

T1: Advantages, it saves times. And there are disadvantages. It does not get pupils to learn organisation and how to get things in order. First they come into the room, then they get the devices and sit properly, and so on. It's better to let them get used to organisation, not just depend on others to get things ready for them.

Me: Could you explain a bit more regarding the devices and time? I didn't get it. Do you think they play a role in saving time or wasting time?

T1: mmm. No no, honestly, the use of devices saves times and reduces time lost, because everything is available on the devices. For example, the PowerPoint lesson is all in the device, so no need to waste time writing on the board. It is better to show things that are ready and save the time to make sure they understand.

Me: However, you still used the board a lot in today's lesson, didn't you?

T1: Yes.

Me: Have you thought of using the devices instead of the board? And why didn't you use devices instead of the board?

T1: I need to give the pupils variety, not only let them each work alone on his tablet. There should be dialogue and discussion. You notice that I had two working on one tablet and even if they are sitting in a group, that might stop dialogue and discussion for the class as whole.

Me: Can't we use the tablets to do what you did on the board? In the same way and the same order?

T1: Maybe. Why not? ... But I don't know, I came to the board ... You know, nowadays it's all about dialogue and discussion.

Me: During the lesson I noticed that sometimes you gave an angry look to two boys, especially Adnan and Bashar...

T1: Yes... you know, because once they get the tablets they don't pay attention, especially if they're sitting in a boys' group. If they were in a mixed group they might have talked less and paid more attention. But when they sit in a group of boys ... lots of noise and distraction.

Me: As a teacher ... haven't you thought of mixing boys and girls?

T1: They are not used to that. From the beginning I found them sitting like this, boys in their own groups and girls in their own groups.

Me: This is not our topic, but as a teacher, aren't you are free to organise your class the way it suits you?

T1: Yes, true, but I found them sitting like this ... In grade two it's OK, boys and girls sit in mixed groups, boys and girls. But as I / you [not clear] heard, the teachers don't know their plan.

ME: Your angry look was repeated several...

T1: It wasn't an angry look. It wasn't anger as such. I was just warning them.

Me: Whatever you call it, angry or warning, this warning look was repeated twice and on the third time you asked the two pupils to stand up and you asked them a question as if it was their punishment.

T1: Yes.

Me: They answered and you let them sit down.

T1: Yes, I was checking their concentration and if they were paying attention to the lesson.

Me: OK Your first use of the projector was after you had explained everything on the boards.

T1: Yes.

Me: It appears as if you were using the projector to show a summary of the lesson.

T1: Yes, so they understand. In fact, they already understood. It was only a revision... I mixed it with discussion and the use of technology.

Me: The question I want to ask... You only used the devices towards the end of the lesson. The pupils hardly had time to hold the devices and the bell rang.

T1: What is important to me is that they understood the lesson ... really understood it. And that's it It is OK... It is OK ..It's OK to use PowerPoint from the beginning. It's mixed.

ME: There was a problem that appeared during the lesson with some pupils, especially boys... the problem of switching the languages when you asked them to type.

T1: Yes.

Me: Does this happen often?

T1: I only noticed it particularly during this lesson. ... It's good for them so they learn something from it. .. Yes, sometimes it happens that parts of the Word document get deleted. I tell them how to undo the deletion.. Now they know it and how to switch languages ... It is good.

ME: I noticed that the girls' groups were working together better than the boys. They discuss before they write... With the boys it seems that only the one holding the device is working on his own.

T1: Boys get angry. They all want to hold their own tablet... They don't want to share, whereas girls find it easy to understand and work together and cooperate But boys all want their own tablet, as you saw.

ME: Do you organise it as to who will hold the device and for how long?

T1: This is a good idea... I never thought of it ...It is a good idea ... For example, today one pupil will hold the device and tomorrow the other will ... This is for pairs.

ME: Do the pupils sit in fixed pairs?

T1: No, it's not fixed. They change seats.