

**TEACHERS' USE OF TECHNOLOGY IN PUNJAB'S SCHOOLS: A
COMPARATIVE CASE STUDY OF A PUBLIC, A PRIVATE, AND A
PARTNERSHIP SCHOOL**

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ABSTRACT

This research studied teachers' use of technology in Punjab's schools. The research questions were: (1) "How are public, private, and partnership schools using technology for teaching purposes?" (2) "What is teachers' and school administrators' attitude towards the use of technology for teaching and learning?" (3) "What factors influence their attitude?" (4) "How is their attitude affecting the schools' teaching and students' learning?" (5) "What can be done to effectively train the stakeholders in using technology meaningfully for the teaching and learning process?"

This qualitative research employed comparative case-study method to study three different types of schools in Punjab province of Pakistan. A public, a private, and a public-private partnership school's teachers and school leaders were research participants. Semi-structured interviews and relevant official documents provided the data for this study.

Findings depicted major weaknesses in Punjab's teacher training, recruitment and professional development domains. Several intrinsic and extrinsic factors were highlighted by teachers and school leaders to identify those factors' impact on participants' attitude and execution of learning with technology. Teacher's willingness to learn and improve was one of the salient positive results of this study. However, there was not enough evidence of eagerness from national government, provincial government, school owners, or policy makers, to bring about major changes to incorporate a culture that is conducive to meaningful use of technology.

The original contribution of this study to the body of knowledge is by depicting the struggle and occasional success of a monolingual (for example, Urdu speaking) teacher trying to make meaningful use of technology, where most of the support is being provided

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in a foreign language (English). This study highlighted technological, linguistic, gender, cultural, and economic barriers faced by a predominantly female teaching staff while working in the participant schools. Non-meaningful use of technology due to lack of proper training was also studied and potentially rectified using information dissemination workshops.

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CHAPTER 1: INTRODUCTION

Chapter 1 of this thesis introduces the study and explains the different types of schools in Pakistan, specifically describing what is meant by public, private and partnership school (1.1). It states the research questions for this study (1.2), scope of the study (1.3), and explains the significance of this study for Pakistan's school education system (1.4).

In 1980, when Seymour Papert highlighted the potential of computers for learning purposes, he could not have possibly envisioned how much the computing power would increase in almost forty years (Papert, 1980). Even when the computers were still in their relatively primitive form in 1993, he insisted on asking a very pertinent question; when all other walks of life are being changed by the ever improving technology, why is technology not being used to improve the quality of education? (Papert, 1993). A thorough survey of articles and books in my library makes one believe that the trend has changed since then. It appears that more and more schools are trying to incorporate technology in school education. In some schools there is a strong emphasis on making students active learners. Schools that can afford Interactive White Boards (IWBs) are frequently using them to convert a teacher-centred classroom into a student led dialogic classroom (Hennessey, 2014). Most IWBs come with a set of instructions, user guides, training manuals and online help to download and update firmware and applications.

These manuals and guides are usually in English or other international languages but never in a language that is Pakistani teachers' mother tongue or even national language; Urdu (Smarttech, 2018). The instruction manuals and training guides show that IWBs require specific expertise to be used effectively; lack of which may render these IWBs as nothing more than an expensive wall-hanging. Similarly, some schools are using mobile phones, handheld devices and social networking to enhance students' language skills (Stanley, 2013). Teaching and learning strategies using these devices cannot be implemented in many schools in Pakistan where students are barred from using mobile phones or handheld devices (System, 2014). To support these innovative ideas, ample

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teacher resource is available on how to use technology in classrooms. Whether it is the use of technology by language teachers (Walker, 2013) or generic technology usage tips for any teacher (Morgan, 2012) or a novice teacher's guide for surviving in a technology using classroom (Johnson, 2012), teachers can find a lot of guidance and comfort from this resource. However, the reality is not that simple.

Although the resources are available in the libraries of famous universities, and in the form of articles in renowned journals, a common secondary school teacher in Pakistan cannot access those resources due to various reasons. Either the resources are too expensive to purchase or they are composed in a language that is not easy to understand for many teachers. These and various other factors are the reasons why a majority of all types of Pakistani schools are failing to make meaningful use of technological advancements to improve students' learning.

1.1 Types of Schools in Pakistan

Before we can delve into the reasons of slow progress in the field of meaningful use of technology for teaching and learning, it is imperative to understand the structure of school education in Pakistan. One official categorization of all Pakistani educational institutions is depicted in the data presented in Table 1.1 below.

Table 1.1 Types of Educational Institutions in Pakistan

Level of Institutions	Total	Rural		Urban	
		Numbers	%	Numbers	%
Total	227,791	167,446	73.5	60,345	26.5
Pre-Primary	1,081	589	54.5	492	45.5
Mosque School	14,123	12,995	92.0	1,128	8.0
Primary	122,349	103,863	84.9	18,486	15.1
Middle	38,449	23,986	62.4	14,463	37.6
Secondary	25,090	11,971	47.7	13,119	52.3
British System	281	29	10.3	252	89.7
Inter and Degree College	1,882	470	25.0	1,412	75.0
General Universities	49	13	26.5	36	73.5
Technical / Professional	1,324	129	9.7	1,195	90.3
Vocational / Poly Technique	3,059	802	26.2	2,257	73.8
NFBE (Non-Formal Basic Education)	4,831	3,726	77.1	1,105	22.9
Deeni Madaris	12,153	6,658	54.8	5,495	45.2
Others	3,120	2,215	71.0	905	29.0

Source: National Education Census 2005, AEPAM, Ministry of Education, Islamabad 2006.

While Table 1.1 depicts a detailed categorisation of Pakistan's educational institutions, it can be overwhelming and confusing for the readers of this research document. Therefore, a succinct and relatively simpler to understand categorization can divide the schools in a tripartite system:

1. Public schools
2. Private schools
3. Partnership schools

It is important to highlight here that the terms Public, Private and Partnership schools may hold a different meaning in Pakistan as opposed to other countries. Therefore, the next section describes these terms in detail before they are frequently used throughout this document.

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Table 1.2 Description of types of schools participating in this research

	Owned by	Curriculum	Examination System
Public Schools	Owned by federal government, provincial government or the armed forces	National Curriculum	National Educational Boards' Matriculation System
Private Schools	Privately owned	Customised curriculum but in line with national guidelines	A-Levels / American High School System / IB / GCSE
Partnership Schools	State owned with private sector investment	National or Customised curriculum. Customised curriculum will be in line with the guidelines set forth in the national curriculum.	National Educational Boards' Matriculation System

1.1.1 Public Schools in Punjab

In Pakistan, public schools are defined as schools which are completely administered by the government of Pakistan. School administrative personnel are hired, promoted, transferred, fired, retained and trained by the appropriate government appointed authorities. Along with several charity schools, public schools are generally the cheapest educational option available in Pakistan. However, there are exceptions like Aitchison College. Aitchison College is still considered a public school despite being one of the more expensive schools in Pakistan, with monthly tuition fees ranging from 31,000 Pakistani Rupees to 43,000 Pakistani Rupees (for the academic year 2017/2018) (College, 2018). Public schools do not provide education free of cost at the secondary level but for most of them the tuition fees

are extremely low as compared to some of the highly reputable private schools. In Pakistan people often refer to public schools as ‘government schools’. Public schools include two subcategories: schools run by provincial governments and schools run by the armed forces of Pakistan. For the purpose of this research a Punjab government run school was chosen; rationale behind that selection is explained in section 3.4.2.1 of this document.

1.1.2 Private Schools in Punjab

Private schools are schools which are owned and managed by people who are not employed by the government of Pakistan or by any provincial government. These schools are, to some extent, regulated by the government as they have to follow the national educational guidelines but they are free to manage their administrative and educational issues on their own. There are plethora of private schools in Pakistan and the quality of education provided by them varies from school to school and from town to town. Beaconhouse School System is by far the largest private school system in Pakistan with around 200 branches all over Pakistan (<http://www.beaconhouse.edu.pk/>). The City Schools is the second largest private schooling system in Pakistan with over 150 branches in the country (<http://thecityschool.edu.pk/>). Private schools may be less, more, or equally economical as compared to public schools. However, generally speaking, they are not as economical as public schools.

1.1.3 Partnership Schools in Punjab

Partnership schools, also known as Public Private Partnership (PPP) schools, are not a new concept in the field of education anymore. Many countries are using this concept to inject private sector money into public schools to reap several benefits including a boost to the public schools’ quality of education. Australia opened its doors to PPP back in January 2004 (Ross, 2004). New Zealand started using PPP to build schools as well, however, recently their government has stipulated that it does not support the use of PPP to build schools (Education, 2018). In a recent working paper UNESCO identifies several potential benefits of using PPP to build schools in developing as well as developed countries (Verger & Moschetti, 2017). While PPP is being used in various sectors, including education, there is an on-going debate about its merits and demerits in education sector. Despite this

uncertain status of suitability of this approach to school education, Punjab government is promoting PPP for school building and improvement in a vehement fashion on its official website (Foundation, 2018).

On this website (<http://pef.edu.pk.pefsis.edu.pk/PSSP/index.aspx>) you can also find record of all the schools being assisted through PPP in 36 districts of Punjab. For the purpose of this research a PPP school was selected in the same area where the public school was selected. In order to protect the identity of the participant schools, name of the city cannot be disclosed. However, it is a relatively southern part of Punjab where Saraiki and dialects of Saraiki language are often students' first language (Simons & Fennig, 2018). Urdu can often be second or third spoken language whereas English is even further down in the list of fluently spoken languages. This is an important factor to identify here and discussed further in section 4.4.2.2.7 of this document.

It is important to note that of the three types of schools mentioned, well known private schools have shown some consistent positive progress in using technology to promote student learning. Both public and partnership schools are fairly inconsistent at meaningful use of technology for teaching and learning. This research therefore aims to understand why is it that some schools in Pakistan have managed to incorporate some forms of technology in their teaching and learning processes whereas, other schools have either not even considered using technology or have struggled in the process and given up on it.

Pakistan is far behind on achieving its millennium development goals for education. United Nations Development Programme, in its millennium development goals report for Pakistan, asserts that it is unlikely that Pakistan will achieve its goal of providing universal primary education till the end of year 2015 (UNDP, 2015). Many believe that the meaningful use of technology in all types of schools can help a country pick up its stride in educational progress. As technology "... is considered by many teachers to have great potential in the classroom, supporting both the children's learning and the work of the teacher." (Loveless, 2003).

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Incorporating technology into school education is not a trivial task. The responsibility must be shared by all key players in this task. Heinrich (1995) states that school administrators, teachers and other support staff are responsible for executing the school's IT plan. Therefore this research identifies teachers and school administrators as the key players in the process of using technology for school education. Thus teachers' and school heads' perceptions about using technology, their expertise in using technology, and their willingness to learn how to use technology meaningfully are key variables to be studied.

1.2 Motivation for this Research

Education as a research field is a personal interest of mine. I have been in the field of formal and informal teaching since 2005. I have been a teacher trainer and curriculum developer for about three years. During my professional experience with various educational institutions and professionals, I have noticed that teachers and schools are expected to concoct miracles of learning with very limited resources. Teachers generally tend to be overworked and underpaid which makes them unhappy professionals. Such conditions may force teachers to start cutting corners which in turn affects the quality of education and hurts the students' learning.

As a teacher trainer I have tried to teach them many fancy models and frameworks. However, it did not result in any sustainable positive change. Teachers neither had the motivation to try them out nor did they feel the need to do so. Head teachers performed an excellent job of covering up their teachers' shortcomings so that trainers never got any feedback which could alarm the school's head office. Tea was served, snacks were enjoyed, and training received overwhelming positive feedback from teachers; all for nothing as none of the taught techniques were ever practiced in the schools where my own nephews and nieces were studying.

So much so all the talk of kindness and engaging the students was thrown out of the window when a teacher assaulted my 11 year old nephew and broke his arm in three places. Head teachers again actively covered it up, or at least tried to, until the parents arrived at home time to pick up their kids. In terse, it is the ineffectiveness of our training and my

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own experiences as a student that prompted me to apply for research in this field. The burning question is, why is it that some techniques work wonderfully well in some schools and fail miserably in others?

It is important to state that I am on an academic scholarship from the Commonwealth Scholarship Commission in the UK. After the country wide test held in Pakistan in which over fifty thousand students participated, I was selected for my field of research to be sponsored by the commonwealth scholarship commission. One of the major expectation of the sponsoring agency and the government of Pakistan is that this research should be pertinent to problems ailing the school education of Pakistan. I am expected to explore and research areas which need attention and then hopefully be able to recommend improvements to the government.

1.3 Research Questions

This research conducts a comparative case study of a public, a private, and a PPP school to explore the following research questions:

1. How are public, private, and partnership schools using technology for teaching purposes?
2. What is teachers' and school administrators' attitude towards the use of technology for teaching and learning?
3. What factors influence their attitude?
4. How is their attitude affecting the schools' teaching and students' learning?
5. What can be done to effectively train the stakeholders in using technology meaningfully for the teaching and learning process?

1.4 Theoretical basis for the Research Questions

The research questions stated in section 1.3 were formulated during the research proposal phase. However, since that first draft they have received significant changes. These changes were necessary and were guided by the pertinent critical review of literature as detailed in Section 2 of thesis. The table below shows which section of the thesis are directly impacting the form and shape of the research questions

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Research Questions	Relationship to theory
How are public, private, and partnership schools using technology for teaching purposes?	Section 2.4 page 35 till Section 2.11 page 71
What is teachers' and school administrators' attitude towards the use of technology for teaching and learning?	Section 2.12 discuss this in some detail as to the importance of teachers and school leaders in the process of teaching and learning. However, throughout Chapter 2 and especially from section 2.4 till 2.16 stakeholders' attitudes are repeatedly mentioned in several relevant contexts. Section 4.4 provides the answer to this research question in the context of the cases that were studied.
<p>What factors influence their attitude?</p> <p>How is their attitude affecting the schools' teaching and students' learning?</p>	Since research question three is directly related to research question two, it receives indirect and referential attention in the literature review. For example, section 2.4.1, 2.4.2, 2.4.3 talk about teachers' use of technology. These sections also mention problems faced by teachers while using technology and therefore, stating the factors that may influence teachers' attitudes. This question is later on answered in detail in Section 4.4 of Data Analysis chapter.
What can be done to effectively train the stakeholders in using technology meaningfully for the teaching and learning process?	While Section 2.4 establishes a baseline for global best practice in the field of teacher training, more detail of international practices is delineated in sections 2.13 and 2.14. Whereas, teacher training in the context of Pakistan is elaborately explained in section 2.15. It is in this section that the need for

	<p>this research is clearly established as it makes a significant original contribution to the body of knowledge by establishing a basis for better and more frequent teacher training and professional development.</p>
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1.5 Scope of this Study

This is a comparative case study and as is the normal practice with all case studies, this study stays focused on the three schools being studied. The study's findings are specific to the three participant schools and therefore cannot be readily generalised and mapped onto other schools. Furthermore, to make this study manageable and focussed, the sample selection excludes teachers from early years, primary, and senior sections. This is discussed and justified in section 3.4.2. While gender and language barriers will be mentioned in data analysis and subsequent chapters, it must be pointed out that in depth analyses of such factors in beyond the scope of this study and factors like these should be studied in detail in a future research.

1.6 Significance of this study for Pakistan's school education

Several governments in Pakistan have tried to uplift the quality of public and private school education. However, despite spending billions of Pakistani rupees (according to Google.com, as of 20th June 2019, 1 Pakistani Rupees is worth 0.0050 Pound sterling, or 0.0064 United States Dollar) on various projects the results are nothing to write home about. Most recent of these projects includes a 17 billion Pakistani Rupees' worth of Educational Endowment Fund that facilitates talented and needy students to get education (Peef, 2018). While these initiatives are a positive step, it may take more than a few steps to propel Pakistan's education system in the right direction; A leapfrog might be needed (Winthrop, et al., 2017). The study reported in this thesis aims to shed light on the problems faced by teachers while trying to use technology in teaching and learning while also highlighting potential areas for improvement.

A lot of organisations and researchers are researching the education systems of developing countries. Researchers have identified that it might take a long time for the students of developing countries to get the same quality of education as the students of developed countries. Even within a country there are skill gaps among students; some are benefitting from the schooling more than the others. One research report terms this “skill inequality” as “the 100 year gap”; stating that is the amount of time required to bridge the gap between the quality of education being received by the students of developing countries and students of developed countries (Winthrop, et al., 2017). Despite the recent increase in studies about developing countries there is not nearly enough data available regarding Pakistani schools’ use of technology.

Therefore, this study is designed to understand the current educational problems in Pakistan which are specifically pertinent to the field of meaningful use of technology to promote 21st century skills. Subsequently, this research will go on to provide feedback and suggestions to the Education Ministry and other relevant personnel in Pakistan so it can pave the way for future research, policy improvement, and execution efficacy. This study delves into the areas of teacher training practices, curriculum design and supporting documents, lesson planning, teacher preparedness and willingness to use technology meaningfully. This qualitative case study analyses the current practices of a public, private and public-private partnership school and compares them with other countries to point out bottlenecks that are impeding progress and preventing Punjab’s education system from ‘leapfrogging’ (Winthrop, et al., 2017).

CHAPTER SUMMARY

This study sought to address the very real challenges of attempted meaningful use of technology by untrained or in-training teachers in Punjab’s three schools. Primary focus of this study is on the current practices of technology usage for teaching purposes, while the study also delves deeper into the attitudes of teachers and school leaders towards meaningful use of technology. It also highlights several key factors that influence the current practices of technology usage by the practitioners of the three different types of participant schools.

This study was worth undertaking due to the noble intentions of facilitating teachers and school leaders to become independent learners and researchers in the field of meaningful use of technology to promote 21st century skills among students. The researcher hoped that this study's outcomes would facilitate the current policy makers and practitioners to adapt and improve their policies and execution to streamline the current practices in the light of the Technology Integration Matrix (TIM). This study tries to answer the critical question of medium of instruction and language as a barrier to learning with technology. It also responds to the dearth of literature dealing with non-professional teachers' experience of trying to use technology to improve their teaching and inculcate 21st century skills in their students and in themselves alike.

This thesis comprises six chapters: Introduction, literature review, research methodology, data analysis, discussion of findings, and conclusion.

CHAPTER 2: LITERATURE REVIEW

Chapter 2 critiques the current literature pertinent to teachers' meaningful use of technology in school education and factors influencing this practice or the lack thereof. Sometimes historical and seemingly obsolete literature is also quoted in this chapter. This is either done to show the change of trends since those earlier times or to highlight the fact that a lot of technological use in the participant schools is still in the primitive stages and that otherwise obsolete literature is still very relevant to them. The initial parts of this chapter (2.1, 2.2, and 2.3) define and discuss the jargon (meaningful, technology integration matrix, and 21st century skills). Subsections 2.4 and 2.5 compare teachers' best practices in some of the developed and developing countries. Pakistan's three types of schools and the quality of education being provided is explored and critiqued (2.6, 2.7, and 2.8). Subsequent subsections critically discuss how technology is being used in these three types of schools. Chapter then goes on to explore the similarities and differences between teacher training practices of developed and developing countries. This chapter concludes with taking a look at the connection between the existing literature, and this study.

2.1 What is a meaningful use of technology?

Technology can be used beneficially in the realm of education. The aim of technology should be to promote meaningful learning. For example, in areas such as experimenting, writing, designing, modelling, figuring out how to prioritize which segments in data to improve learning outcomes. The aim of technology should thus be to provide a toolkit to teachers who could access it to the best of their abilities.

An aim of learning in order for it to be meaningful is that learning should be engaging for the students. The method of learning should not only be constructive but it must seek to be authentic, cooperative as well as genuine (Jonassen, et al., 2014). The aim of technology should be to engage as well as facilitate the reader. For example, technology could be used to represent ideas, concepts, methodologies as well as help in compilation of data. Technology can also be used for the organization of knowledge through multimedia tools as it would provide a medium for individuals to access information anywhere,

anytime. It also makes it easier to connect to the globalized world of the 21st century where different ideas, themes and context can be compared and best practices can be developed.

Perhaps technology's most meaningful use is the realm of service delivery. Technology can be used to develop a comprehensive framework for learning through interventions in pedagogy as well as integrating 21st century skills in the process. Furthermore, technology can be used for the idea of meaningful inquiry which is to indicate that through proper prioritization of goals, targets and key performance indicators, technology can be used to facilitate and achieve these targets and goals identified in the education eco system. It is without a doubt that technology is useful for identifying, analysing, collecting as well as interpreting data. The flexible nature of technology further allows it to be easily integrated with learners in the 21st century. The fact, that technology is seamless and offers synchronous communication, allows through applications such as Skype, Facebook, WhatsApp, Power Point, Microsoft Office offers various tools to learners to enrich themselves in the world of knowledge; it forms the basis of the existence of knowledge based communities such as that of Wikipedia. Hence it can be said that technology can be used to facilitate shared learning through a mutual common interest. The aim of technology to be meaningful should be to promote collaboration, team work, cooperation amongst various stakeholders in the education stratosphere. The connectivist nature of technology makes it easier to introduce innovations and creative ways to utilize technology for meaningful learning.

In a broader sense, technology is also being promoted meaningfully through the introduction of experiments in technology such as simulations, games, virtual labs as well as establishing a computerized setting and making algorithms and models to find new and innovative ways to improve student learning outcomes.

It is important to understand that the fundamental idea of driving learning is to understand that learning should be focused on a certain task or activity as illustrated in the figure 2.1. Most tasks that students face currently is either of standardized testing or memorizing information for classes which are teacher constructed. Most K-12 Schools in

the US due to the pressure have adopted test preparation as the most important part of their curriculum (Jonassen, et al., 2014). This is due to the fact that a legislation was introduced in the States which mandated compulsory testing for all K-12 students in order to increase accountability and assessing whether any sort of learning was being achieved or not. The unfortunate aspect of this is that most students eventually will only have skills and abilities of learning how to ace tests or exams. Hence the idea of students engaging in a meaningful tasks fails as the idea of test taking is individualistic and there is no cooperation amongst students. The test only indicates a singular form of knowledge representation. Hence taking tests is not in any way indicative of meaningful learning. It is imperative to ensure that students are occupied with a meaningful task or activity. The task at hand needs to be constructive and authentic as well as engaging. Technology can be used as an intervention then in order to help students recognize and learn problems, understand complex ideas, establish new methods of learning as well as be given the autonomy to regulate their own learning at their pace and convenience.

Characteristics of Meaningful Learning

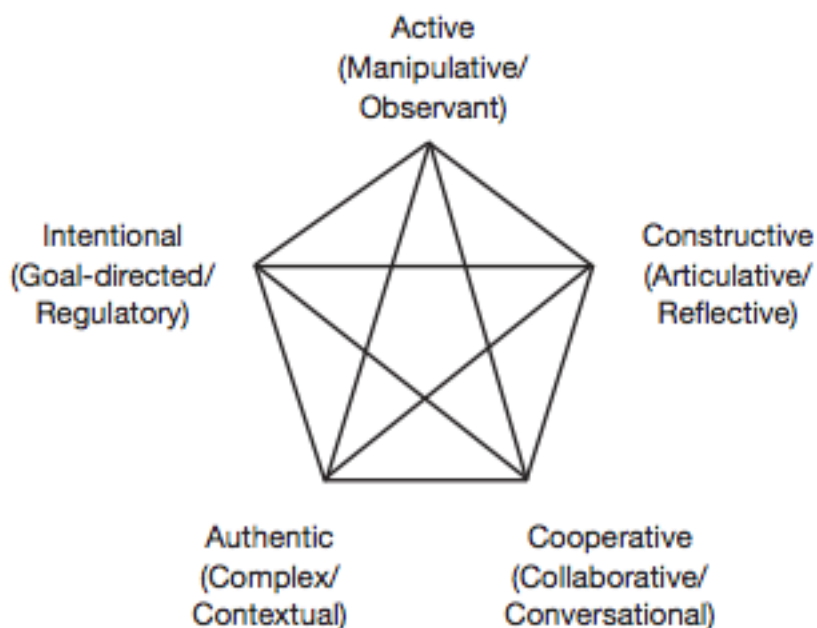


Figure 2.1 Characteristics of Meaningful Learning

Historically the role of technology was that it would be used as a medium to deliver lessons to students (Clark, 1983). Furthermore, by 1983, a study indicated that drill and practice tests were the most common use of the existence of microcomputers in the education realm (Becker, 1985). However the trend started to change during the late 1980s when the use of computers was being realized for its potential of increasing productivity as well as efficiency through the development of innovations and practices such as spreadsheets, databases, graphic programs etc. The use of using technology as a tool was then illustrated as well informed teachers during 1993 would widely use tools such as word processors, informational and analytical tools as well as instructional software. The advent of the internet was further responsible for the exponential increase of technology by teachers. Technology at that point was then fundamentally used as a communication tool. It is said that Web 2.0 is responsible for quickly transforming the landscape of educational

computing (Schrum and Levin, 2009). This has been largely due to the idea that Web 2.0 is more collaborative, and promotes cooperation through having a lot of open source content.

However at the same time, the students have still been using technology to replicate what the teacher or the textbook has been teaching them. In order for technology to be meaningful it should be recognized as more than a source or repository of knowledge, a deposit which contains vast reserves of knowledge. Technology can be used meaningfully to provide students a set of tools which they can use side by side to advance their educational outcomes. Technology provides a unique platform for students where they can effectively communicate their ideas with other students through collaborative groups. Technology should be seen as from the lens of a learning tool that students learn with rather than from. Essentially technology in order to be meaningful it should be used as a partner in the learning process. It should facilitate productive thinking through designing environments and engaging learners such as cognitive learning strategies as well as enhancement of critical thinking skills.

It is imperative for interactions to be learner controlled and should be looking to help fulfil a specific learning need for the learner only then will technology's use will be considered as meaningful and should be used as a chief facilitator for thinking for students. For example, technology should be used as a tool to build knowledge production such as representation of ideas associated with learners, providing access to information, helping compare contrasting worldviews. The use of meaningful technology must also be authentic for example it should represent a certain meaningful real world problem, situation as well as context. It should provide grounds for collaboration and be considered as an intellectual partner (Jonassen, 2000a) to facilitate learning through supporting mindful thinking.

Different models also exist with regards to utilization of technology in the realm of education. For example, a model by the name of Technological Pedagogical Content Knowledge (TPACK) exists which focuses on what teachers should be aware of when utilizing technology for the sake of promoting learning as well as understanding which sort of knowledge should be available to the students for example according to Jonassen

(2009) various forms of knowledge exists such as declarative, structural, conceptual, procedural, situational, strategic, tacit, sociocultural and episodic knowledge. Pedagogical knowledge should not be considered monotheistic and should encompass a variety of different strands associated with knowledge. It is said that good teaching requires knowledge of pedagogy, content and technology. The aim of TPACK then is to figure out how various strands of technology can be utilized effectively to facilitate teachers. Hence we can see here that technology is used as not only as a learning tool but as an instructional tool and a storage device as well (Perkins, 1992).

Meaningful use of technology resonates well with the constructionist school of thought as it is a theory which essentially emphasizes upon activity based approach towards teaching and learning which enables learners to develop their own capacity, autonomy as well as frames of thought. Learners gain thorough knowledge through exploration and active learning (McBrien & Brandt, 1997). It is heavily inspired by four characteristics learning being dependent upon what is already known, emergence of new ideas through adaptation and change, inventing and innovating ideas rather than mechanization and incorporation of meaningful learning through critical analysis of old ideas and coming up with new conclusions. It is said that students and learners generally engage well with technology with regards to education as they are able to construct their own understanding and technology is a fun tool for them which facilitates this process (Jonassen and Wilson, 1999). Meaningful learning through technology can only enhance student achievement if it is used appropriately (Dede, 1998).

If we look at technology as a tool then tools can be considered as an extension of human capability (Forcier & Descy, 2002). Similarly, technology can then help in empowering and instilling thinking skills, learning skills as well as cognitive outcomes amongst students (Waxman & Huang, 1996) while technology is also used as a helpful platform of collaboration and shared learning (Singh & Means, 1997). At the same time it is important to point out that technology should not be the one which drives any sort of instruction (Jonassen, 2000) and it should be the other way around through integration of technology into the curriculum (Goodman, 1996). It must also be maintained that good

pedagogical practices are maintained at all times while utilizing technology and that should in no way be undermined (Anderson & Becker, 2001).

In the context of the classroom, technology can be effectively used in various ways and interventions. It is essential for technology to be utilized by teachers as a learning tool in the 21st Century (Jonassen, 1999) even if the teacher themselves haven't specialized in the said technology. Students are able to improve their learning outcomes, have a sense of meaningful learning when they learn side by side with computers rather than from computers (Jonassen, 2000). Research also indicates that instructors are willing to spend additional time in which they devote themselves to technology when they realize the benefits of increase in student learning outcomes through technology (Kent and McNergney, 1999).

Furthermore, technology can also be utilized to enhance professional development of teachers. The main key performance indicators for such interventions according to studies are mostly those factors which connect teacher training to student learning, hands on practical training of technology, diverse set of learning experiences, applications which are specific to the curriculum and fit a certain context, enhancing the role of teachers by giving them more autonomy as well as continuous funding and administrative support (Rodriquez and Knuth, 2000). The teaching strategies should in effect complement the use of technology in the curriculum (Pierson, 2001).

A checklist of sorts should also be analysed before engaging with a meaningful use of technology. It must be analysed whether classrooms have the resources to equip themselves with this technology, will the intervention for technology help in improving cognitive outcomes of students? Will technology help in transforming or changing prevailing methods of learning and pedagogy as well as does it facilitate students to be autonomous and learn on their own? (Jonassen, 2003).

Ultimately it can be stated that technology can only have meaningful use in education if it is able to fulfil the following criteria which includes the fundamental notion that all learners should be engaged in aspects such as collaboration instead of competition,

emphasis on a communal level of learning, articulation, enhancement of critical thinking skills, conversations rather than receptions, knowledge creation rather than memorization as well as an element of reflection (Jonassen et al., 2003). Technology must find meaning through everyday experiences, situations, experiences and events which then should motivate the learner or the student to engage in such activities so that competencies such as active learning, critical thinking, and motivation are developed.

2.2 What are 21st Century Skills

21st century learners must possess both self-direction and an ability to collaborate with individuals, groups, and machines (McCoog, 2008). Social networking is built on the idea of how people know should know and interact with each other (Zaidieh, 2012). Social networking enables preservice teachers to integrate technology into teaching and learning. In addition, it will capacitate them to be socially aware of the problems of the students. Electronic social-networking services such as Myspace and especially Facebook have rapidly earned fame. Ractham and Firpo (2011) as cited in Zaidieh (2012) stress that the model of the web as a decentralized search engine to search information or communicate with others is becoming obsolete.

The notion of 21st Century skills for students, deals with the idea of students effectively utilizing ICT based interventions to their advantage. Currently it is said according to various studies that students currently do not have enough skills in evaluating, understanding, or analysing information while they access technology and the Internet. Current curriculum of students fails to adapt to these changes and ICT interventions are used to facilitate instruction to students. It is without a doubt that currently students have developed the ability to effectively communicate with their peers through the Internet as well as the ability to search information however advanced skills such as, processing and evaluation of available information are not part of the development of students. In order to effectively benefit from the real potential of digital media it is imperative for students to have access to these 21st century skills.

According to the International Society for Technology in Education, they have adopted a set of standards for learning, teaching, and leading the technological age and their standards are widely applicable worldwide with their aim of promoting meaningful education through the use of technology while incorporating 21st Century skills. For example, the 2016 ISTE Standards for Students has the following aspects: empowered learner, digital citizen, knowledge constructor, innovative designer, computational thinker, creative communicator and global collaborator (ISTE Standards for Students, 2016). The aim of these standards is to challenge the existing status quo as it raises the bar and expectations of both students and teachers to exert more effort into their education.

Similarly, an organization by the name of The Partnership for 21s Century Skills also exists. The purpose of this organization is to prepare students for the 21st century by equipping them with the right skills through the right tools and guidance. Members of P21 assist the United States education system by integrating critical thinking, communication, problem-solving, sharing and collaborating amongst each other as well as innovating. Their ambition is for students to realize their 21st century outcomes through development of life skills as well as career skills. For example, with regards to the aspect of learning and innovation skills, creative thinking is an important indicator identified by the organization. For P21 a 21st century student should be able to brainstorm on his/her own as in the student should possess the ability to create ideas and associations on their own which could lead to the introduction of creative and innovative ideas. Furthermore, 21st century skills according to the criteria set by P21 should also allow students to enhance, refine and develop existing theories and ideas in order to maximize their creativity. After the student is able to develop such a level of creativity then the student must also be able to engage, collaborate and interact with their peers which means to develop as well as communicate ideas effectively with one another. The student should learn to be tolerant as well as responsive to new environments, different perspectives and paradigms while incorporating a feedback loop (P21, 2013).

With regards to the notion of critical thinking and problem solving, the 21st Century student according to P2I should be able to reason effectively which includes the various

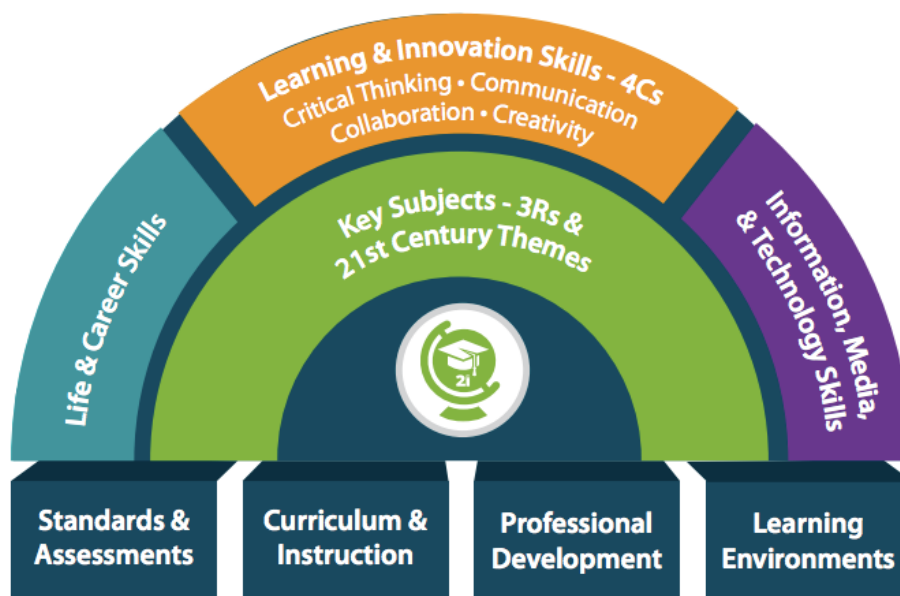
types of reasoning such as, inductive or deductive, depending upon the context. The student should also possess the ability to analyse a specific situation, have a good understanding of the diagnostic as well as the ability to synthesise the information and come up with a solution to problems while reflecting critically on the various processes incorporated.

Communication skills are also a vital aspect for a 21st Century student. The ability to communicate clearly is one of the biggest assets that students could possess in the 21st century as it will allow them to not only articulate their thoughts effectively, but they would be able to decipher statements and meanings as well as benefit from digital media while communicating effectively with diverse cultures and environments.

With regards to information, media and technology skills, it is important for students to be equipped with a specific level of literacy with regards to the Internet; for example how to access information efficiently and from the relevant source, how to manage that information effectively as well being aware of the nuances attached to the media such as understanding how media messages are constructed and the purpose for which they are constituted, gaining an understanding on how individuals have different ways of interpreting the same message but avoiding a conflict of interest. Finally, the student must be able to implement ICT efficiently for example the student must use technology as a tool for research, organization, analysis, evaluation as well as communication. Social networks and digital technologies should be adequately used to access, integrate and evaluate information in the knowledge economy.

Furthermore, if we take examples from the ISTE then according to their curriculum, 21st century students should be an empowered learner. The guidelines they have set for students in the age band 8-11 illustrates that students in order to be empowered in their learning must develop learning goals in collaboration with an educator (ISTE Guidelines, 2016). Students should also be able to seek feedback and explore technologies appropriate to their age. With regards to becoming a 'Digital Citizen', the student should be able to have an adequate idea about the role of online identity, practicing and encouraging safe and

ethical behaviour as well as respect for intellectual property. Other examples include students in order to develop the 21st century skill of a ‘Knowledge Constructor’ should be taught appropriate research techniques to acquire and access digital resources to facilitate their learning. Real world problems should also be explored (ISTE Guidelines, 2016). Being an ‘Innovative Designer’ the student in the age bracket of 8-11 must be able to use designing processes to come up with creative, new and original ideas while embracing the concept of trial and error while understanding the importance of hard work and perseverance. A ‘Computational Thinker’ should have students be equipped with skills which allows students to analyse, interpret and evaluate information through data analysis as well as through the ability to organize and clean data. The idea of learning how to break tasks into various components should also be taught to students. In ISTE’s aspect of ‘Creative Communicator’, students should be able to communicate clear ideas effectively to each other as well as their peers. While finally ‘Global Collaborator’ should allow students to broaden their perspectives through collaboration with others across the world.



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Figure 2.2 P21 21st Century Student Outcomes

Muhammad Shahbaz Khan

Harris (2000) observed that technology will be a significant tool to recreate learning in the 21st Century. However, educators will need to experience a paradigm shift in their vision for technology in education. Further, they need to change their beliefs in learning processes. Harris (2000) acknowledged that, ‘The technological revolution can be used to reframe the very nature of the educational experience, for the barriers we often faced in the past are no longer barriers, and students no longer have to be bound by time and place to learn.’ The tremendous technological potential will only be realized if we can create a new vision of how technology will change the way we define teaching and how we believe learning can take place (p. 1). There is evidence to show that computers can help students improve their performance on standardized tests (Ringstaff & Kelley, 2002), and that “student-centred approaches are better suited to fully realizing the potential of computer-based technology” (p. 2).

Further, when teachers use technology as one of the many tools in the instructional repertoire and only when appropriate for completing tasks, students are less likely to become bored. In student-centred learning, faculty must become facilitators and collaborators, and instruction must move from memorization to problem solving. Therefore, to meaningfully teach with technology, teachers must shift their instructional practices from a teacher-centred lecture approach to a more student-centred learning or constructivist approach (Jonassen, 2000).

The use of technology and meaningful learning raises serious and significant issues as to how best we can educate our students. Although technology is an important tool for education, its appropriate use to support learning is more desirable. Grabe and Grabe (2004) suggested the active use of text, graphics, sound, or animation in the classroom to help students acquire and synthesize information—an activity that facilitates meaningful learning. Therefore, teachers should guide students to construct their thoughts through various activities that target problem solving, decision making, goal setting, managing and preventing conflict, and achievements.

Technology-based environments enhance constructive interactions between learners and instructors to share meanings and develop new more powerful meanings (Novak, 1998). Ausubel's (1960) cognitive theory on meaningful learning could help teachers to visualize the importance of organizing learning materials and presenting new ideas to learners. It also reveals the importance of inputs to learning and how anchoring new concepts into the learner's existing cognitive structure helps to make new concepts retrievable. Teachers should, therefore, strive to design learning environments that can facilitate active learning, guide the learners to learn how to learn, recognize differences in each learner, and create different learning styles to meet the needs of each learner (Brooks & Brooks, 2001). Constructivist practices are never easy, but the benefits may justify their adoption in a multitude of classrooms.

There is no magic solution for integration of technology in the classroom. While factors such as access, support, and training are prerequisites for using technology in the classroom, effective technology integration constitutes a major change in people's lives. Such change cannot be realized overnight; even in the best of circumstances. Teachers should not view technology use as an end in itself, but a means to an end. In this context, teachers should strive to understand appropriate ways to support students to learn meaningfully in modern technology-rich classrooms. Teaching with technology is a complex phenomenon that involves understanding teachers' motivations, perceptions, and beliefs about learning and technology (Woodbridge, 2004).

Further, to be able to benefit from technology use and integration use, teachers should have a strong conviction that the use of technology is more efficient and effective than the use of traditional or alternative instructional strategies available for them in teaching and learning (Simonson & Thompson, 1997). Generally, teachers are more willing to use new technology when they have a good reason to use it (Scoolis, 1999). Therefore, teachers need to be self-motivated, interested, and willing to integrate technology in their courses. Technology provides opportunities to support student learning. However, to achieve the full benefits of education technology requires strategic planning and integration of these tools into instruction that only a sense-making and skilled teacher can provide.

2.3 Technology Integration Matrix

For the purpose of this study I used Technology Integration Matrix as a lens to evaluate teachers' and school leaders' use of technology in the participant schools.

2.3.1 Background

Developed in 2005, Technology Integration Matrix (TIM) was created by the Florida Centre for Instructional Technology (FCIT) at the University of South Florida (USF) in The United States of America (Technology, 2005). This initial version of matrix utilised the five underlying aspects of meaningful learning as stated by Jonassen et. al (2014):

- a. Active
- b. Constructive
- c. Collaborative
- d. Authentic
- e. Goal Directed

According to the TIM developers the purpose of creating TIM was not to push the agenda of forcing schools and teachers to use new technology. The main objective was to encourage the more meaningful use of technology, whether it is new or already existing (Winkleman, 2019).

2.3.2 Levels of Technology Integration

TIM expands on the concept of meaningful learning and provides five stages of implementation for each of the five concepts of meaningful learning. This original version of TIM was used since 2005 till 2010. It stated the following five levels of technology integration:

1. Entry
2. Adoption
3. Adaptation
4. Infusion
5. Transformation

2.3.3 TIM Version 1 Descriptors in Detail

Table 2.3.1 below shows descriptor as represented in the original TIM version 1 (Technology, 2005). While it provided the description for all the relevant terms, it lacked the depth and detail to guide teachers and students to move from Entry towards Transformation levels.

Table 2.3.1 Technology Integration Matrix Version 1 descriptors

	Entry	Adoption	Adaptation	Infusion	Transformation
	The teacher uses technology to deliver curriculum content to students.	The teacher directs students in the conventional use of tool-based software. If such software is available, this level is the recommended entry point.	The teacher encourages adaptation of tool-based software by allowing students to select a tool and modify its use to accomplish the task at hand.	The teacher creates a learning environment that infuses the power of technology tools throughout the day and across subject areas.	The teacher creates a rich learning environment in which students regularly engage in activities that would have been impossible to achieve without technology.

<p>Active</p> <p>Students are actively engaged in using technology as a tool rather than passively receiving information from the technology</p>	<p>students use technology for drill and practice and computer based training</p>	<p>Students begin to utilize technology tools to create products, for example using a word processor to create a report.</p>	<p>Students have opportunities to select and modify technology tools to accomplish specific purposes, for example using coloured cells on a spreadsheet to plan a garden.</p>	<p>Throughout the school day, students are empowered to select appropriate technology tools and actively apply them to the tasks at hand.</p>	<p>Given ongoing access to online resources, students actively select and pursue topics beyond the limitations of even the best school library.</p>
<p>Collaborative</p> <p>Students use technology tools to collaborate with others rather than working individually at all times.</p>	<p>Students primarily work alone when using technology.</p>	<p>Students have opportunities to utilize collaborative tools, such as email, in conventional ways.</p>	<p>Students have opportunities to select and modify technology tools to facilitate collaborative work.</p>	<p>Throughout the day and across subject areas, students utilize technology tools to facilitate collaborative learning.</p>	<p>Technology enables students to collaborate with peers and experts irrespective of time zone or physical distances.</p>

<p>Constructive</p> <p>Students use technology tools to build understanding rather than simply receive information.</p>	<p>Tech-nology is used to deliver information to students.</p>	<p>Students begin to utilize constructive tools such as graphic organizers to build upon prior knowledge and construct meaning.</p>	<p>Students have opportunities to select and modify technology tools to assist them in the construction of understanding.</p>	<p>Students utilize technology to make connections and construct understanding across disciplines and throughout the day.</p>	<p>Students use technology to construct, share, and publish knowledge to a worldwide audience.</p>
<p>Authentic</p> <p>Students use technology tools to solve real world problems meaningful to them rather than working on artificial assignments.</p>	<p>Students use technology to complete assigned activities that are generally unrelated to real-world problems.</p>	<p>Students have opportunities to apply technology tools to some content-specific activities that are based on real-world problems.</p>	<p>Students have opportunities to select and modify technology tools to solve problems based on real-world issues.</p>	<p>Students select appropriate technology tools to complete authentic tasks across disciplines.</p>	<p>By means of technology tools, students participate in outside of school projects and problem-solving activities that have meaning for the students and the community.</p>

<p>Goal Directed</p> <p>Students use technology tools to set goals, plan activities, monitor progress, and evaluate results rather than simply completing assignments without reflection.</p>	<p>Students receive directions, guidance, and feedback from technology, rather than using technology tools to set goals, plan activities, monitor progress, or self-evaluate.</p>	<p>From time to time, students have the opportunity to use technology to either plan, monitor, or evaluate an activity.</p>	<p>Students have opportunities to select and modify the use of technology tools to facilitate goal-setting, planning, monitoring, and evaluating specific activities.</p>	<p>Students use technology tools to set goals, plan activities, monitor progress, and evaluate results throughout the curriculum.</p>	<p>Students engage in ongoing metacognitive activities at a level that would be unattainable without the support of technology tools.</p>
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For example, in the description for Entry level of technology integration it states that “The teacher uses technology to deliver curriculum content to students.” While this looks like a simple and easy to understand statement for many academics, it is far more complex in nature. It leaves the reader to ask questions like:

- a. What constitutes teacher’s use of technology?
- b. Does it include assistance of students?
- c. How much say do students have in this use of technology?
- d. How much choice does the teacher have in deciding whether or not to use technology?

- e. Which technology (digital or non-digital) is being referred to?

Such questions led the TIM developers to come up with a more detailed version of TIM in 2011. This version further subdivides each category of Entry, Adoption, Adaptation, Infusion, and Transformation into three domains:

1. Teacher
2. Students
3. Environment

For Example, for active learning at Entry level it has descriptions for

1. **Entry level Active teacher:** The teacher may be the only one actively using technology. This may include using presentation software to support delivery of a lecture. The teacher may also get the students to complete “drill and practice” activities on computers to practice basic skills, such as typing (Technology, 2019).
2. **Entry level Active student:** Students receive information from the teacher or from other sources. Students may be watching an instructional video on a website or using a computer program for “drill and practice” activities (Technology, 2019).
3. **Entry level Active environment:** The setting is arranged for direct instruction and individual seat work. The students may have very limited and regulated access to the technology resources (Technology, 2019).

Similarly all aspects of meaningful learning and their corresponding integration levels have been described in three separate documents; one each for teacher, student, and environment.

It is noticeable that these TIM version 2 descriptions are not absolutely concrete and leave a lot of interpretation to be done by the users. This slight abstraction in the Matrix is by design and is intended to provide the users with marginal freedom to adapt the TIM to suit their needs.

2.3.4 TIM Version 2 Support Material

TIM version 2 came with not only an improvement to the matrix but also a major upgrade to the TIM website as well. Even in 2005 it had significant amount of resources for teachers and other pertinent personnel to utilise. However, now the website has become extremely robust when it comes to providing support to any school or academic institutions that are eager to use TIM as framework for technology integration.

2.3.4.1 Detailed Matrix

One major improvement to TIM framework was made in version 2 of TIM where instead of one matrix TIM provides the users with 4 matrices on its website

(<https://fcit.usf.edu/matrix/tim-descriptors/>). One matrix each for descriptor summary, descriptors for teacher, descriptors for student, and descriptor for setting or environment.

2.3.4.2 Video Examples

TIM website also contains a multitude of instructional videos to demonstrate TIM technology integration levels for all five aspects of meaningful learning with technology. These videos encompass a diversity of subjects and can be browsed using class level filters, subject specific filters, meaningful learning filters, or level of integration filters.

2.3.4.3 Textual lesson plan guidance

When you click on a specific video to watch it shows you an embedded video link from YouTube. Underneath that video interface is a detailed textual aid for the reader. This detailed description provides the readers with the lesson objectives and lesson planning details for the technology integration lesson being depicted in the YouTube video. It is important to note that the video is only a highlight or a summary of what happened in the lesson and it is not a recording of the complete lesson. This makes the textual aid even more important as it gives more depth, direction and clarity to the reader on how to make their own lesson plan at a similar level, while maintaining their own individuality and catering to their own specific needs.

2.3.4.4 Online assistance

TIM has grown from a locally usable framework to an international phenomenon. Therefore, TIM website has included several online features to enable the user to make better use of TIM. However, many of these features are now for commercial use only and come with a buyable license that grants permission to use. In terms of the context of this study's participants it is safe to assume that none of the schools will be going for the purchasable options of TIM website. However, many schools in other countries are making regular use of these additional tools provided by TIM (Welsh, et al., 2011).

2.3.4.5 Books and research material

On the similar lines as online assistance, TIM website also provides access to book chapters and various relevant research material for its registered members. These resources are only available to the members and are not free to use for non-members.

2.3.5 Research based rationale for choosing Technology Integration Matrix as a framework

Technology Integration Matrix is not only an innovative lens to look at technology in education, it is also rooted in thorough, extensive, and frequent research. TIM highlights a tiered model which can be seen as a product of inspiration begotten from a report by Apple Computer, Inc. (Apple Computer, Inc, 1995). This report is one of the earliest published works that studies the uses of tiered technology integration in education. One can clearly see that these tiers were used in a modified form to form the basis of TIM's levels of integration. TIM's rows (the five characteristics on meaningful learning: active, authentic, collaborative, goal-directed, and constructive) are clearly based on the seminal work of Jonassen et al, (2003).

Even these five concepts are not isolated works of a single researcher. Much research has been conducted on all five elements. Researchers have been using the term active learning for a long time in the discourse pertaining to pedagogical skills and students' performance (Newmann, Marks, & Gamoran, 1996). A review of more recent literature reveals more mentions of active learning and how it improves student performance in various

educational fields (Freeman, et al., 2014). Some researchers have even tried to establish memory improvement as a direct benefit of using active learning as a pedagogical approach (Markant, Ruggeri, Gureckis, & Xu, 2016).

Similarly there has been enough emphasis on the second aspect of meaningful learning; Authentic learning. Research on this topic is extensive and some of the relevant works include using authentic thinking in subject specialist's teaching practice (King, Newmann, & Carmichael, 2009). Other research has delved into the domain of tackling the challenges faced by innovators while engendering change (Ertmer & Ottenbreit-Leftwich, 2013), according to the definition of authentic learning by Jonassen's (2003). Similarly, Herrington, et al. (2014) discuss the concept of authentic learning in the context of creating an overall environment of authentic learning. Same book talks in detail about collaborative learning and its importance and impact on student learning (Goodyear, Jones, & Thompson, 2014). Goal directed learning is highlighted in many of the published research works. One of the more widely cited works signifies the importance of goal-directed learning as a tool to improve students' learning (Bransford, Brown, & Cocking, 2000).

Overall, much research highlights various aspects that allude towards constructive elements of learning. More and more researchers are emphasizing the shift from teacher-led classroom to a more learner-centred and learner-led approach while advocating the potential benefits of a learner-centred dynamic of a classroom (Cornelius-White, 2007). Research has tried to show a positive correlation between teachers' teaching practice and students' performance at schools (Wenglinsky, 1999). When talking about constructive learning it is also emphasized that student engagement should be given its due priority (Fredericks, Blumenfeld, & Paris, 2004).

In conclusion, TIM is based on the seminal works that are widely studied and cited in educational and technological research alike. Especially, when it comes to the use of technology in schools, many researchers make use of not just the seminal works (Jonassen, Howland, Moore, & Marra, 2003) but also the works built from or on top of the original (Davies & West, 2014).

Earlier version of TIM were field tested and then the results were presented at various conferences (Allsopp, Hohlfeld, & Kemker, 2007). There have been studies that validate the effectiveness of TIM and tools originating from this approach (Hogarty, Lang, & Kromrey, 2003). Several tools have been developed using TIM as a guiding framework and many researcher have focused on gauging the effectiveness of these tools whether it is to support action research to engender meaningful use of technology in classroom (Dawson, Cavanaugh, & Ritzhaupt, 2012). There is a plethora of relevant and positive research pertinent to a trained, English-speaking teacher's meaningful use of technology using TIM (See Appendix B for a list of citations of some of the studies that incorporate the TIM and TIM tools). However, there is an equally strong dearth of research on an untrained, non-English speaking teacher's attempts at making meaningful use of technology. This scarcity of research on TIM in untrained teachers' hands is the reason why I chose TIM as a theoretical lens to guide the research for this thesis.

2.4 Educational Technology in Developed Countries

Governments of developed countries are putting in a lot of money to enable school education to benefit from the technological advancements. In the decade spanning 1990-2000 the US government spent more than 40 billion US dollars to increase the school students' access to technology (Dickard, 2003). The access to technology kept on increasing for teachers and students. In the US, by 2009, around 97 percent of the teachers had access to at least one computer in their classroom. Moreover, 96 percent of teachers said their computer had Internet access as well (Gray, et al., 2010). Developed countries have made noticeable advancements in the use of technology in their schools. However, comparing Finland's education system with Pakistan's is an unfair comparison if the purpose of this juxtaposing is to find ways to map the former's education system onto the latter. However, it is still important to look at these successful models to learn from their mistakes and successes, and developed sustainable long-term solutions for improvement of Pakistan's education system.

Therefore, this section will take a look at what some of the developed countries are doing and how can their best practices inspire positive and sustainable change in Pakistan's education system. For the purpose of this document the researcher will ascribe to the commonly accepted definition of developed and developing countries, as provided by WESP (World Economic Situations and Prospects) and quoted by country classification report by the UN (WESP, 2014).

2.4.1 Teachers' Use of Technology in Finland

Finland ever since the introduction of the first PISA results in 2000 has been praised for its educational eco-system. For example, compared to other European countries, the learning outcome of 15 year old Finnish students in areas such as reading, numerical literacy and science literacy were at the top level while differences between schools in Finland was the smallest in the world.

Finland has a design centric approach when it comes to innovating the educational sector through technology. Finland seeks to emphasize upon the 'idea to product' process

which involves the student to be fully involved in the process of designing and problem solving (Opetushallitus, 1994). The element of design has been part of the national curriculum of Finland for decades as it offers a holistic learning environment which is flexible for students as well as teachers. Finland on a national level has various policies regarding the use of ICT for improving learning objectives through e-learning, digital literacy as well as e-skills development. According to a report by the European Commission, students in Finland are privileged to be amongst the top countries when it comes to provision of ICT infrastructure in Europe as well as the availability of high speed connectivity and broadband. For example at the grade 8 level, Finland is in the lead amongst all European countries with regards to the indicator of 'Students per Computer' with Finland having approximately 5 students per Computer at the Grade 8 level.

ICT are generally introduced for fulfilling three purposes which are mainly the direct support that it provides to learning, indirect support to learning as well as achieving community purposes (Scrimshaw, 2000). A recent Finnish study observed (Niemi, Kyanlashti & Vahtivouri-Hanninen, 2013) that Finland utilizes the following strategy which has six essential features through which ICT is integrated in the education ecosystem for example firstly it introduces ICT in strategic planning, making it a part of the school's culture. Secondly it refers to the use of a flexible curriculum. The third characteristic deals with utilizing ICT in teacher and learning methods. The fourth one is high investments in communications. The fifth characteristic is usage of ICT to optimize school leadership and management and lastly improving teaching staff's commitment and enhancing their technical capacity.

Furthermore, emphasis is placed upon self-evaluation rather than external assessments and according to a recent study (Niemi et al, 2013) the use of ICT has led to a culture of sharing within the education ecosystem in Finland in which each school learns from each other and adapts to changing trends. The Finnish, Agency of Technology and Innovation (Tekes) has a program by the name of 'Learning Solutions' that supports an ecosystem where learning is emphasized in the digitalized age (Tekes, 2013). The aim of this program is to introduce teachers with access and support from technological companies

as well as pedagogical experts in order to create new and innovative solutions in improving student learning outcomes.

In order to promote subjects such as Math and Science while improving student learning outcomes in these areas, the LUMA Center was established in 2003 in Finland which covers subjects such as science, technology and maths as disciplines (Vihma 2014). The Center provides an ecosystem for collaboration on STEM education (Aksela, 2008). Through shared expertise which involves all relevant stakeholders such as universities, schools, teachers, parents and the education sector industry in general collaborate with each other to find engaging ways for children aged 3-19 to develop interest in STEM subjects while emphasising upon communality.

Finland in recent times through a design based research (DBR) has implemented various projects while utilizing technology for the benefit of teachers. For example the Innovative School Community (ISC) which was implemented in a school in the area of Helensiki (Kornohean et al 2014) and it offers a unique model where learning and teaching is done through application of technology. The project requires a collaborative commitment from teachers and researchers while the processes included students' learning and learning environments, teachers' professionalism, leadership and partnerships (Kornohean 2014). The aim of the project was to promote personalized learning through mobiles and home school collaborations in order to align students with their surrounding neighbourhoods such as libraries, elderly homes through cell phones.

2.4.2 Teachers' Use of Technology in the United Kingdom

There has been such immense developments and breakthroughs in computers and computing during the turn of the century (past quarter century) that it is not surprising that they have replaced the other technological teaching aids once available. It is noticeable how significantly the computers have increased the sophistication, complexity and most importantly range of possible class room activities. Having said this, these technologies have brought with them many new challenges for the teachers who are now responsible to

determine what they need to offer and how that should be efficiently delivered to the students.

While there has been an exponentially positive increase in use of technology and ICT in schools on the UK and the impact that it is having on every day education and facilitation of modern day tech tools being introduced into ways of teaching. At the same time, the schools and teachers in the UK are facing certain budgetary and other hurdles in order to engage these technologies in everyday class room teaching.

A global education technology provider, Promethean surveyed over 1600 education centers across the UK in order to correctly identify the current attitudes and trends with regards to the use and implementation of technology in the classrooms. The result in the findings of its annual report show that the two factors that are hampering the progress of schools to implement tech driven education is due to a lack of training for the staff and budgetary constraints.

Majority of the schools surveyed had access to technology, with 80% having interactive flat panel displays, almost 58% of the schools had access to the latest tablets and I-pads. Since only 5% of the teachers who were respondents in the survey believed that they had received full training and technical support to integrate education technologies, it is evident that a lack of training and technical ability is a major reason why there is difficulty in adopting new technologies for schools. The survey results revealed certain areas of improvement, for instance all of the surveyed teachers felt that they have a clear educational technology strategy in place while half the respondents claimed that the schools are not utilizing budgets effectively with respect to technology.

The survey results were not all bad since they do indicate that when technology is being used correctly, more than 50% of the teachers surveyed agreed, it does improve the levels of engagement from the students. Furthermore, technology is helping teachers to reduce the assessment burden, given that 63% of the teachers use technology to track formative assessments submitted by students, whereas 35% of the teachers use it to track informal investment.

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Even though tech companies in the UK which include big names like Microsoft and Apple, have been urged to help support and foster a technological revolution by putting technology at the heart of the classroom. While at the same time imploring the United Kingdom's tech industry, along with the key players to provide support. The Education secretary of the United Kingdom, Damian Hinds, said: "Only a minority of schools and colleges were taking advantage of opportunities to bring education to life by, for instance, enabling children to take virtual trips through the Amazon or to control robots. Technology can also slash the time teachers spend on burdensome administrative tasks.

Despite the United Kingdom having faced their fair share of challenges and hurdles in deploying technology into classrooms all across the board with managing resource and budget deployment effectively, they have come a long way and ahead of many developed nations, in the recent years, to foster and enable the use of technology and educational devices into their classrooms setting an example for others to follow.

During the biggest ed-tech conference in London. Anthony Salcito, the vice-president of Microsoft said that: "The UK is leading the way in how technology should be used in schools" and further added that the UK has gotten ahead by redesigning its curriculum by ensuring that technology and computer skills are ingrained in the subjects.

Despite, the United Kingdom having a burgeoning record to facilitate the deployment of technology in school and college classrooms, there are certain aspects that could further enhance this shift in this rapidly changing technological world and help create a system for lifelong education. Some key areas where the educational sector can provide innovative solutions include the following: Everyday teacher practices, training and development of teachers, assessment processes, administration processes and lifelong learning, helping those who have left formal education to get the best from online courses.

There are many available tools that are contributing towards aiding both students and the teachers in classrooms for the delivery of everyday education. The teaching aid, or tool, that assists a teacher in teaching a particular subject or topic does only a certain part of the job and is primarily administered in the classrooms and controlled by the teachers.

These aids entail many kinds of tools ranging from the simple and basic blackboard to the most modern mobile operated teaching aids. The implementation and clarity of the classroom curriculum depends on what kind of teaching aid is being used. Usually the choice of teaching aid used depends essentially on the kind of lesson that needs to be delivered or what task needs to be accomplished.

There is no doubting the fact that the use of technology in education and classrooms has come a long way since the early days of computers. Yet as we now embark on an educational journey with advanced technology and aids we must not forget the lessons learnt from the past. The lessons should be used as the guiding hand to make a conscious effort of embracing the new methods of teaching that come our way while at the same time ensuring that we do not let go of the evergreen basic principles of education.

2.4.3 Teachers' Use of Technology in the United States of America

In very layman terms, technology refers to the advancement in our methods and tools we use to solve everyday problems. Whereas in a classroom anything from a pencil, scratch paper to a chalkboard, can be catered under the umbrella of the term "Technology" (Washington, 2018).

In today's tech-centric world, we have seen that technology has impacted almost every aspect of our lives today and education is no exception. If we picture a classroom we imagine a group of students with their textbooks and study material opened in front of them on their desks, some flipping through the pages, others just fidgeting with the books lost in thought. A few look bored, others talking to their neighbour while a couple snooze at the back of the classroom.

The classrooms today are not any different from our earlier depiction, though you might find the students now engaged with smart phones, laptops and tablets on their desks instead of their curriculum books.

As we embark on the Fourth Industrial Revolution, it's clear that technology will play a central role in nearly all aspects of our lives. Research by the World Economic Forum estimates that 65% of children entering primary school will find themselves in occupations that today do not exist. By 2020 it's estimated there will be 1.5 million new digitised jobs across the globe. At the same time, 90% of organisations currently have an IT skills shortage, while 75% of educators and students feel there is a gap in their ability to meet the skills needs of the IT workforce. To prepare the talent needed for the digital economy, education must adapt as fast as the demand for IT skills is growing and evolving (Frezzo, 2017, p. 27).

A cynic would argue that technology has no correlation or has done nothing to change education. However, in so many ways, technology and tech-based educational tools have had a profound impact on education and its transformation. To begin with, technology for one has expanded the overall access to education. History shows us that at a point in time, books were rare and were only accessible to the elite, along with any educational opportunities and individuals had to travel to centres of learning to get an education.

Yet, today you see massive amount of information being disseminated in the form of books, audio books, visual aids; these are available to the common man with just a click of the button away on the internet. Today we have a vast amount of formal learning opportunities available online throughout the world in the form of platforms like Khan Academy, MOOCs, MAGOOSH, and several podcasts and traditional online degree programs along with several self-help and individual teaching platforms for a variety of subjects and generalised tests. Hence access to learning opportunities both inside and outside the classrooms are unprecedented in both scope and range; all of that is due to technology.

Traditionally, we can see that the only form of collaboration has been limited to other students in the same classroom of school building. Technology today offers several opportunities for communication and collaboration that are unprecedented. A student sitting

in the USA can learn about the Arctic by following the expedition online using technology, along with viewing photos and e-mailing questions to the scientists themselves. These are all the ways in which technology is now opening learning avenues and broadening our learning horizons on the whole. Students can collaborate on group projects, or otherwise, making using technology-based tools such as wikis and Google docs.

These new tech advances have broken the walls of traditional classrooms and help aid in learning, communicating, and working collaboratively. These strong powerful tools are helping transforming education in multiple ways, ranging from making it easier for teachers to create coursework material and at the same time enabling new ways for students to not only learn, but collaborate together, with the ubiquity of the internet and the devices that can connect to it is transforming education on whole.

(Purdue University, 2018)

With such transformation technological resources available today, both to the masses of the USA and to the tech niche in the Silicon Valley, since this availability and awareness is rapidly booming, there is no doubt about the fact that technology is and will continue to shape the future of education in the United states of America.

With an influx of new learning models available, traditional educational methods are bound to evolve in the next decade. To get a better sense of where things are heading, Business Insider has taken a closer look at technology's developing role in the field of education and outlined the advances that could be spelled out for the future.

Every student learns differently, and technology allows educators to accommodate unique learning styles on a case-by-case basis. Technologies like DreamBox, a math education software that's used in a number of classrooms across the US, adapts to each student's skill level and lets students learn at a pace best suited to their needs.

Adaptive learning software is quickly replacing the role of textbooks in the classrooms and students are tackling subjects with the aid of tailor-made computer programs that assist

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their needs. There are certain technologies that will enable more tech-based learning in classroom environments and will enable both the students and the teacher, yet currently there are certain technologies already making a difference in education and aiding classroom learning in the USA.

It is most likely that we see start seeing classrooms adopt a one-to-one ration between a kid and a handheld device. Currently the following are the most innovative and attractive educational technology programs in the US:

- a) The Google Chrome Tablets
- b) Dream Box, Zearn and ST Math are mathematical software programs
- c) Newsela, No red Ink are software's that help students with reading and writings
- d) Quizlet – Software used by teacher to manage classroom quizzes

(Bernand, 2017)

“The newest technologies allow us to try things in physical and virtual classrooms that were not possible before. What you use depends fundamentally on what you are trying to accomplish” (Washington, 2018)

There are several technological tools and aids being used by classrooms all across the USA and have helped facilitate the learning that stems from a quality education. Furthermore, these new tools have aided both the instructors and the students to collaborate using online collaboration tools such as those in Google Apps: Google Worksheet Etc. that allow the back and forth sharing of documents online with the accessibility to edit them in real time and share. This is a particularly handy tool for students, giving them a platform to collectively brainstorm ideas and documents their ideas and thoughts using both text and imagery.

Other tools that are currently being used in the classrooms by the teachers in the schools and colleges of the United States of America include the following:

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- “Presentation software (such as PowerPoint) enable instructors to embed high-resolution photographs, diagrams, videos and sound files to augment text and verbal lecture content.
- Tablets can be linked to computers, projectors and the cloud so that students and instructors can communicate through text, drawings and diagrams.
- Course management tools such as Canvas allow instructors to organize all the resources students need for a class (e.g. syllabi, assignments, readings, online quizzes), provide valuable grading tools, and create spaces for discussion, document sharing, and video and audio commentary. All courses are automatically given a Canvas site!
- Clickers and smartphones are a quick and easy way to survey students during class. This is great for instant polling, which can quickly assess students’ understanding and help instructors adjust pace and content.
- Lecture-capture tools, such as ‘Panopto’, allow instructors to record lectures directly from their computer, without elaborate or additional classroom equipment. Consider recording your lectures as you give them and then uploading them for students to re-watch. Studies show that posting recorded lectures does not diminish attendance and students really appreciate the opportunity to review lectures at their own pace.” (Washington, 2018)

Apart from these aforementioned technological uses that have been embedded into bits and pieces in classrooms, there are these different system technologies that have completely taken the level of engagement via technology in the classroom environment to a whole new tech-driven level, one and not just focusing on specific aspects. One of these systems that is currently being deployed in the classroom of the United States is the Geographic Information Systems (GIS) technology that gives students the opportunity and freedom to visualize, analyse and interpret their curriculum in a way that is unprecedented. The Washington academy in Machian, use a Geographic Information Systems (GIS) technology offers the opportunity for unlimited interdisciplinary studies.

There are many different aspects of social studies, science, math, language arts and other curricula that GIS technology enhances for students. This helps them explore subjects in ways that typical curriculum does not. Spatial analyses, such location selection, change over time, and environmental impact, can play an integral part in the use of GIS in the classroom.

For instance, English literature students can discover and study the locations mentioned in the books they're reading, as well as map the travel logs/journals of a specific author. Using the same technology, math students can analyze the mathematical functions of demographic data

Washington Academy students study demographic information for countries worldwide visualize of historical events; and examine natural changes over time. Furthermore, students explore natural phenomena such as earthquakes and volcano locations, explore habits of animals, and the environmental impact of humans. Students also engage in business location analysis; create travel routes for a business that will be delivering goods to our local towns.

For the students enrolled in Business and Marketing, they have the opportunity to engage in business location analysis and create travel routes for a business that will be delivering goods to our local towns. Even the exploration of the spread of diseases and illnesses, like the flu, and where they originated is a part of the GIS program. Teachers and their students collect and create their own data. The GIS is then used to display the data and analyse the results. GIS technology promotes higher order thinking skills. Used in the classroom, GIS enhances students' understanding of the spatial relationships that are found in their world" (Study USA, 2015).

While we observe how well the schools in the USA have incorporated technology in the classrooms we need to firstly understand certain metrics. Firstly, we need to review what are the factors that influence the use of technology in classrooms? And at the same

time, what are the hindrances that are present for the adoption and integration of ed-tech tool, including the reluctances and capabilities of the school teachers today in the USA.

Introducing a new technology into the classroom in order to transform teaching and learning has been a long-standing tradition in education. Classrooms and educators alike have seen technologies (e.g., radio, television, etc.) come and go, innovations tried and tossed out. Some technological innovations had strong support to be used in the classroom, others have not. Some have stayed, some have not. However, no other instructional tool has been at the centre of an educational revolution like the computer, nor has any other innovation been as invested in, supported, criticized, and researched as the computer (Tyack & Cuban, 2000). It is clear that computer technology will not be tossed out so quickly. What is more likely is that the pressure to increase computer use in the classroom from researchers, reformers, policy-makers, and private-sector developers will steadily intensify (Cuban, 2002; Loveless, 1996).

These statistics raise quite a conundrum; *why is there such a large disparity between classroom professional and instructional use of computers?* Why is it that so many teachers use computers to increase their own efficiency and productivity, yet do not strive to find effective applications for their use as instructional tools? *What is it that keeps teachers from making this quantum leap?*” (Groff & Mouza, 2008)

The use of technology in classrooms in the US is dependent upon many contributing factors that influence not only the implementation of technology in a classroom and a curriculum but also the ability of the teacher to successfully integrate these tools and aids in the classroom.

There are major influencing factors that are pertinent to the school, its administration and/or the environment along with legislative factors. These factors have a direct correlation with the number of classrooms and schools that deploy and make use of this tech based learning methodology.

Policy factors

Over the last two decades' policy-makers have articulated different rationales for the integration of technology into the school curriculum. These rationales often emphasize three key themes: (a) using technology to address challenges in teaching and learning, (b) using technology to foster changes in the content and quality of teaching and learning, and (c) using technology to prepare students for an increasingly technological world (McMillan-Culp, Honey, & Mandinach, 2005). Concrete recommendations on how to achieve these goals, however, are rarely included in policy reports, thereby making it difficult to draw any practical implications.

The focus on technology in schools has also ebbed and flowed in the past several years as a result of high-stakes testing. Since technology itself is not directly assessed and attached to consequences through state testing, the political focus has waned from this area¹. However, much of national dialogue on the critical need for students to develop 21st century skills have only escalated since the introduction of No Child Left Behind. The challenge lies in that the classroom practices to meet each of these goals do not line up, and many educators do not feel they have the ability to develop rigorous, integrated, technology-based projects while still working towards the goals of annual state testing.

Research

While most researchers agree that technology can change the teaching process, making it more flexible, engaging, and challenging for students, little evidence exists to support these claims. Further, it appears that opinions on how to best establish such evidence also differ. Earlier studies followed comparative research designs and sought to find out whether use of computers increased student learning compared to other instructional approaches (Honey, McMillan, & Carrigg, 1999). Such studies treated technology as an isolated addition to the curriculum. Current approaches emphasize the importance of employing research designs that systematically examine computers as one element among other tools in the educational environment. They also emphasize the importance of improved outcome measures that can capture the strengths and weaknesses of students' technology work-products (McMillan-Culp et al., 2005).

Until such measures are developed, however, researchers have difficulty providing concrete answers on the efficacy of specific types of technology uses in the classroom in the form that policy-makers require.

School administration

Any teacher can testify to the importance of school administration. As directors, administrators influence school structure and culture, constituting the venue for any instructional initiative. Therefore, administrative support (or lack thereof) can make or break teachers' endeavours to integrate technology into the classroom. It is the responsibility of the school administration, faculty, and staff to develop their own understanding of technology and learning—and create a working environment that condones these efforts (Collier, 2001).

School administrators should not only advocate the use of technology but also provide support mechanisms such as professional development, time for planning and collaboration, and necessary resources (Earle, 2002; Groves, Jarnigan, & Eller, 1998). Necessary resources include: (a) adequate access to hardware and software; (b) technical and pedagogical support; (c) professional development plans that allocate time and resources for follow-up; and (d) social support from colleagues, including mentoring and time to explore new technologies (Morris, 2002; Zhao et al., 2002).

The lack of use of technology in many classrooms across the board in the United States is not just cause because of the lack of technology available or its implementation on the school administration level, rather it is accredited to several reasons, one of the major reason as to why there is a deficit in the deployment of technological aids and tools all across the United States is the reluctance of the teachers/instructors to use and apply the available technology in their teaching method, but also a lack of training and ability in order to successfully deploy these tools and engage in effective pedagogy.

Be it acceptance of the use of technology in the classroom or the successful implementation of it, the teacher is undoubtedly a critical factor in determining and gauging the success of the use of technology-based education. Similar to other activities, the teacher

has the greatest influence in classroom decisions and is perhaps the final decision maker/decider. This fluctuation of influence can stem from either a lack of understanding of the technology and its implementation or the resistance to the acceptance of an innovative and superior way of conducting classroom sessions, other times it may just be averseness to changing their way old methods set in stone.

Technology skills and proficiency

Often, the most foreseeable hurdle for teachers implementing technology into their classroom is their own lack of computer knowledge and experience. Those teachers with prior computer experience are more likely to learn new necessary skills quickly and seamlessly than those who have no prior experience. They are also more apt to use technology for instructional purposes (Hanks, 2002). Despite that, learning new computer skills requires significant amounts of time and, therefore, the importance of professional development should not be under-estimated. Effective professional development needs to provide time for training, experimentation, as well as follow-up support (Casey & Rakes, 2002; Groves et al., 1998; Levine & Donista-Schmidt, 1998). It also needs to support teachers in developing and sustaining alternative pedagogies and teaching strategies (Dede, 1997). This is where professional development often falls short in schools—addressing the new pedagogies necessary for successful implementation.

Attitudes and beliefs

Teacher attitudes and beliefs are powerful forces which significantly influence actions in the classroom. Teacher beliefs influence professional practice, and therefore, become pivotal factors in the implementation of new technologies (Haney & Lumpe, 1995). To implement technology successfully in their classroom, teachers must develop a positive attitude towards computers and feel comfortable using them as instructional tools (Rakes & Casey, 2002). Often, however, teachers' "attitudinal pendulum" does not swing as far to the positive side of the spectrum as most educational technologists might like and many still remain sceptical of the value of technology.

Teachers often feel apprehensive about technology because use of computers requires them to challenge their current role in the classroom (Earle, 2002; McKenzie,

2004; Zhao & Frank, 2003). When attempting a technology-based project, teachers may find themselves taking on roles they never before had to fulfil such as the role of instructional designer, trainer, collaborator, team coordinator, advisor, and monitoring/assessment specialist (McGhee & Kozma, 2003). They may also find themselves in the role of “student,” as many of the classroom pupils find themselves teaching the teacher how to use aspects of technology—an uncomfortable role for many teachers (Bowman, 2004). Although many of these roles may not be foreign to the teacher, the definition of these roles in regard to technology implementation may be.

It is seen that computer and technology related instructional tasks at times require teachers to confront their pedagogical beliefs as well. Whereas teachers who select tech based projects that closely align with their own personal pedagogical beliefs are much more likely to be successful. However there have been indications that this highly effective technology-enhanced environment need to be more student-centred and should be more widely centred on the needs and requirements of the students (Groff & Mouza, 2008).

Technology is present everywhere in education today, where Public schools in the United States spend more than \$3 Billion per year on digital each school now have at least a 1:5 ratio of Student to computer. The country is making major efforts in tandem with the federal government to ensure affordable high-speed internet long with online teaching resources are available to all schools across the board, even the most rural and remote schools.

To keep up with what’s changing (and what isn’t), observers must know where to look. There’s the booming ed-tech industry, with corporate titans and small start-ups alike vying for a slice of an \$8 billion-plus yearly market for hardware and software. Much attention is also paid to the “early adopters”—those districts, schools, and teachers who are making the most ingenious and effective uses of the new tools at their disposal.

There has been abundance of research clearly indication that despite the influx of the latest technologies in their classrooms, the teachers have been slow to incorporate these tools to transform their teaching methods.

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State and federal lawmakers, meanwhile, have wrestled in recent years with the reality that new technologies also present new challenges. The rise of “big data,” for example, has led to new concerns about how schools can keep sensitive student information private and secure. What follows is an overview of the big trends, opportunities, and concerns associated with classroom technology. Links to additional resources are included in each section for those who would like to dig deeper (Herold, 2016).

Having defined the influencers as well as the fluctuations when it comes to the implementation of technological tools in classrooms, there is a major factor that has not been mentioned or brought forward. This factor is that of a community/society along with the support of the parents of the school going children. It is not a secret that guardians/parents can be sources of major support for the use of technological aids to teach in the local school classroom and help assist in managing the operation of instructional material. They are an influencer that should not go lost and we should make all our efforts to maximise our by gain from parents volunteering and assisting in the facilitation of the deployment of tech-aids. This would not only have the parents more involved in the process but would also alleviate teachers of time consuming managerial tasks and focus all their energies on the students and their learning.

There is no debate that the possibilities enabled by technology for learning are endless. While at the same time we must also embrace the change, which is necessary to realize its rightful potential. With the widespread mass usage of applications and various devices we must aim to build the understanding and ability of all the teachers/administration so they can serve as stewards of student data so that only those with the clearance for the data can access it. Furthermore, we need to ensure to find a creative way to solve the problem of connectivity between learner’s homes so that the learning made possible in connected schools does not come to a halt when the students leave for the day

The US department of Education is of the opinion that we should not only aim to bridge the digital divide in schools and homes across the board but also should work

towards building educator to take part in new and transforming learning experiences with the new and upcoming technological aids (Education, 2017).

2.5 Educational Technology in Developing Countries

Unfortunately, Pakistan has not been able to stay abreast of this trend. Government of Pakistan admits that its educational policies were “not producing the desired educational results and the performance remained deficient in several key aspects including access, quality and equity of educational opportunities” (Education, 2009). This report identifies two major deficiencies in Pakistan’s education system; lack of access and low quality (Education, 2009). Pakistan government has been trying to improve both access to and quality of education in the higher education sector. Allama Iqbal Open University was set up with the vision of enabling access to education through distance learning programs. Many years later, Virtual University was established to use technology to provide distance learning and to improve education quality. However, this effort has not effectively trickled down to school education as yet.

Research has indicated that ICT when integrated correctly can help in enhancing students’ knowledge, learning outcomes as well as polishing their critical thinking skills (Kozma, 2005; Webb & Cox, 2004). However, there seems to exist a wide gap between developed countries who are effectively utilizing technology for improving education in contrast to developing countries which hinders developing countries to fully utilize the benefits of education technology. An important barrier that explains this ‘digital divide’ is that of access. According to a report by the U.S State Department (Larson, 2000) approximately out of the 275 million at the end of the 20th Century, barely a quarter of them resided outside of North America and Europe. A reason for this decline is said to be that developing countries need to resolve issues of teacher preparation, student learning outcomes, curriculum, assessment and pedagogy before they start emphasizing upon the use of technology in their respective education ecosystems.

In order to curb this gap, the World Bank at the end of the 20th Century launched its World Links for Development or the ‘WorLD’ project which emphasized upon improving

education in developing countries through the use of technology. Through their trainings WorLD teachers and students were more like to engage in the use of computers to participate in class room activities such as data gathering, research as well as the exchange of information (Kozma & Mcghee, 1999).

With the case of developing countries, we can see numerous examples where technology has been used to improve upon the aspect of governance as well as service delivery in the realm of education. For example, in Pakistan's Punjab province, in 2017 the School Education Department collaborated with Punjab Information Technology Board (PITB) to develop a tablet-based School Information System (SIS) that allows schools to self-report data on a real-time basis. In this regard, all the schools have been provided tablets to record detailed information about students such as the CNIC number of parent/guardian, their phone numbers, date of birth, enrolment year and current grade. Advancements are currently being made in the app to generate real-time reports, send SMS alerts to parents, and track attendance (PMIU, 2017).

In order to show how data and use of technology has played a role in evidence based decision making the Government of Punjab's School Education Department and its affiliated organizations all have developed data structures to document their proceedings; Monthly Monitoring reports, Annual School Census, Literacy and Numeracy, exam results, teacher training data, PEF data and the Student Information System are some of the data streams currently part of the School Education Department. As a management tool, data is utilized as powerful resource for key policymakers and implementers to improve student learning, reduce educational disparities and make reforms aimed at increasing the overall access to and quality of education (Punjab Education Sector Plan, 2017).

2.6 Quality of Public Schools in Punjab

In 2010, the state of Pakistan announced that the 'State shall provide free and compulsory education to all children of the age of five to sixteen years'. Four years later a pledge was made with regards to the Sustainable Development Goals of quality education while ensuring that 'inclusive and equitable quality education as well as the promotion of

lifelong learning opportunities for all'. For the sake of this thesis, the quality of public schools in Punjab will be based on key performance indicators related to access, learning and governance.

With regards to access, according to a recent data based on the Nielsen Report (2017), the population of Punjab has around 10 million children enrolled in public schools. According to another report by PEF, total enrolment in public schools is 12.3 million (PEF, 2017). Participation rate of 5-9 year olds has increased to over 90% from 85% in a period of six years (PSES, 2017; PMIU Data, 2017). Basic school facilities in schools have increased to over 96% from an average of 75% in six years (PITB, 2017). In order to curb the problem of a widening gap of males being enrolled in schools as compared to females the enrolment ratio has improved to 0.93 from 0.89, and rural/urban PR gap has reduced to 4.6% from 10.3% in six years (PMIU Data, 2017). The enabling environment has prospered through the establishment of the Project Management Implementation Unit, merger of Punjab Education Commission and PEAC. The introduction of District Education Assistants (DEAs) has helped in strengthening local delivery setups since 2015. The use of data is a critical tool utilized by the Government of Punjab as their data systems indicate that around 95% of total enrolled students are now registered on the system.

Yet at the same time, data and statistics indicate that are still around 4.8 million out of school children across primary and secondary education out of which 2.5 million individuals belong to the Southern districts of Punjab which historically has been an area lagging behind development indicators compared to the Northern region of Punjab. Data by PMIU (2017) shows that approximately 46% of children enrolled in Grade 1 drop out before completing school. With regards to the construction of schools, an estimated 1000 government schools have been built during the period of 2006 and 2016. For the past 5 years, the Government set up a target of establishing 36000 classrooms however only 3000 classrooms have been built compared to their initial target.

Access is further hindered through a weak leadership as around 78% of school heads and principals have less than 1 week of formal training, tenure of an education

manager is less than 1 year leading issues in continuity as a considerable reliance on external technical support (PEF, 2017)

If we concentrate on the aspect of learning, then it is observed that the biggest challenge in public schools in Punjab is that of student learning outcomes (SLOs). According to a report (Saber SD, 2018), 43% of Grade 5 students cannot read a sentence, 40% of Grade 5 students cannot perform 2 digit division. If we look at the side of teaching quality then 48% of Grade 1-7 teachers do not have minimum knowledge of curriculum content (ASER), 53% of Grade 4 teachers do not have minimum pedagogical knowledge, 56% of primary and middle school teachers fail to meet basic English standard and 75% primary schools have less than one class per grade making teaching a major challenge in a multi-grade setting where as emphasis is placed upon rote learning rather than instilling critical thinking amongst students. (ASER).

The largest province of Pakistan is Punjab which has a population of around 110 million. Punjab consists of 52,000 public sector schools and has enrolled approximately 12,268,981 students. Teachers employed in public schools is over 403,172 teachers. It can be said that Punjab is the largest sub-national education system of Pakistan (Punjab Annual School Census, 2017).

Punjab also has the highest participation rate amongst all other provinces in Pakistan as well as the lowest gender disparity with regards to access to education in the country (ASER Report, 2017). Also in terms of educational achievements, Punjab has been able to introduce key initiatives including Farog-e-Taleem fund, the Zewar-e-Taleem Program as well as the Brick Kiln Initiative. In the past few years, Punjab has also been able to revolutionize education in the public sector through the introduction of merit based recruitment of teachers, introduction of data and use of technology which includes real time monitoring of schools. Decisions for the future of education are based on data-driven methodologies and approaches as well as the provision of financial autonomy to schools through non-salary budgets. There has also been an increase in Public Private Partnerships through strengthening of the Punjab Education Foundation (PEF) as well as the creation of

Early Childhood Education (ECE) classrooms. These are some of the well-known initiatives taken by the Government of Punjab to improve, access, learning and governance in the public sector in Punjab, Pakistan.

According to a UNESCO report in 2011, it can be said that around 90% of the households who were part of the sample have access to public schools within a distance of 2 kilometers (UNESCO Report, 2011). If we divide this into rural and urban areas then it is observed that in 2011, around 91% of schools in rural areas were at a distance of 2 kilometers or less compared to 96% in urban areas. Although it is interesting to observe that according to the data (MICS, 2011), households which belong to the poorest quartile of wealth are less likely to have governments schools nearby for example it has been calculated that boys have access at 83% and girls at 78%.

If we examine factors such as the Gender Parity Index in Punjab then it is investigated that net enrolment for primary school is 0.98 which illustrates that more boys attend primary government schools than girls (MICS, 2016). With regards to middle and secondary education the index stands at 0.94 which again indicates that for every 94 girls enrolled, there are 100 boys enrolled. The gender disparity widens in rural areas and is much more equal in urban areas especially major cities. It is also noted that Gender Parity Index increases significantly if the mother of the children has been educated as well as what quartile of the wealth quartile the individual resides in (UNESCO, 2011). If we compare the different districts of Punjab then it can be noted that GPI for primary school's value is more than one in districts such as Mandi Bahauddin, Faisalabad, Narowal, Lahore and Gujarat in which Narowal has a GPI of 1.12.

Similarly, in the case of secondary schools, districts such as Gujranwala, Sialkot, Narowal and Lahore have more than one GPI which indicates that in certain districts the participation rate of girls is higher than boys. Furthermore, if we dive deeper in the data then it is found that approximately 29% of children of the age bracket 10-14 years old are able to attend middle or secondary school which portrays that the rest of the 71% either

dropped out, they are not currently enrolled in any school institution or are still enrolled in primary schooling (MICS, 2007, PSLM 2010-11).

While comparing urban areas with rural areas it is observed that in rural areas more children attend government school (69%) where as enrolment in private schools is at 30% (MICS 2007). Another interesting observation was that mothers who had access to education till middle or higher education were more likely to send their offspring to private schools rather than government schools compared with mothers who only had primary education or no education. It can be said that the type of school in which a child is enrolled in heavily dependent upon the wealth quartile, the individual resides in. The higher the individual or family is on the wealth quartile index, the more likely it is for the child to be enrolled in an expensive private school. For example, in urban areas such as Lahore, Gujranwala, Sialkot and Faisalabad it is noted that more children attend private schools as compared to government schools (PSLM 2010-11).

If we observe the gross primary attendance in government schools, then the average GAR in Punjab is approximately 97%. Gross Primary Attendance Rate can be defined as the number of children of all ages which attend primary school as a percentage of the total number of children of primary school age which is 5-9 years old. (Punjab Development Statistics, 2011). The rate of 97% obviously varies across districts and is dependent upon number of indicators such as gender, education level of the mother, wealth index, district as well as the area of residence. It can be said that boys have a higher rate as compared to girls in urban areas as well as rural areas as it is 102% of boys compared to 93% of girls in rural areas. Hence the conclusion can be said that regardless of urban or rural area, more boys attend schools at the primary level.

The level of Gross Primary Attendance rate in Public schools depends heavily on the wealth index as it is 62% in the lowest quartile and 113% in the highest. The data indicates that approximately 43% of children in Punjab who are of primary school level are able to attend primary or secondary schools and attendance rates are lowest of children which is approximately 19% perhaps due to the prevailing idea in Punjab that most children attend primary school at the age of 6 rather than 5 (Punjab Development Statistics, 2011).

To improve indicators in learning of children in Public schools, the Government of Punjab undertook various transformative changes which included restructuring, strengthening of formative assessments as well as increase in governance and institutional coordination (UNESCO, 2012). For example, in 2010, the Government of Punjab tried to restructure its Boards of Intermediate and Secondary Education as well as the Punjab Examination Commission. It is surprising to note that in the education system of Punjab, there was no institutional body which oversaw assessment of student learning outcomes from children from Grade 1 – 9 by an external body or a third party institution. It was only at Grade 9 that there existed an external body which would assess the student learning outcome of students. In order to counter this, the Government of Punjab introduced the creation of the Punjab Education Commission. The aim of the Punjab Examination Commission (PEC) is to assess learning outcomes of students who are enrolled in the earlier stages of education such as Primary as well as elementary education. The result is tabulated by PEC school wise as well as subject wise. A feedback loop and mechanism is also prevalent in PEC which helps the Government's School Education Department to not only strengthen its existing policy but also identify gaps and then come up with solutions to improve student learning outcomes in the province. Due to the formation of PEC, now it is mandatory and essential for all students enrolled in Grade 5 as well as Grade 8 to be part of the PEC examination regardless whether the individual is present in a Government, Private or Public-Private Partnership school.

The Government of Punjab also recognized that provision of textbooks is an important indicator for supply side inputs. A rigorous revision of the existing curriculum and syllabus had to be made with special emphasis and focus to be placed on the methodology. For this reason the Punjab Curriculum Textbook Board was assigned the important task of revising the existing curriculum while keeping in mind skills that students should be equipped with in the 21st Century as well as the introduction of modern techniques for not only compilation but printing of books as well. Through engagement with multiple stakeholders which includes mentorship and guidance from esteemed academicians the Government of

Punjab has made a serious effort in improving the quality of education in Public Schools in Punjab (PCTB, 2013).

An important aspect that needs to be analyzed while observing the quality of public schools in Punjab is effective Monitoring and Evaluation (M&E). The province of Punjab with the help of School Education Department has been able to introduce a robust system of monitoring and evaluation to ensure that the education sector, public schools are on track with their objectives and targets for the year. This has essentially been done through the establishment of Project Monitoring Implementation Unit (PMIU) for the sake of M&E in the education realm in Punjab. This has led to the creation of District Monitoring Officers (DMOs) who directly report to PMIU while incorporating District Monitoring Officers in the loop. The aim of DMOs is to monitor the attendance rate of teachers, how many teachers are present, distribution of textbooks, stipends as well as overall implementation of the vision outlined by the School Education Department, Punjab (PMIU, 2015). DMOs are also responsible for organizing workshops to improve professional development of teachers in the province. Through a data driven approach, the M&E arm of the Government of Punjab has succeeded in effectively monitoring reports at district and the provincial level and the implementation arm of the Government which is the PMIU ensures that all projects are on track and aligned with the objectives outlined.

However, it is to be stated that learning in public schools across Punjab varies according to schools present within a certain district as compared to schools within districts (Andrabi, 2012). The existing gap between districts is smaller compared to the gap that could exist within districts perhaps due to various factors related to area of residence, use of technology, level of infrastructure etc. (Andrabi, 2012). According to the study there are various school level factors that could explain this divide when observing the data at the sub-Tehsil or 'Markaz' level.

It is stated that despite 97% of Gross Attendance Rate in Punjab, learning outcomes of students in Public schools are still of poor quality and the student is not only disengaged

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with the existing method of learning but is also dropping out. According to a study, the result from PEC examinations suggest that in the field of Mathematics, none of the 1.2 million students who appeared in the grade 5 exam for Mathematics were able to achieve a perfect score of 100 in which 50% of the students who were enrolled in public scores got a score which was less than 39-40 marks and at least one in every five students scored less than 26. This indicates that in public schools even after 6 formative years of assessment, the students failed to build adequate understanding of numerical concepts which indicates a huge failure on part of public schools in improving the quality of education in the province (Andrabi, 2012). However at the same time when closely observing the data it can be said that not all government schools perform poorly. The PEC data consists of 49,983 public schools which were analyzed and are classified by district, tehsil and markaz in which the school is located. In order to determine the level of variance of performance of government schools is to analyze it through scores attained in the various administrative regions. Given that Punjab has around more than 130 Tehsils which are divided amongst 36 districts it is natural to assume that variances in terms of education will exist yet data by the study indicates that there is less difference of scores between districts or tehsils but the bigger difference exists in schools which are located in the same administrative unit (Andrabi, 2012).

Furthermore in 2010, the state of Pakistan announced that the ‘State shall provide free and compulsory education to all children of the age of five to sixteen years’. After this a similar pledge was made for Sustainable Development Goals of promoting quality education which calls for ‘inclusive and equitable quality education as well as the promotion of lifelong learning opportunities for all’. For the sake of this thesis, the quality of public schools in Punjab will be based on key performance indicators related to access, learning and governance.

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Access is further hindered through a weak leadership as around 78% of school heads and principals have less than 1 week of formal training, tenure of an education manager is less than 1 year leading issues in continuity as a considerable reliance on external technical support (PEF, 2017)

2.7 Quality of Private Schools in Punjab

The growth of private schooling in Pakistan is in part a response to an increasing demand for education from a rapidly expanding school-age population, as well as a reflection of the public sector's lack of capacity to attract and provide education for all of these potential students (ILM IDEAS, 2014). The number of private schools has multiplied at a much faster rate than the number of public sector schools. Between 1999–2000 and 2007–08, the number of private schools increased by 69 percent, as compared with a mere 8 percent increase in the number of government schools (I-SAPS, 2010). Most of this growth has been in LFPS, which now account for 30 percent of total enrollment (Government of Pakistan, 2014).

Private schools operate at different levels and offer services to all socio-economic segments and all areas of Pakistan. The private school sector is represented through a huge network which has differing and unique operational models. It can be said that private schools in Punjab range from schools catered exclusively to the elite class as well as large segments of schools devoted to catering education to lower-middle class, upper-middle class as well as the elites (ILM, IDEAS, 2014). There is a huge provision of low fee private schools which charge a nominal fee for students who wish to be enrolled for example their range could be between PKR 20 (\$0.14) to PKR 3000 (\$21.8) per month (ILM, IDEAS, 2014).

For the past ten years, the private education sector while placing emphasis on the primary school level of education has faced an exponential growth rate. It is considered as one of the fastest growing subsectors in the education ecosphere in Pakistan. Across the country there are apparently more than 70,000 low fee private schools and this sector provides a significant percentage of primary schooling to the population especially in the province of Punjab (Ibid.). Through a huge influx of foreign funds from organizations such as the World Bank, DFID and UNESCO the Government of Punjab alongside the School Education Department Punjab has been able to come up with a comprehensive framework of Low Fee Private Schools to be included in the Government's agenda of promoting public-private-partnerships in the education ecosphere in the province.

Majority of the private schools in Pakistan have a system of Franchising. Education Franchising through which these schools are able to have benefits in terms of curriculum, quality control, management, leadership, use of latest technology and methodologies (Frazer & Weaven, 2004). For example in Pakistan, 'The Educators School' has around more than 700+ campuses in more than 200 cities in Pakistan (Perrigot & Warraich, 2016).

At the same time, the quality of education in private schools is a widely debated issue (Elacqua, Contreras & Salazar, 2007). Proponents argue that increasing the size of school operations not only allows schools to reap from economies of scale which minimizes their cost but also gives them plenty of resources for improving school level facilities (Chubb, 2001). Furthermore private schools have the potential to yield more efficiency and benefit than the government schools (Chubb, 2001).

If we observe private schooling in Pakistan through the lens of an input, process and output approach then the input would include the quality of teaching, quality of support services, infrastructure, provision of IT, supplementary teacher training documents as well as financial support (Iqbal, 2004). The processes should be seen from the lens of planning, delivery, monitoring and evaluation, feedback mechanism which will then lead to outcomes such as targets set for achieving learning outcomes, successful graduates in the labor market as well as alignment of all stakeholders (Bolaji & Ali, 2013).

2.8 Quality of PPP Schools in Punjab

According to the World Bank PPP can be defined as a long-term contract between a private party and a government entity, for providing a public asset or service, in which the private party bears significant risk and management responsibility, and remuneration is linked to performance" (PPP Knowledge Lab World Bank, 2010).

PPPs amalgamate and integrate skills of both the public and private sector as the risks and responsibilities are shared. Not only does this enable the government to benefit from the increase in expertise which is available from the private sector but allows the government to focus on implementation, policy, planning and regulation issues.

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The Government of Punjab, with support from donors such as the World Bank, has agreed to introduce low fee private schools in Public Private Partnership frameworks. Instead of propagating the creation of new private schools, private school stakeholders will be encouraged to participate in PPP modes of school governance especially the creation of low fee private schools. The province of Punjab has established this policy since 2016 and has been propagating PPP schools and their modalities through the Punjab Education Foundation (PEF). The organization is responsible for allocating and managing financing through private schools through the introduction of various initiatives such as fee vouchers as well as their flagship Foundation Assisted Schools program.

The Punjab Educational Foundation was established in 1991 through the Punjab Education Foundation Act of 1991 (PEF Act, 1991). During the period of 2000s, the Board of Directors created a new strategy to engage with the private sector which included providing better access to the poor through teacher training in districts and areas which were lagging behind in education as well as the provision of vouchers to marginalized households. According to statistics and data, the Foundation Assisted School program initiated by PEF led to a huge 720.5% increase in number of students enrolled in 2006 in contrast and comparison to 2005 which has a value of 8,573 students to 70,345 students in 2006 (PEF, 2009).

Recently the Punjab Education Foundation was revamped in 2016 and was restructured in order to promote this new vision of education especially to motivate efforts of the private sector in providing access of education to the poor and marginalized through public private partnerships. For this purpose, the Punjab Education Foundation (PEF) has been restructured for the promotion of education, especially to encourage and support the efforts of the private sector in providing education to the poor, through public private partnership. Currently, PEF has a total of 8,041 partner schools and is catering to the needs of 2,424,097 students. The main initiatives of these schools are the Foundation Assisted Schools, New School Program, Public School Support Program as well as the Education Voucher

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Scheme. The newer initiative out of this is the public school support program which involves management of low quality or low performing government schools to the private sector for better governance, management and administration of these schools.

In order to accomplish the objectives of the Sustainable Development Goals as well as the Millennium Development Goals it is important for the Government to engage with the private sector in order to improve service delivery in the province. In order to enrol estimated 10 million out of school Children in Punjab it is then imperative to collaborate with the Private Sector. It can be said that the Punjab Education Foundation has played a pivotal role in collaborating with private partners to alleviate the problems of education within the province. It has undertaken various initiatives such as the Foundation Assisted Schools (FAS), Continuous Professional Development Program (CPDP) as well as the Education Voucher Scheme (ADB, 2010).

The PPP mode allows financial and administrative support to be given by PEF whereas quality and academic leadership and management is offered by the school management. The FAS program has helped in alleviating stress of parents who have a higher disposable income due to the program, schools have better infrastructure as well as high quality teachers are hired. Through the program, Quality Assurance Tests are also conducted which keeps a check on quality standards that are being maintained in these schools. (Academic Development Unit, PEF, 2009).

The Continuous Professional Development Program is a PPP partnership which aims to increase student learning outcomes in low cost private schools through effective mentoring and capacity building for teachers. Effort is made to improve the pedagogy skills of teachers and increasing their capacity in their respective subjects.

The flagship program of PEF which is the Foundation Assisted Schools Scheme has alone has grown from just 54 schools and 8,573 students in 2005 to more than 1,300 schools and 529,000 students in 2009. Several key lessons can be drawn from the PEF experience with public-private partnership (PPP) programs. Firstly when working within demand-based

PPP programs, the private sector can be strongly pro-poor and can increase access to, and quality of, education while also enhancing gender equity. The PEF Act of 2004 mandated the foundation to encourage the participation in the PPPs of everyone who has a stake in the educational system; to provide funds for the expansion, improvement, and better management of private schools in the interest of offering quality education to the poor; and to provide technical assistance to low-tuition private schools for the testing of innovative programs, with replication in mind. This mission has been facilitated by the program development of the PEF and by service delivery through the PPPs. The PEF programs, based on PPP model, seek to promote affordable quality education and better access to education in Punjab on a sustainable basis, making it possible for poor students to perform better and stay in school longer. Projections for these programs are encouraging.

The PEF has been able to achieve its result through a cost effective operational model. Not only are their programs economic and efficient but in terms of service delivery are hitting the right indicators. It has won massive support from private schools as well as international donor agencies such as the Asian Development Bank, The World Bank as well as wide spread patronage and support from district, provincial and federal governments (Allah Baksh Malik, 2010). The unique nature of PPPs has started to give returns. Students who have been enrolled in PEF programs in private institutions show stark improvement compared to students enrolled in Government schools as measured by the scores they attained in their QATs. The FAS program has shown that high quality education can be achieved in a cost effective way through PPPs. Schools which are affiliated with PEF are now able to provide access to high quality education to the marginalized residents residing in urban as well as rural and suburban areas (Allah Baksh Malik, 2010). Comparing the success of students enrolled in the FAS program it is shown that students on average have scored higher every year on their respective QATS. The proportion of students scoring over 90% has almost risen from 1% to a remarkable 18% in a period of four years. More surprising is the element that the dropout rate in FAS partner schools is extremely low and almost zero which is an incredible accomplishment given the

fact that most studies estimate overall dropout rate in Pakistan schools to be around 40% by the end of Grade 4 and as high as 77% in Grade 10.

Through PPP frameworks, there is continuous professional development of teachers as well. It is said that through these programs teachers who are part of low fee private schools have been given the opportunity to progress and advance their professional skills. The Continuous Professional Development Program is an initiative which aims to not only improve the pedagogical skills of teachers but also improve their understanding in their respective subjective areas. This program ultimately not only benefits the teachers but helps in improving student learning outcomes amongst the students who are the ultimate winners in this context (Allah Baksh Malik, 2010). Rather than focusing on rote memorization, teachers and principals as well as vice principals are trained to ensure that new teaching methods are introduced and constant exertion and emphasis is placed on increasing authentic understanding for students compared to rote memorization. The success is shown from the fact that it has around 24,000 participants. The Public Private Partnership programs ensure that access is provided to even children residing in slums, it has played an important role in reducing the wide deficit that exists of educational outcomes of students belonging to different levels of wealth (Allah Baksh, 2010).

The flexibility offered in the Voucher programs and schools gives parents of these children a wide variety of choices for example they can opt their children out of a certain school and shift them to any other partner school available if they are not satisfied with the results that their children have been attained in one school. Not only does this wider autonomy increase the bargaining power of parents to put pressure on schools to perform better but it also keeps the administration accountable as they realize if the children leave the school then the available voucher funding will also be decreased for the school in question. The Voucher Scheme helps these schools by enhancing their student enrollment and retention.

The Teaching in Clusters by Subject Specialist program introduced through PPP modalities has helped in increasing the competencies and skills of teachers who are present in low fee

private schools in urban as well as rural areas. The aim of this program is to hire subject specialists who are given market based salaries. These specialists are allocated to low fee private schools and act as mentors for teachers in subject areas such as Mathematics, English and Science. Not only are these schools able to have access to a highly qualified staff which they could not afford in the first place but it has helped in increasing student learning outcomes (Allah Baksh, 2010).

Evidence on the benefits and impact of PPP in the realm of education is limited. Pakistan as a country struggles with the second largest population of out of school children in the world. It also has fewer girls enrolled in schools than boys as well as a weak emphasis on students with special needs such as those students who have disabilities as well as students belonging to the poorest and marginalized segments. On top of that issues of quality have always been a problem as well as problems of access and learning deficits. Even the amount allocated by the Government in the realm of education shows stagnant growth and is considered as one of the lowest levels in the world and much below the international benchmarks which have been set. Ultimately in this context, PPP schools in Pakistan especially in Punjab should be taken into account. And how PPPs play a vital part in improving access to children across Pakistan.

According to a recent study which had a sample size of 497 teachers, 57 percent had a grade 12 qualification or lower (Afridi, 2018). Schools also complained that PEF had failed to train these teachers during the past four, five years at least and there was a lack of teaching opportunities which contradicts the vision of PEF. Interviews suggest that teachers and principals were worried that the training received by them will not help in improving student learning outcomes and will not help in fulfilling the needs of students who hail from marginalized backgrounds especially in schools which have limited resources and infrastructure. The study suggests that problems were observed in the areas of curriculum, teaching as well as the quality of instruction. The use of QAT as an assessment tool was also criticized and was considered as weak. It was also reported that during teacher training, there was a reliance on rote memorization due to a high testing environment (Afridi, 2018).

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Also the study indicates that due to the gender imbalance in the market of teachers, for example, most of the teachers that are selected are females, this produces a wide disparity of salaries offered to these teachers. According to the study, the average monthly salary of teacher affiliated with PEF was calculated at around PKR 6000 (\$42) per month which is lower than that offered to a public school teacher. They were also being paid low due to other factors such as not having access to other jobs in the market and low level of mobility (Afridi, 2018).

2.9 Use of technology in Public schools

In developed countries such as the United States of America, widespread effort has been placed on utilizing technology in public schools. For example the Secretary of Education, Margaret Spellings in 2006 illustrated the need for Americans to be technically adept and numerically literate regardless of the occupation they chose in order to make informed decisions as well as advance in their careers (Spellings, 2006). Hence students at an early age should be exposed to technology in order to compete in competitive job markets both internationally as well as nationally (Basset, 2005).

In public schools' district and state governments present in the United States have been mandated to use technology for example in the Kaserlautern School District, all 750 Grade Teachers that existed in grades K-12 were given access to toolkits related to new technology that they could utilize in the classroom. This included provision of a SMART Board which is basically an interactive white board, a LCD Projector to show videos and multimedia to the students along with a laptop computer as well as a wireless keyboard and monitor. The aim of offering these provisions was that teachers will utilize these tools to improve test scores of students as well as their motivation to improve and engage in authentic learning practices. Research indicates that using technology increases the attention span of students due to its engaging and interactive nature (Young, 2008).

Across the developed world, technology is used in public schools to enhance student learning. For example, many schools use Internet access, interactive whiteboards, LCD projectors which complement and facilitate the curriculum of each respective school. Teachers are trained to have an understanding of basic word processing software such as Microsoft Word. Report compiled by the National Center for Education Statistics indicates that public schools have made stable and growing progress in its expansion of Internet access in instructional rooms (Honey, 2005).

2.10 Use of technology in Private Schools

It has been cited in various studies that technological innovation opens new avenues of innovation while instilling more demand for teachers and students to effectively collaborate with each other (Jung, 2005). Our investigation portrays that after going extensively through studies present in the British Education Communication and Technology Agency International Journal of Distance Education and E-Learning (Dec 2017) shows that the user's ability to use ICT technology is the greatest indicator of successful ICT integration in schools (National Council For Curriculum and Assessment UK, 2004). In developed countries, teachers are effectively implementing ICT usage in order to facilitate and progress the learning experience of their students (Davis, 2000). Introduction of ICT in private schools has helped in increasing teacher knowledge as well as allowed sharing of knowledge with other colleagues. This has led to the creation of knowledge groups in order to analyse education projects (UNESCO, 2002). The advantage of knowledge communities is that not only has it helped in opening up a new exciting avenue in the education sector where innovation is rampant (Davis, 2000) but it has allowed a positive role in effective implementation of ICT in the education sphere. In private schools it can be said that the conventional teaching model has altered. Initially the student was entirely and wholeheartedly dependent upon the teacher, the introduction of ICT has changed that as students now have the ability through ICT and the opportunity to develop their own individual research which helps in broadening perspectives and paradigms.

2.11 Use of technology in Public-Private Partnership (PPP) Schools

Since there exists a wide range of modalities related to PPP schools, it can be said that PPPs have the potential for increasing innovations in teaching and learning in both developed and developing countries. For example, in Bangladesh, various PPP projects utilize information technology in order to enhance quality and learning for example the Secondary Education Sector Investment Program includes training and learning programs that utilize ICTs in design and implementation of increasing learning outcomes for students.

ICT is also widely used in the design and implementation of PPP programs for example it helps in providing connectivity to the education sector through online educational services or the existence of web based applications which assist the teacher and the student as they have the ability and choice to customize their learning experience, this can be linked to increased engagement of the student with the curriculum and then helping increase student learning outcomes. Technology can also be used in PPP schools to manage these schools through the creation of a centralized management system such as having an education management information system, human resource database as well as a financial management system as well as establishment of communication systems to the relevant staff members and learners. ICT can also be utilized to provide learners with access to digital knowledge as well as the provision of courses through distance learning in order to meet the growing demand for education (Sarvi, 2015). At the same time, ICT can serve as a useful multiplier to promote benefits of education and enhance learning for all students and PPP framework provides the perfect platform to utilize this potential of ICT in order to deliver innovative educational services to all (Sarvi, 2015).

A famous PPP initiative that utilizes technology is the GILAS initiative which was introduced in Philippines. In public high schools it was observed that only 50% of the schools have computers and a meagre 6% has internet access. The initiative incorporates a consortium of companies that utilize their Corporate Social Responsibility Funds for the provision of ICT based technologies in public high schools by introducing state of the art computer technologies as well as internet access to all public high schools present in the Philippines. Apart from providing hardware and software, the program includes the

provision of free internet access for a period of one year as well as training of teachers. The training includes making teachers learn research and teaching methods that they could utilize through the internet as well as understanding of troubleshooting issues that may arise while using ICT (Sarvi, 2015).

In developing countries such as Pakistan, The Virtual University was established by the Government through PPP modalities. Its aim was the introduction of television and internet broadcasts on various education courses which were free. It constituted of 200 campuses across Pakistan in which 30 were operated by the public sector and the remainder of them are operated by private partners. Private partners are responsible for providing the campus building, computers, and a laboratory with computers installed according to VUP's specifications. The public partner provides the course material, examinations, and certification.

Another PPP model in which ICT was used has been Indonesia's collaboration with Intel. The partnership delivers professional development for teachers across ten cities. Intel has been providing the teacher training curriculum and the training, and Telkom Indonesia has been providing access to the necessary broadband and internet. MoEC has been providing certification for teachers once they have completed the training. The partnership has created 10,000 master teachers who, in turn, will train up to 50,000 other teachers in 61 cities by the end of 2015.

2.12 Role of Teachers in schools

Quite often, teachers have been criticised when it comes to reforming education (Cuban, 2001). Yet teachers remain one of the more influential personalities in any student's life. When it comes to the concept of using technology for teaching and learning purposes, teachers and the quality of instruction is automatically put under spotlight. Teaching in schools is not often a well-paid profession in Pakistan. Somehow, being a teacher in Pakistan does not earn the same respect from society that being a doctor, engineer or a successful entrepreneur does. George Bernard Shaw's famous quote seems to depict the

attitude of millions of Pakistanis towards teaching: “He who can, does; he who cannot; teaches.”

As far as the use of computers and technology is concerned, many teachers struggle to make the most optimum use of it. Access issues, insufficient technical support and strictly time bound time tables hinder the teachers’ ability to adapt and change (Sandholtz, et al., 1997). These problems were highlighted 18 years ago and one might believe that things would have improved by now. It is a yes and no situation. Yes, the teachers have generally become more comfortable with various forms of technology but technological advancements have rendered that expertise obsolete. Therefore, the new challenge for teachers is to keep learning the newer forms of technology so that whenever they are given access and technical support, they can use the available technology to aid and augment their teaching methods in order to promote students’ learning.

A teacher in the modern day classroom needs to realize that students’ might have different learning profiles and learning may not be constrained to one particular school of thought. It can be associative, constructive (individual or social), or even situative thus the teacher has to cater to the learning needs of all students (Mayes & Freitas, 2007). All of these learning styles have implications for learning, teaching, and assessment. For example an associative framework could use guided instruction and drill and practice whereas, constructivist framework would make use of cognitive scaffolding and experiential learning etc. (Mayes & Freitas, 2007). There are other ways of mapping learning models as well. One interesting way adds not only another perspective to this mapping but also a lot of depth. Conole et al. (2004) present a simple yet effective way of classifying different learning theories by placing them somewhere on this octahedron:

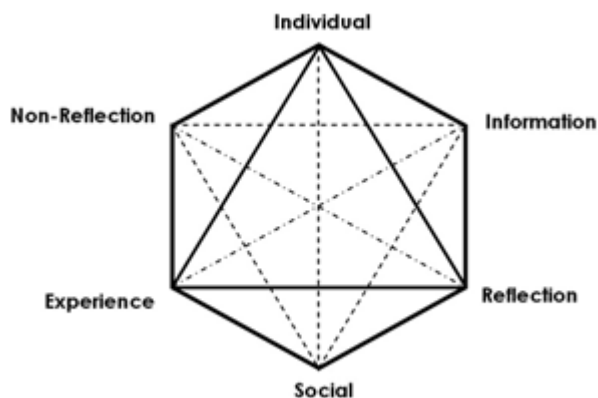


Figure 2.12 Octahedron for classifying different learning theories

Source: <http://www.cdtl.nus.edu.sg/brief/v10n2/sec6.htm>

Regardless of its simplicity the researcher foresees that teachers in Pakistan are not skilled or trained enough to even fully understand learning models let alone classify them on the octahedron. Therefore, one is inclined to think that it may not be the lack of knowledge that is hindering Pakistan's school education it may be the lack of preparedness to assimilate that knowledge, or a lack of willingness to explore knowledge, or a lack of resources to do both. There can be various reasons due to which schools and especially teachers are struggling to seamlessly incorporate technology into their teaching practice. Which is why this research pays special attention to a teacher's perspective on use of technology, especially teachers' preparedness and training to use technology meaningfully.

2.13 Teacher training in developed countries

Economic theory indicates that individuals with incredible academic and/or professional achievements are more likely to be good and effective teachers. The, "human capital theory," developed by Becker (1964), Schultz (1963), and Mincer (1962), proposes that employers should hire individuals with more schooling because additional education increases productivity by raising workers' ability to understand and use new information. In contrast, the "market signaling theory," developed by Spence (1974) and Arrow (1963), among others, proposes that, even if the education that potential employees acquire does

not raise their productivity, high-skilled individuals will pursue it to send a signal to their employers that they possess skills that others lack and deserve to be paid more (Vegas, 2013).

Both schools of thoughts have differences with regards to the reason of employing applicants who have higher credentials yet the similar and unifying goal of both theories is that both theories propose that attracting applicants with higher credentials will be beneficial in establishing a higher skilled teaching force. For example various studies in economics suggests that hiring top talent in the teaching sector could lead to a multiplier effect. Proponents claim that people's action will have an influence on their neighbor's incentives as well as information (Becker & Murphy, 2000) which manifests itself in various ways in the labor market (Montogamery, 1991). These effects can be categorized as social multiplier effects and these models illustrate the growing reason to accept that if the teaching sector is able to incentivize and in turn attract better qualified professionals with higher credentials then it would attract top tier candidates who had no considered the profession of teaching in the first place.

One manner by which instruction frameworks can pull in gifted people is by offering aggressive wages. As anyone might expect, market analysts have a great deal to state about the job of pay. Compensation serves two capacities: they designate work and give impetuses to worker exertion. (Akerlof 1982, Shapiro, Stiglitz, 1984). This, studies contend, is the motivation behind why firms looking to pull in exceptional competitors should need to pay their representatives an "efficiency wage," than what competitors offer. Studies, nonetheless, contended that organizations can maintain a strategic distance from a portion of the issues characteristic in efficiency compensation by paying their workers similar with their performance (Lazear and Rosen, 1981). This thought has as of late recaptured significance in the instruction writing. In particular, studies demonstrated that a "pay-for-percentile" approach, in which educators are remunerated for enhancements in the performance of their students in respect to peers with comparative accomplishment levels toward the start of the school year, boosts instructors to allot socially optimal levels of effort to all learners (Barlevy and Neal, 2011).

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This "panel data" enabled the researchers to observe a teachers adequacy and competence within the same school, grade, 16 and year over time and use combinations of FE to account for factors that confound the effect of certification. The impacts of teacher certificates were, in the best case scenario, little and not statistically significant. Indeed, in math, students allotted to instructors without a certification performed, by and large, no uniquely in contrast to peers allocated to certified teachers. However, these outcomes varied to some degree as indicated by the gathering of uncertified instructors to which generally certified teachers were analyzed. A potential clarification for the absence of impacts of accreditation in New York City might be that certification could serve as a better proxy and indicator for teacher quality at certain levels and in certain subjects when compared to others or the idea that the quality of teacher certification in places such as New York is not strong enough to indicate the effectiveness of teacher effectiveness. This would suggest that teacher accreditation ought to be made more stringent as opposed to surrender inside and out.

This is what a study by Clotfelter, Ladd, and Vigdor (2007) in North Carolina suggested. Studies have measured the predictive effect of a number of teacher qualifications which includes teacher certification and its impact on student learning outcomes at the high school level from a data from the timeframe 1999 – 2002 (Clotfelter, Ladd and Vigdor, 2007). The study estimated that collaborators found that having a teacher with an alternative certification reduces student achievement by .06 of a standard deviation, and that having a teacher with a certification that is neither traditional nor alternative negatively affects student achievement by .05 of a standard deviation.

One manner by which instruction frameworks have tried to improve learners and teacher training is by offering instructors progressively organized rules for their classroom work. One intervention in the United States that offers framework for educators is "Accomplishment for All" (SFA), a program with an exceptionally organized school-wide educational modules that employments books, occasionally regroups learners crosswise

over age and grade limits, furthermore, expects understudies to take part in perusing at class. In 2000, the SFA was assessed using a Randomized Control Trial (Borman et al, 2007). In which the authors randomly assigned 41 high poverty schools into a grade K-2 SFA treatment or a grade 3-5 SFA treatment in which the group comprised of kindergarten and first grade students. The conclusion of the study was that the program had a positive impact on literacy learning and outcomes with a 0.21 standard deviation on aspects such as passage comprehension and 0.33 standard deviation on the word attack measure. This illustrates and indicates that a change in expectations in schools that primarily cater to disadvantaged and marginalized children can affect achievement through making teachers job more bearable and manageable.

Countries such as the United States has experimented with policies that expand the school day and year, and the results of these interventions are encouraging. A study in which a program which provided academic instructing, enrichment activities and mentoring after school and during the summer to teachers and students. The program helped in raising students test scores by .09 standard deviation in English and 0.12 in math by the end of the second year (Linden, Herrera and Grossman, 2001)

If we look at the case of Australia then it can be said that approximately 25% of the aid budget of Australia which amounts to \$1,158 million in 2013-14 was spent on education in which a considerable amount was allocated on teacher development and improving teacher quality. Furthermore a study which comprised of 30 countries, it was found that salaries of experienced teachers in contrast to other professions are the main distinction which distinguishes countries with higher student achievement (Akiba, Chiu, Shimizu and Liang, 2012). Consistent with another study (Carnoy, Beteille, Brodziak, Loyalka, 2009), found that even when other factors, such as student background, are controlled for, students with male teachers do better on mathematics tests in countries where those teachers are paid more relative to males' salaries in competing professions (similar level of education who are employed or trained as scientists). The finding does not apply to female teachers. There is no correlation between competitive wages and increased student mathematics scores.

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Teacher salaries in Chinese Taipei, Korea and Singapore—all high-performing countries in PISA tests—are among the highest in the world (OECD, 2011). The evidence indicates that policies have created a strong incentive among high qualified graduates in those countries to pursue teaching profession (Ingvarson et al., 2013, p. 155). Tatto, Krajcik & Pippin (2013, p. 34) through offering a competitive market based salary has helped in the improvement of learning outcome for students. In some countries teachers' salary is as high or on par with that of other civil servants (Carnoy et al., 2009; Mourshed, Chijioke & Barber, 2010; OECD, 2011).

Most high-performing countries provide assured and promising career paths that attract people of higher credentials to a career in teaching. In most education systems teachers can be promoted to the position of a principal and other leadership positions, but in addition to these 'vertical' promotion opportunities, a growing number of successful systems offer 'horizontal' promotion positions allowing teachers to remain more closely connected to the classroom (Darling-Hammond, 2010). In Singapore, career paths are defined, well remunerated and matched to teacher interests. Teachers may choose between master-teacher, curriculum developer and school leader positions (OECD, 2011).

In Finland, Shanghai it is observed that that compared to Australia's 20 hours per week time of face to face teaching, Finland and Shanghai have approximately a 10-12 hours of face to face teaching per week (Jensen, Hunter, Sonneman & Burns, 2012). This allows the creation of more professional interaction, engagement, planning and monitoring areas such as student motivation and achievement (Barber & Mourshed, 2007; Morris & Patterso, 2013). These benefits only mount up in systems where there is an understanding that teacher work time includes duties that support their face-to-face instruction.

In effective education systems, all instructors show high level scholastic and expert learning and abilities picked up in thorough, pertinent, tertiary level degree programs. In Canada, teacher educators complete somewhere around four years of tertiary study before

being presented a Bachelor of Education (B.Ed) degree. On the off chance that they have a degree in a scholarly claim to fame outside of instruction, they are required to accomplish the B.Ed. Those with multiyear scholastic degrees in a zone outside of instruction can secure their training degree in a couple of years.

In Germany, where PISA results are presently appearing, all participants to educator instruction courses are required to have passed a requesting Abitur or registration examination, after which they consider for a long time in an underlying 'scholarly' stage and afterward two years in an 'academic' stage amid which they work in schools for more often than not (Blömeke, Suhl, Kaiser and Döhrmann, 2012; König and Blömeke, 2013; OECD, 2011). In Finland, instructor teaching degrees are 'academic' in that they are firmly research and proof based. Each understudy finishes a Masters' certificate proposal in training or the subjects they will instruct. Fruitful consummation for the most part takes somewhere in the range of five and seven years (Sahlberg, 2011a). In Singapore, postgraduate Diplomas in Education are granted following four years of qualification study and one year of academic preparing. The framework additionally offers a non-graduate, two-year confirmation program for essential instructors, and simultaneous degree programs. In 2001, these were situated as four-year Bachelor of Arts (Education) and Bachelor of Science (Education) with a fifth discretionary year in a subject order (Schwille, Ingvarson and Holdgreve-Resendez, 2013).

In Chinese Taipei, most teachers graduate with a Bachelor's Degree before they attempt the practicum. They at that point function as understudies at an essential or optional school for in any event a large portion of a-year under the supervision of a coach (Hsieh, Wong and Wang, 2013) Other nations that perform well or respectably well in worldwide trial of understudy accomplishment, for example, Australia, France, Israel, Scotland, United Kingdom and United States, all require their educators to have tertiary level academic and proficient capabilities. Self-evaluation of teacher training classes by the competent organization is an integral part of most accreditation and quality confirmation processes.

In Japan, every teacher training organization must lead a self-assessment before the accreditation procedure that happens on a yearly basis. Outside accreditations are directed

by the Japan Institution for Higher Education Evaluation (Tatto et al., 2013). Under the Teacher Education Act of 2002 and the Teacher Enforcement Rules of 1995, Chinese Taipei has quality control components at each phase of instructor training, from determination through to affirmation. Hong Kong and South Korea utilize accreditation schemes like those of Japan. In Hong Kong, self-assessment must incorporate input from staff, teachers and past outside analysts (Tatto et al., 2013). In South Korea, budgetary help and managerial choices are attached to the assessments which incorporate a site assessment led by a group from the Ministry of Education, Science and Technology (Tatto et al., 2013).

2.14 Teacher training in developing countries

An inquiry and investigation of the literature indicates that few developing countries have implemented effective policies and strategies or programs that are in line with the international evidence for attracting, recruiting, developing and retaining sufficient numbers of quality teachers. This is largely a fiscal problem, given that 'ensuring an adequate supply of quality teachers requires monetary resources that many countries do not presently have and are unlikely to get in the near future' (Mulkeen, Chapman, DeJaeghere & Leu, 2007).

Schwille, Dembélé and Schubert (2007, p. 41) point out that, especially in developing countries, the pool of prospective applicants to teaching is 'far from optimal'. The VSO Report explores qualitative data from places such as Malawi, Papua New Guinea and Zambia where they argue that due to the weak salary structure of teachers, the fact that the teachers are underpaid or their salary is delayed, all these factors make the profession of teachers unattractive an career option (VSO Report, 2002). Also in these countries it was observed that teachers also do not have support from the bureaucracy nor a proper forum where their grievances can be addressed and solved. Due to this the attrition rates are quite high and the turnover is constant. All of these factors ultimately lead to the decline in the status of the teaching profession (VSO Report, 2002).

The greatest obstacle for developing policies that require all teachers to have tertiary level formal academic and teacher education qualifications is the huge quantities of teachers required by systems of mass education. A study indicates that this is true of

resource scarce countries (Schwille, 2007). Bernard, Tiyab and Vianou have stated that if all of the anticipated 180 million children in Africa are in school by 2015, the continent will need 4 million teachers to be working in public schools at that time. The resources and costs of putting 4 million people through an extended formal tertiary level program are immense and, certainly in the shorter term, the associated problems insurmountable. Lewin & Stuart (2002), on the basis of their study of teacher education costs in four countries, concluded that, in many countries, targets for universal enrolments and student–teacher ratios could not be achieved with conventional tertiary teacher preparation programs of up to three years.

There are more stringent assessment of initiatives that increase the support provided to teachers in developing countries, where teacher capacity tends to be much lower. Two recent studies conducted in India used a Randomized Control Trial to assess an intervention designed to teach English through flashcards or a specially designed machine (Linden and Macleod, 2007). The results indicated that when flashcards or a machine is used, both interventions increase the score in English achievement by 0.30 standard deviation and the intervention as quite successful with students who poorly performed in English. The program also helped in increasing the math scores of students and hence it has been suggested in the study that it is important to invest in improving a teacher’s pedagogy rather than finding an alternative for it.

The other study in India indicates that support could yield beneficial results if simple interventions are introduced in changing teacher pedagogy however the low competence and capacity of certain teachers in schools might limit the impact of the intervention especially to which more complex changes can be attained (Linden and Macleod, 2009). The study randomly assigned learners in preschools, primary schools as well as standalone reading classes in which programs either changed the reading curriculum or provided innovative and new activities to teachers or no treatment at all. The program had beneficial impact as it improved reading scores of learners by 0.26 standard deviation and its substantial benefit could be seen from pre-school as well as low-performing students. However, this intervention also concludes that out of school hours support is more effective than the support given during school time.

In developing countries such as Philippines, a study randomly assigned fourth grade students and categorized them in a treatment group that had inputs such as in service training for teachers, reading marathon and reading materials as well as a control group which did not receive any part of the intervention (Abeberese, Kumler and Linden, 2011). The program concluded after a one month observation that number of books student read increased from 2.3 to 9.5 points and students reading scores also increased by 0.13 of a standard deviation. Furthermore these effects stayed constant over time as it was found that after three months of reading, students who were part of the treatment group still read more books than those present in the control group.

Another study utilized the advantage of the reality that students and teachers were tested in the same year on two subjects to ascertain whether the same student taught by the same teacher in two diverse subjects was able to perform better in one of the two subjects if the teacher's knowledge was more in that subject (Meltzer and Woessman, 2010). Fixed Effects were used in the model like within teacher and within student variation in student outcomes. Factors which were controlled were the fixed characteristics of students, subjects and teachers. The study indicated that subject knowledge of the teacher impacts student achievement for example a one standard deviation increase in teacher test scores allegedly increases a student test score and learning outcome by 0.10 standard deviation units. This illustrates that if a student has a teacher which has more subject knowledge on the subject being taught for example from a teacher which had 5th percentile distribution of subject knowledge to 60th percentile, this would help in increasing students learning outcome and test scores 0.17 standard deviation by the end of the year.

Teacher shortages have always been a supply side phenomenon. In order to address these gaps especially in areas which lag behind and are disadvantaged due to weak infrastructure, inadequate resources and allocation of budget, some countries have decided to hire teachers on limited term contracts (UNESCO, 2007) rather than having a permanent civil servant jobs which are often negotiated through teacher unions. Studies indicate that some of the benefits of contract teachers are flexibility as teacher shortages are easily addressed through this intervention (UNESCO, 2007).

The report also suggests that there might be an increase in the performance of poor performing students however the evidence is not statistically significant (UNESCO, 2007). It also suggests these measures can be cost effective in nature however the study does not take into account hidden costs that can be accrued when hiring teachers on a short term contract (Bruns, Filmer, 2011). Furthermore other research indicates that short term contracts are beneficial for the teacher as well due to the flexible nature of the contract for example teaching could be part time (Bruns and Filmer, 2011).

At the same time since the school management or parent committees will be responsible for the hiring process, studies indicate that using contract teachers can also enable close monitoring of absenteeism and teacher performance which will have an effect eventually on student performance (Duflo and Kremer, 2011; Kremer and Holla, 2009; OECD, 2011). Furthermore it is necessary to engage and amalgamate contract teachers into the teaching force in order to avoid issues of attrition (UNESCO, 2007). On the other hand, it may be necessary to integrate contract teachers into the teaching force to avoid attrition (UNESCO, 2007a). It is noted that competent and qualified candidates will only agree to a contract if they have an expectation that their pay will get better in the future or there will be a good chance of promotion which also makes it difficult for qualified candidates to work for less (Bruns, Filmer and Patrinos, 2011).

Another argument is that the existence of contract teachers in the teachers pool results in demoralization of the teaching force and instead a better alternative would be to emphasize upon improving conditions of teachers who have been hired on a permanent basis (UNESCO, 2007a).

Continuous improvement in teacher education is seen an important indicator in improving education as well as supporting teachers (SABER, 2012; Westbrook, 2013; Hardman and Abrishamianc, 2011; OECD, 2011; UNESCO, 2013; UNESCO 2007). Accomplished teachers also need to improve themselves and adapt to changing circumstances due to an ever changing context in terms of student population as well as curriculum. Teachers need to be prepared for all sorts of new challenges in the 21st Century.

The above mentioned studies highlight the significance of continuous and ongoing teacher education especially in developing countries or places in Sub Saharan Africa where

it is known that pre service education is devoid or of insufficient quality (UNESCO, 2007a). Studies suggest that teachers in East Africa are dependent upon choral lessons as well as recitation and memorization of factual information (Nag et al, 2014). For example countries like Uganda and Kenya, the fact that English is forced to be the main language for primary school instruction also creates significant communication issues that affect learning and weaken student learning outcomes (Hardman et al., 2011).

This is an important area for in-service support and the effective strategies that have been illustrated in various studies include the formation of a systematic long term approach as it is considered that ‘one-off’ or short term interventions are rarely effective and the strategies need to be sustainable for the future (Timperley et al., 2007; Hardman, 2011). These long term strategies should include modelling effective practices in activities undertaken during teacher development (OECD, 2011; Nag et al., 2014; SABER, 2012; Timperley et al., 2007) as well as peer collaboration and engagement with relevant stakeholders which should encompass research, peer observation, collaborative learning, assessment and analysis and this engagement should be conducted in schools as well as the wider education ecosphere network (Westbrook et al., 2013; OECD 2011; SABER, 2012; Timperley et al., 2007).

An effective feedback loop mechanism as well as a follow up should also be present in the classroom in order for teachers to figure out the impact they are making on students on their motivation and learning outcomes (Westbrook et al., 2013; SABER, 2012; Timperley et al., 2007). Many countries are now experimenting with different sorts of intervention which includes the use of ICT and distance learning approaches which run parallel with face to face teaching and mentoring (Hardman et al., 2011; SABER 2012; UNESCO, 2007b; UNESCO, 2013)

2.15 Teacher training in Pakistan

Socio-economic development of a country is directly linked with the quality of its human resource. While a number of factors impact student learning outcomes, research evidence shows that quality of teachers is one of the most important factors in improvement of student learning levels. In order to improve learning outcomes, the School Education

Department of Punjab has introduced various diverse policies for the effective management of its human resource. In 2013 for example, the government of Punjab School Education Department introduced a teacher rationalization policy that reallocated the existing pool of teachers to schools where there was a scarcity of teaching staff or where staff was not present. The department also introduced a new merit based teacher recruitment policy in the same year to formalize the recruitment of new teachers on high merit.

Over the last few years, Punjab has been actively engaged in recruiting teachers to overcome the teacher shortage as well as elimination of multi grade classrooms from the public schools infrastructure. Since 2012, Directorate of Staff Development (DSD) has been given the responsibility for training and development of public school teachers in order to promote the concept of quality education. Efforts to improve pedagogical skills of teachers as well as subject and content knowledge have been done by the DSD through its continuous professional development program. The program provides pre-service as well as in-service training to all primary school teachers. Given the effectiveness and positive spill-over of the program, the School Education Department Punjab has in recent times revamped the DSD into the Quaid e Azam Academy for Educational Development (QAED) in order to increase the domain of training of teachers belonging to all cadres. Yet the Department recognizes that there still is a need to further solidify and strengthen the existing system in order to achieve the target of providing quality learning and instruction to students (Javed, 2012).

Endeavours to improve teaching quality and service delivery performance in schools was introduced in 2012 and included incentivizing and attracting teachers based on their students' performance as well as enrolment. Furthermore there was a strategy to rationalize teaching posts in order to effectively ensure that teachers are sent to schools on the basis of enrolment as well as other needs. In order to avoid politicization of teachers, a process of merit based teacher recruitment has been initiated in which all teachers need to go through a recruitment tests which are based on a criteria and terms of references finalized by the School Education Department. Due to these interventions statistics show that not only has the number of teachers increased by 17.6% last year and an overall 24.7% over the last 5 years. At the same time another observation to note is that the mean Student-

Teacher ratio for all schools is on average 30:1 which is well below the threshold defined by the School Education Department which is 40:1.

The institute by the name of Quaid-e-Azam Academy for Educational Development (QAED) has a special program by the name of Continuous Professional Development of Teachers (CPD). The institution in recent times has been receiving a lot of support and patronage and QAED has been able to have focused programs in Primary classrooms on numeracy, literacy, multi grade as well as overcrowded classrooms. The program also includes training for teachers through extensive support materials, teacher guides as well as assessment and learning materials. Teachers are also taught to effectively utilize these instructional materials.

The current provincial curriculum of Punjab is also being revised according to international best practices. Previous analysis of the curriculum indicates that the textbooks instead of having simplified content which was easy for the learners was replaced with complicated and difficult content which was not laid out logically and students were encouraged to memorize the passages rather than understand the crux and essence of a particular concept. In recent times, the English, Math and Urdu curriculum from Grades 1 to 5 has not only improved but teacher guides and learning materials have improved in the process due to QAED. An important factor that needs to be focused upon teachers learning to teach is how teacher education experiences in teacher education institutions vary (Darling-Hammond, 2007). Hence it is significant to understand how different teacher education policies and programs are not only implemented but how due to the various teacher education policies the implementation is impacted. A major problem in Pakistan currently is the lack of implementation of effective teacher education programs and this issue is an important issue that is taken up by various scholars and stakeholders in the realm of education in Pakistan (USAID, 2010).

The National Education Policy of Pakistan in 2009 understood that there are various problems with regards to the quality of teacher education and the policy proposed removing or phasing out the conventional and traditional teacher education programs (which were offered in two modes, one was conventional on campus and the other model was off

campus (National Education Policy, 2009). These programs were to be replaced with a stringent and much more comprehensive four year post K-12 Program (Ministry of Education, Government of Pakistan, 2009a). This reform program is largely funded by USAID Mission Pakistan (Pre-STEP/USAID, 2010). The program has been initiated and aims to evolve course curriculum, internship components and certification requirements in different institutions. Whereas the response from different stakeholders has been mixed.

The traditional programs include the Primary Certificate of Teaching which is a post-secondary or higher secondary level of qualification for preparing primary teachers, the Certificate of Teaching which is post higher secondary for preparing middle school teachers, and the Bachelor of Education which is post baccalaureate for preparing secondary school teachers. Various organizations also offer Master of Education programs as post- Bachelor of Education (B. Ed.) programs to prepare educational administrators and teacher educators. In most of the provinces it can be said that the curriculum outline and instructional approaches are aligned with each other as all these programs require fulfilment of ten courses of three credit hours each. Total credits are thirty in total. In addition to all of this, the practical teaching component is equivalent of six credit hours. At the same time the content of these courses is not standardized amongst the provinces as well as organizations (UNESCO, 2008). The newly initiated four-year programs are significantly different in terms of entry requirements, curriculum content, and instructional and evaluation approaches.

Historically, all of the conventional teacher education programs were offered as on-campus programs in the face-to-face mode until the late 1970s, when Allama Iqbal Open University Islamabad (a federal public university) began offering a variety of programs as off-campus programs in open and distance learning modes (USAID/UNESCO, 2008). However, the curriculum outline for most of the programs remained the same. Two decades later, influenced by globalization, the national education policy of 1998 to 2010 allowed all institutions to offer programs in open and distance learning modes.

In the last two decades, there has been a significantly increasing influence of donors and international financial organizations on educational programs and policy making in Pakistan (Ali, 2012; and Ahsan, 2005) which as a result, market approaches and private schools have grown rapidly (Andrabi, Das, & Khawaja, 2008).

Since its re-organization in 2004 as the pivotal agency responsible for teacher development in Punjab, the Directorate for Staff Development (DSD) has attempted to “establish a system of professional development for teachers and education personnel for enhancing the quality of earning in the government schools of Punjab.” (Andrabi, 2012). In addition to its in-service teacher training programs, DSD has administrative control over the 33 pre-service teacher training institutes in Punjab known as the Government Colleges of Elementary Training (GCETs). The Continuous Professional Development (CPD) framework aims at providing decentralized training to primary school teachers in Punjab. This model conceives of a district as the primary unit for assessing and undertaking training activities with de-centralized delivery of teacher training at an appropriate sub-district level. In the CPD framework, all government primary schools have been grouped into clusters and, within each cluster, a school has been designated as the Cluster Training and Support Center (CTSC) to act as a local hub of CPD activities. It is the role of the CTSC to coordinate activities in its cluster and act as a link between the schools and the DSD for implementation of its policy. The District setup of DSD consists of the District Training and Support Centers (DTSC) at the top coordinating with the Cluster Training and Support Centers (CTSCs). The DTSC is often housed at a Government College for Elementary Teachers (GCET) and the CTSC is typically located at a Government Middle/High School. The DTSC and CTSCs in each district have permanent staff for the purpose of CPD implementation and oversight called Teacher Educators (TE) and District Teacher Educators, respectively. The DTEs, on which the program rests in the district, are tasked with the responsibility to reach out to schools for learning assessment and teacher training/mentorship. The clustering of schools brings teacher support and mentoring close to classrooms and to the schools’ doorsteps, and is efficient in that teachers do not have to travel long distances to acquire training. The CPD Program focuses on the in-service

training needs of the teachers and runs in parallel to the setup of Education Department in the district.

2.15.1 Identification of Issues in Teacher Education

Most of the research on teacher education in Pakistan, as well as on other areas of education, has been done in the last two decades; however, there are many challenges with regard to the quality of the studies, as many of them are neither rigorous nor scholarly. Two rigorous studies on teacher education in Pakistan were reported by Warwick and Reimers (1995) and Davies and Iqbal (1997). Warwick and Reimers (1995) drew on the findings of the BRIDGES project, a significant research project in the early 1990s, conducted collaboratively by the Harvard School for International Development and the Academy of Educational Planning and Management Islamabad in four provinces and in the Islamabad federal area, on how formal education and teacher training (certification) are related to the quality of teaching and student achievement in the public primary schools of Pakistan. In-service teachers and principals were surveyed, and achievement tests were conducted with 4th and 5th grade students on science and math. In addition, the researchers interviewed faculty and conducted intensive observation of classes at two teacher training colleges in Baluchistan, a remote south-western province of Pakistan.

The study found a significant relationship between higher levels of formal education (academic) of teachers and student achievement on four test scores, whereas teacher certification was found to be significantly related to student achievement test scores on only one out of four tests. Moreover, neither higher level formal education nor higher level teacher education was found to be significantly related to effective teaching. The study highlighted many issues with teacher education programs as reasons for the ineffectiveness of teacher education, such as

“... unmotivated faculty and students; inactive principals; a curriculum divorced from tough realities of teaching; heavy reliance on lecturing, dictation, and rote memorization; and a lack of supervision ... (which) all undercut the ability of certification programs [teacher education programs] to turn out well-prepared and dynamic teachers” (Warwick & Reimers, 1995; p. 32).

Although this study identified some significant issues with teacher education for primary teachers, it did not examine how the policies were related to these issues, particularly with program implementation. Moreover, the study of teacher training programs was confined to regular programs at two colleges of elementary education in a remote province of Pakistan.

The research by Davies and Iqbal (1997) was a case study of one teacher education college, in which the researchers surveyed the views of students and faculty in four areas: how well participants in the teacher education program felt prepared for effective teaching; what was needed in the program to prepare more effective teachers; what was appropriate curricular material in courses; and what were the usual teaching and learning methods used in the program.

Overall, the study explored how well the teacher education program matched the areas considered appropriate for school effectiveness. The researchers found that students, faculty, and tutors varied in their views about what factors in teacher education were responsible for school effectiveness, except that they did agree that the participant-teachers needed to develop practical classroom teaching skills. However, the study reported that the teacher education program heavily emphasized rote memorization among participants, through lecturing and dictating notes methods, outdated and theoretical syllabi, and question-spotting assessment, which hardly prepares teachers for how to teach and learn effectively.

The findings reported in this study are similar to those reported by Warwick and Reimers (1995), which identified important gaps in teacher education programs around 1995, particularly their over-emphasis on theory and memorization to reproduce the memorized material in exams; that is why most of the participants in Davies and Iqbal's (1997) study reported that graduates of the program lacked practical skills. However, neither study investigated what led to the theoretical nature of these programs, their emphasis on rote memorization, and the possible relationship between policies and levels of program implementation. This limitation notwithstanding, these two studies were pioneering work, in the decade of 1990 to 2000, in identifying issues with conventional

teacher education in Pakistan.

Building on the discussion of the issues reported in the above-mentioned two studies on teacher education programs in Pakistan, and based on analysis of available reports on teacher education institutions, Kizilbash (1998) reported several aspects which need to be addressed in order to improve the performance of teacher education institutions. He listed many significant issues which have caused the poor performance of public teacher education institutions in Pakistan, including extensive use of the conventional lecture method, inadequate and outdated preparation of teacher educators, the short period of preparation programs, the shortage of schools for internship or practice teaching, traditional outdated curriculum for programs, lack of commitment to quality and improvement at teacher education institutions, lack of research on teacher education for the improvement of programs, lack of effective evaluation of teacher education programs, and lack of coordination among teacher education institutions to improve quality. Kizilbash, based on his analysis, criticized government education policies which lack proper measures to improve the quality of teacher education programs and institutions. He claimed that “the harsh fact is that the neglect of the education sector as a whole has been had enough, but the need for quality teacher educators has gone completely unrecognized” (Kizilbash, 1998, p. 115). These were the few rigorous and valid studies in the decade of 1990 to 2000 which effectively demonstrated scholarly and critical work on issues and gaps in teacher education in Pakistan.

The criticism by researchers/scholars in the late 1990s, combined with pressure from local stakeholders and international donors, has pushed the federal government to focus on teacher education in order to improve the quality of teaching in Pakistan. Similar pressures aroused efforts to improve the quality of teachers and teaching through effective teacher education (in-service and pre-service), as Pakistan committed to “Education for All.” Thus the National Education Policy 1998-2010 provided a section on improving teacher quality through teacher education, which led to many in-service teacher training reforms, such as short refresher courses, short in-service certificate programs, and continuing professional development programs for teachers.

The policy also recognized the importance of training all in-service untrained

teachers, which constituted about a quarter of all public school teachers in Pakistan (AEPAM Islamabad, 1998), through allowing teacher education institutions to offer in-service short courses and off-campus teacher education programs. Moreover, the National Education Policy 1998-2010 heavily emphasized the expansion and growth of higher education for economic development in Pakistan. Thus, the higher education commission reforms which began in 2001 (HEC, 2002) allowed a market approach in higher education institutions, including teacher education institutions, and they allowed them to offer market-model programs, mostly off-campus programs in open and distance learning modes, under the policy initiative titled “self-finance programs.” Thus the early 2000s were the years of initiating two major changes to improve teacher quality and the provision of teacher education to all untrained teachers, which included many reform projects for the in-service professional development of teachers and the growth of off-campus market-model teacher education programs across Pakistan.

However, most of the literature on teacher education in this period focused on studying different aspects of in-service professional development programs for teachers, whereas off-campus programs as well as conventional teacher education programs and their effects received minimal scholarly attention.

Most of the studies on in-service teacher education programs and reforms have focused on identifying effective practices, strategies, and mechanisms for improving in-service teachers’ competence. For example, several studies (Khan & Halai, 2009; Chang, 2006; and Hussain & Ali, 1998) reported how a cluster-based mentoring program, which originated in the Aga Khan University’s Institute for Educational Development, was an effective strategy for the professional development of teachers. Hussain and Ali (1998) studied the impact of a cluster-based mentoring program for in-service teachers in several districts of Baluchistan province, in which a mentor teacher (or professional development teacher), stationed at a learning resource center (LRC), worked with about 25 teachers in a cluster of schools in the radius of a few miles, and organized different professional development activities such as day-long weekly workshops, development of learning resources and instructional materials, observation of mentee-teachers’ classes, and post-observation of one-to-one reflective sessions. Based on their evidence collected through

observations and interviews, they concluded that this strategy effectively changed in-service teachers' practices from traditional lecturing and rote-learning to a more progressive activity-based teaching.

Chang (2006) conducted a study about the impact of a similar cluster-based mentoring program in a rural district of Sindh, finding that mentee-teachers had changed their teaching practices to more student-centered teaching while engaging their students in different kinds of activities, but that this change was sustainable only while the teachers were supported by the mentor. Once the ongoing support by the mentor stopped, because of the end of the mentoring program, most of the teachers went back to their traditional note-dictation, lecturing, and rote-learning based practices, which were the norm in most of the schools.

A few other studies (such as Khan & Halai 2009; Halai, 1998, 2006; and Ali, 2000) demonstrated a slightly varied mentoring approach, under the broader umbrella of ongoing school-based support, where the mentor worked with in-service mentee-teachers as co-planner, co-teacher, and subject expert. However, most of the studies on mentoring strategies for teachers' in-service professional development only focused on changes which occurred during the program, whereas they overlooked the critical question of change sustainability. A few studies in the literature on the issue of sustainability (Chang, 2006; Ahsan 2005; and Memon & Wheeler 2000) suggest that most of the changes in teachers' practices were not sustainable, and teachers went back to traditional teaching practices because of their long-standing traditional teaching school environments and the continuous influx of traditionally-trained teachers from conventional public teacher education institutions.

Another review of literature (Mehrun-Nisa, 2009; Rarieya, 2009; Rettalick & Mithani, 2003) indicates studies which recognized triumphant practices and tactics used in in-service on-campus programs, which effectively transformed in-service teachers' understanding of teaching and learning. It resulted in changing their practices into more authentic, activity based teaching while participating in the in-service program. Most of these studies came up with a conclusion that the accomplished and successful in-service programs constituted of a reasonable balance between on-campus sessions and a field-

based (classroom teaching and school-based work) component. These studies portray and lead credence to the idea that the in-service programs engaged the participants in progressive learning environments to re-conceptualize their notions of teaching and learning successfully, and to change teachers’.

At the same time various studies emphasized upon reflection as well as a critical lens to develop practices which are reflective in nature for the teachers (Rarieya, 2009). Through these reflective dialogues as well as teacher action research (Dean, 2009), these ideas helped in reforming and reconceptualization of teachers notions. The use of hands on (basically physical movement such as engaging of hands) and “minds on” (processes which involved various types of thinking) activities, collaboration in the development of learning and instructional materials and collaborative project work/assignments in-service courses led to changes in teachers’ practices.

However it must be recognized that a significant limitation of these studies is that they all focused on analyzing the participants while they were participating in their in-service professional development program, where they were more likely to implement the practices which were supported through the program. Hence the nature of the study can be said to be biased in nature. None of the studies seem to focus on how the teachers who changed their practices during the reform program taught once the reform program support ended.

Observations then indicate that as soon as the support and training from the program ended and teachers were again independent and were not being monitored and that the teacher was responsible for the maintenance of issues in most public school environments which are full of conventional teachers trained in a certain conventional way, those teachers went back to their traditional teaching practices.

A huge amount of research literature on effective practices for in-service teachers’ professional development appeared over the decade of 2000 to 2010. Additionally, significant growth took place in the offerings of off-campus teacher education programs, in order to address the issues of untrained teachers. However, rarely did any study focus on the effectiveness and effects of these programs.

While dissatisfaction with the conventional and traditional teacher education

programs was apparent in most of the literature mentioned earlier however no validation of any sort or follow up was done to understand the implementation phase of the program and to analyze the effectiveness of the conventional teacher education programs. However the dissatisfaction in academic circles as well as the poor quality indicators of school education especially those related to enrollment, student learning outcomes and quality of teaching reported by World bank and UNESCO generated pressure on the government to reform teacher education in order to improve the quality of teachers and teaching in Pakistan. Thus several government initiated studies, in collaboration with international donors (UNESCO/USAID, 2006; Butt, 2008; USAID, 2010), led to teacher education reforms in public teacher education institutions, particularly the initiation of the Pre-service Teacher Education Project to build the capacity of teacher education institutions, and to initiate a two-year diploma in education and a four-year honors teacher education program for primary and secondary teachers. These studies reported several challenges faced by teacher education institutions which led to poor governance and weak structure of the institutions and outdated program practices at these institutions.

As discussed earlier, a few rigorous and scholarly authentic studies were conducted by researchers from international development organizations in collaboration with government and donor organizations. A study reported an analysis of teacher education policies and existing challenges in teacher education in the public sector teacher education institutions (UNESCO, 2006). The report, based on historical analysis of policies and plans, claimed that there was random and irrelevant emphasis on policies and plans, while no single authentic and comprehensive policy was established for reforms to improve the quality of teacher education. The report pointed out several issues with teacher education programs and institutions, such as course work irrelevant to classroom teaching, lack of preparation of teachers for classroom management and motivation for teaching, lack of preparation for the relationship between teachers, the school, and the community, and no focus on quality improvement (UNESCO, 2006). This report, and the criticism in other studies (Pre-STEP/USAID, 2010; But, 2008), played a significant role in initiating teacher education reforms, such as the initiation of four-year teacher education programs at colleges in the Punjab province, and initiation of the Pre-service Teacher Education Project

(Pre-STEP), a nation-wide teacher education reform program to initiate four-year teacher education programs in public institutions, in collaboration with, and with funding from, USAID Pakistan.

A comprehensive survey study which aimed to assess the relative strengths and challenges in a few selected teacher education colleges and universities across Pakistan focused on four strategic areas of teacher education institutions which included physical infrastructure and resources, learning and teaching, programs offered by the institution, management and competencies of teachers educators, principals and the management (USAID, 2010). The study was in the form of a baseline study and was comprehensive due to its inclusion of the above mentioned factors. The study also used both qualitative data (interviews and observations) and survey data; however, it only focused on colleges for preparing primary teachers, and on university departments for preparing secondary teachers, excluding the colleges for preparing secondary teachers. The study reported "... that educators generally address content knowledge of their subjects but do very little to prepare teacher trainees to teach those subjects" (Pre-STEP/USAID, 2010; p.V). The study highlighted many other important issues, such as serious gaps in the capacity of faculty, over-emphasis on the lecture method, absence of effective lesson planning, non-existent research capacity at colleges, and theoretical and hard to complete syllabi in the traditional regular programs (Pre-STEP/USAID, 2010). This study also reported some interesting initial findings about an off-campus (AIUO Islamabad based) program in comparison to regular programs, which included over-enrollment (two thirds of total enrollment) in the AIOU Islamabad-based off-campus programs compared to lack of enrollment in the regular programs at government colleges, where about 50% of slots open for enrollment remained unfilled. They also reported that even though the regular programs cost less than the AIOU Islamabad-based off-campus programs, most of the enrollment went to off-campus programs. They claimed that the reason for the high enrollment in AIOU Islamabad programs, "... as mentioned during focus group interviews – is that the loopholes in the AIOU Islamabad assessment and examination system allow for serious manipulation in completion of assignments and examinations, thereby attracting less motivated students to opt for AIOU Islamabad program" (Pre-STEP/USAID, 2010; p. 6). Because this study did

not systematically look into why enrollment was so high in off-campus programs, and how that affected teacher education in Pakistan, the researchers strongly recommended a comprehensive study to assess the efficacy of AIUO Islamabad off-campus programs. Here, potentially, my study contributes in filling the gap by providing empirical evidence on the effects of growth in off-campus market-model programs

2.15.2 Local Faculty-published Literature and Quality Issues in Pakistan related to Education

Although the publication of papers by local faculty dramatically increased in the last five years, correspondingly with the publication of many papers on teacher education in Pakistan, a close analysis of the quality of these papers shows that many of them do not meet the criteria for high-quality research and research reporting in education (AERA, 2006, 2009). Few studies published in the last five years highlight issues similar to those reported in Pre-STEP/USAID (2010), chiefly expressing the dissatisfaction of different stakeholders with the quality of teacher education programs and the preparedness of teachers (graduates). Ali's (2011) analysis focused broadly on understanding how teacher education practices in Pakistan compare with popular narratives and theories in the international context.

This study found that teacher education in Pakistan is heavily focused on technical aspects, providing a certain set of concepts and understandings about teaching and learning, whereas teacher education in the international context focuses on social, ethical, reflective, and analytical issues, and on the professional importance of teaching and learning. Manzar-Abbas and Lu (2013) studied problems in collaboration with schools during the practicum or internship of participants in teacher education programs at 14 public elementary colleges of education. They found that the role descriptions for interns and the differentiation of roles were not clear between faculty supervisors and school-based facilitators, which left students confused about what they were required to do and from whom to seek particular support. They also found that schools considered the practicum or the practice teaching exercise of teacher education program participants (pre-service and in-service teachers) disruptive and unimportant because they thought it did not result in learning important

skills.

Overall, most of the studies in the last five years have focused on broader issues related to different aspects of traditional teacher education programs in elementary colleges. However, none of the studies focused on a comprehensive analysis of program implementation, particularly in relation to the policy resulting in the growth of off-campus market-model programs.

2.15.3 Open and Distance Learning Teacher Education

The off-campus programs focused on in the present study offer a variety of versions of open and distance learning modes in Pakistan, and the majority of these are offered by AIOU Islamabad – the federal Open University. Before turning to an analysis of the literature on distance learning with regard to its effectiveness, I first sketch a brief background of open and distance education in the developing world to provide a context for the subsequent analysis. The first evidence of distance learning for teacher education was found in 1963, when teachers for hundreds of thousands of Palestinian refugee children were trained through distance learning teacher education (Perraton, 2010). Since then, distance teacher education has grown significantly in the last four decades, particularly in developing countries; however, the evidence about its effectiveness is mixed, and it varies among countries. Perraton's (2010) analysis shows that several countries have used distance learning for initial teacher education and continuing professional development, but there is no direct evidence of its effects on classroom teaching. Although Perraton's (2010) analysis of reports about different countries indicates that distance learning teacher education programs have been helpful in training large numbers of teachers, there is insufficient empirical evidence of the quality of these programs.

Adding to this conversation, Ogunleye (2013), analyzing quality and quality assurance issues in distance education, claimed that wide expansion of open and distance learning in the developing world has posed many challenges and serious concerns for its quality because the use of quality assurance techniques, which are used for traditional teacher education programs, does not seem appropriate for the quality assurance of distance and open learning programs.

The papers reporting studies of distance education (including teacher education)

offered by AIOU Islamabad, as well as by other institutions in Pakistan, have also been mostly published by local faculty in the last five years. Many of these papers also have similar issues regarding the quality of the study and its reporting, as discussed earlier. Nonetheless, some of these papers and studies highlight some important facets of distance learning and off-campus programs, including their strengths and challenges, as next discussed.

A study addressed the three instructional components of AIOU Islamabad's program (Jumani, Rahman, Chishti and Malik, 2011) which include optional tutorials at study centers across the country, self-instructional materials (such as course books, study guides, audio/video programs on TV and radio), and one full-day compulsory workshop at the end of a semester. The authors' description of the evaluation of AIOU Islamabad-offered courses noted that it consists of formative assignments (30% of the total) and a final exam (70% of the total), and the minimum requirement to get a passing grade in a course is 40%. It is noteworthy here that the minimum requirement for passing a course in regular programs is 50% to 60% at various traditional institutions. Jumani, Rahman, Chisti and Malik (2011), while describing the nature of teacher education programs at AIOU Islamabad, the gigantic structure of which spreads across Pakistan, and the huge enrollment in its programs, claim that AIOU Islamabad programs are successful and effective. However, their paper does not provide any direct evidence of the effectiveness of the AIOU Islamabad programs in terms of improving the quality of teachers and teaching, or in terms of its effects on students' learning achievement.

Studies of distance learning (off-campus programs) reported in other papers provide evidence of satisfaction with some aspects of off-campus programs and dissatisfaction with many other aspects of these programs. Another study (Buzdar and Ali, 2013) surveyed 450 students at nine centers of the AIOU Islamabad teacher education program for primary teachers, to ascertain whether the courses develop reflective thinking among the participants. Their study's finding that the mean scores for categories about reflective thinking were higher than habitual actions, and were statistically significant, strongly suggests that the courses helped the participants to develop reflective thinking. However, the survey was not clear about how far the mean score of students was from the maximum

possible score.

Another study investigated (Ali, Mahmood, Mahmood, 2011) investigated whether students in off-campus programs were satisfied with their tutors' performance in handling their assignment work, and another study (Akhter, 2011) studied the effectiveness of using TV programs by AIOU Islamabad with teacher program participants. Furthermore the study (Ali, Mahmood and Mahmood, 2011) found an overall dissatisfaction on the part of students with the evaluation of their assignments by tutors. The most common types of dissatisfaction reported by students in this study included below average input by tutors and the university for writing assignments: 60% of students reported that tutors did not provide any written feedback and just wrote a check mark on their assignments; roughly 70% of students reported that tutors did not review their assignments thoroughly; about 77% of students reported that they did not get any feedback on the strengths and weakness in their assignments; about 70% of students were not satisfied with the evaluation grade of their assignments; and about 80% of students did not get their first assignment back before writing their second assignment.

The study (Akhtar, 2011) highlights a common issue of access and the availability of television programs to the program participants. This study found that while slightly more than 50% of the participants surveyed considered the contents of the television programs useful, the participants reported that they could not watch more than 60% of the programs because of odd television program schedules, electricity failures, and the non-availability of television.

Although the literature analyzed above provides some insights about open and distance learning in teacher education programs in Pakistan, it is too limited to provide an understanding of the overall issues with the effectiveness of these programs, given the fact that off-campus programs constitute an overwhelming proportion of enrollment in teacher education programs. Further, the important work of policy and program reforms requires evidence on how the overwhelming growth of these off-campus market-model programs has affected the effectiveness of teacher education program implementation in Pakistan.

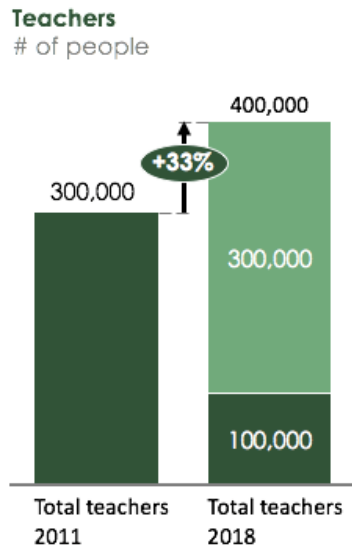


Figure 2.15.1 Increase in merit based hiring

Source: PMIU Data 2018

Figure 2.15.1 illustrates how merit based recruitment was implemented in Punjab which increased the number of teachers recruited. This was done through centralization of hiring through NTS testing. Secondly it involves an 8 week induction training with QAED. Teachers are required to complete on Med or Bed once they have joined and finally the majority of the teachers which are recruited are post graduates.

Schools with less than 4 teachers
Number of schools

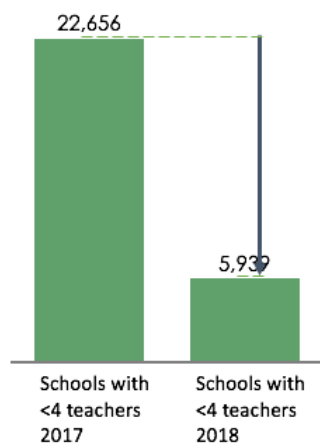


Figure 2.15.2 PMIU Data 2018 on schools with less than 4 teachers

Figure 2.15.2 illustrates how Punjab has been able to reduce the number of teachers with less than 4 teachers from 22,656 schools to 5,939 schools.

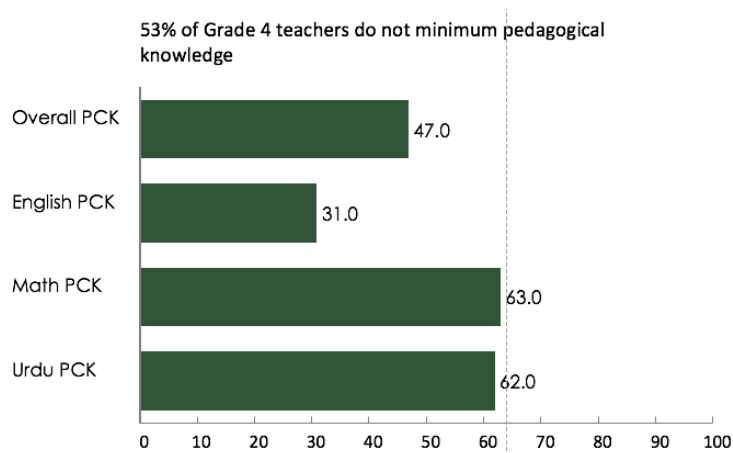


Figure 2.15.3 Source: SABER SD preliminary results, 2018

53% of Grade 4 teachers do not have minimum pedagogical knowledge

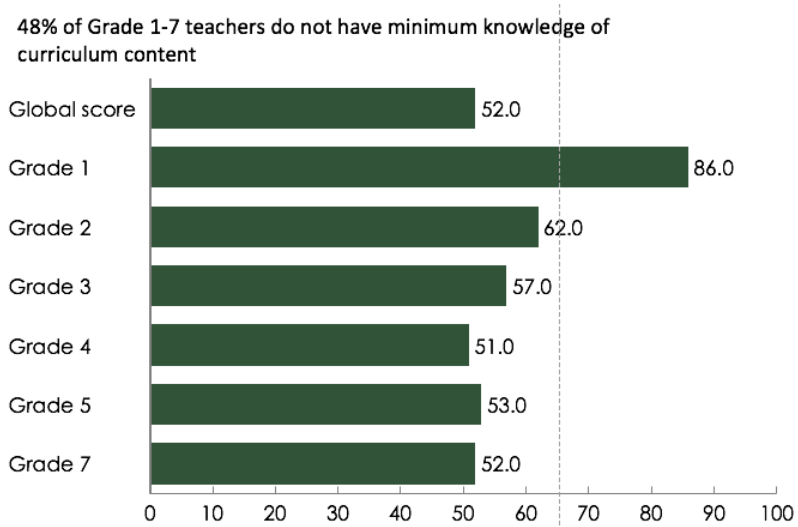


Figure 1.15.4 Lack of content knowledge

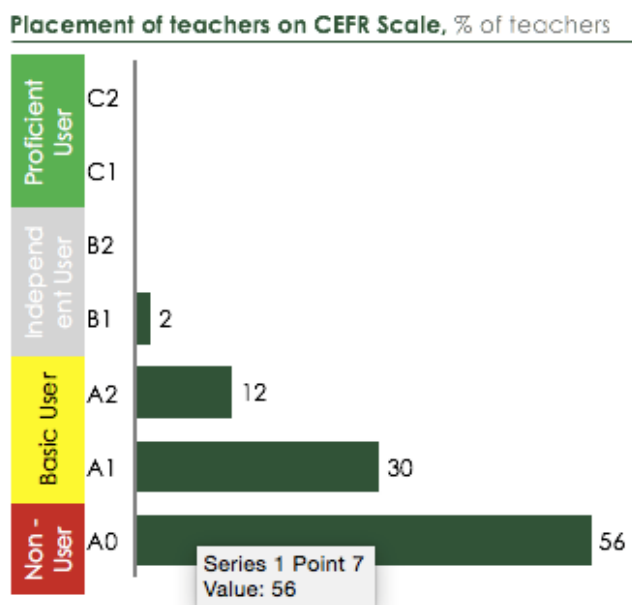


Figure 2.15.5 Punjab Education and English Learning Initiative: “Can English Medium Education Work in Pakistan? Lessons from Punjab”

In 2013, the British Council administered a computer based test to assess the English Language skills of primary and middle school teachers across Punjab. A sample of 2008 teachers (77% of whom were from government schools) from 18 districts of Punjab was used. Based on the results, teachers were given a ranking on a global CEFR¹ scale

Furthermore School Education Department Punjab has conducted a pilot survey of 425 teachers to understand drivers of motivation. The survey showed that More than 95% teachers believed that new textbooks and teachers guides have helped them improve their pedagogy – however, some teachers reported that consistent changes to curriculum disrupted their classroom practices. Teachers’ perception regarding system incentives was quite low - only 12% believed that they were rewarded if they performed well. Most teachers had a negative perception of the government’s policies towards them:

More than 50% of the surveyed teachers believed that the government unnecessarily punished teachers but only 5% actually reported receiving this ‘unnecessary’ punishment in the last one year. Based on these findings the department will regularly collect data on teachers’ perception and behaviour through detailed surveys with teachers every academic year. The first version of this has been scheduled for December Communicate rationale of various initiatives to teachers and administrators through multiple forums; PD days, social media, Pre-DRC meetings, et cetera.

2.16 Conclusion from Literature Review

Advocates of technology have clearly outlined the possible benefits of its use in schools. Opponents of technology have expressed their reservations about its meaningless use. In Pakistan’s context the warnings are much more applicable. As (Jonassen, et al., 2014) warn, technology’s use can be rendered meaningless if teachers use it merely as a content delivery mechanism. Teachers in Pakistan’s private schools generally do not require a degree in teaching and learning. Public school teachers are required to pass an entry test however, their salary increments and promotions are more dependent on students doing well in standardised examinations rather than teachers excelling in their teaching practice. These factors render many teachers unable to improvise whenever an innovation

like ‘technology integration’ happens. Therefore, they end up using technology as a content delivery vehicle rather than an aid to deeper learning.

Teachers who do not go through a quality assured process of becoming a teacher are laden with the same expectations as the professionally trained teachers. However, more research needs to be done in the process of teacher training in Pakistan to come up with a hypothesis and possibly a result on whether trained teachers make more meaningful use of technology than untrained or novice teachers.

Whether trained or untrained, both teachers need more support from curriculum and administration as compared to what they are currently receiving. Pakistan’s national curriculum gets revised after a few years, this pace of revision is not nearly enough to keep up with the global changes in the field of education. It is not enough to keep up with the domestic economic and political changes to ensure that the education being provided will equip the students to become productive citizens of Pakistan. While some professionals are working on using technology to improve the state of education in Pakistan, other factors are undoing the good work being done.

For example the pressure of exams and parental pressure on students to learn in order to get good grades, and the predominant teacher centred approach are a few major constraints for students and teachers in Pakistan that prevent them from delving into meaningful use of technology and just focus on getting good results in the standardised examination. Despite these constraints technology can still play a pivotal role in student learning provided it is used meaningfully. If the focus is on student learning then this innovation can be deemed successful. Reckless, meaningless or unplanned use of technology can render the whole effort futile.

CHAPTER SUMMARY

This chapter discusses the concept and meaningful use of technology and advocates the use of the term as described by Jonassen (2014). It goes on to build upon that definition to come up with Technology Integration Matrix that will serve as a lens to analyse most of the

data for this study in Chapter 4. The term ‘21st Century Skills’ is defined as an umbrella term whose definition keeps adapting and evolving with more and more research being done in this field. This chapter goes on to explore how technology is being used in Finland, The United States of America, and The United Kingdom. Finland is studied due to its ever present name at the top of school rankings for a long time. The US and UK are studied as these two countries’ schooling systems heavily inspire the private school systems in Pakistan.

Furthermore, this chapter also looks at the published literature about the quality of education and about the use of technology in the three types of participant schools; the public, the private, and the partnership school.

Teacher training practices are also looked into, with in depth discussion on the current state of teacher education and training in Pakistan. This will be highlighted as one of the factors that severely affects the use of technology in the participant schools.

Eventually the chapter creates a link between the current literature and this study thus identifying and justifying the need for such a study to highlight the struggles and successes of non-professional (untrained or in training) as well as professional teachers. As mentioned in Section 2.3.5 this research makes an original contribution to the body of knowledge by studying the usage of Technology Integration Matrix by teachers whose primary language is not English. Study identifies and acknowledges barriers such as language, culture, gender, demographic background, and school location, availability of human and technological resources when it comes to attempting to make meaningful use of technology in the context of a trained, under-training or untrained teacher.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes and justifies the qualitative methodological approach of this study. It includes: (a) the objectives and research question(s); (b) justification of ontological and epistemological approaches (c) the research design; (d) data collection tools; (e) data analysis methods; (f) validity and reliability of the study; (g) limitations and challenges of this study; and (h) highlighting ethical concerns and ways to uphold ethical standards for this research.

3.2 Objectives and Research Questions

This study analysed the process of using technology for teaching and learning at a private school system and compare it with the practices of a public school and a partnership school. Eventually, the research evaluated the planned process of technology integration in the selected schools. The study identified the steps involved in this educational change in these schools. Moreover, it explored the hindrances faced by teachers while imparting this change. The study delves into the teachers' perceptions and how these perceptions influence the technology integration process.

The research questions that guide this study are:

1. How are public, private, and partnership schools using technology for teaching purposes?
2. What is teachers' and school administrators' attitude towards the use of technology for teaching and learning?
3. What factors influence their attitude?
4. How is their attitude affecting the schools' teaching and students' learning?
5. What can be done to effectively train the stakeholders in using technology meaningfully for the teaching and learning process?

3.3 The Question of what is reality in the context of Qualitative Research

With regards to literature it is imperative for the researcher to have a clear understanding of their ontological and epistemological stance (Dixon-Woods et al., 2007).

Different schools of thought and paradigms exist with regards to exploring the nature of reality (ontology) (Bryman, 2007) and the researcher's relationship with it (epistemology) (Creswell, 1998).

Two of the more frequently adopted epistemological approaches are positivism and interpretivism. With regards to the positivistic approach, the approach is closely associated and aligned with natural scientific enquiry while focusing upon phenomena and knowledge that can be considered as theory and then is practically tested in order to illustrate and explain natural laws.

An important presumption of this approach is that observations through the senses should provide an objective and factual result. Beliefs of objective experimentation and quantitative data collection are methods that reflect this school of thought and illustrates a more objective form of research. For example many positivistic researchers propose that an observable phenomenon or event is more powerful than one that is imagined, hypothesized or lacking in systematic clarity. The essence of this approach is to observe, collect and gather information through 'senses' while testing scientific principles of replicability, reliability as well as validity (Shaddish, Cook & Campbell, 2002). There are various benefits of this approach especially when it is combined with objectivism as it allows observations to be considered as 'untainted' and not be influenced by subjective actions or social constructs which could influence a certain phenomenon.

At the same time it is crucial to consider that positivistic research is highly respected in the physical and biological sciences due to the fact that these tests can be repeated, observed and be measured accurately over a certain period of time (Paul & Marfo, 2001). However such an emphasis on objective analysis could lead to an overreliance on using data and numbers to formulate decision making as well as theories without considering the human element in the process. This makes it difficult to apply positivistic elements in areas such as education, health and social science research as it is difficult to define social constructs and data is not entirely objective (Winn, 2003) which makes the situation much more complicated. In areas such as education it makes difficult to formulate a theory based on 'sensory observations' alone due to the complicated social system that exists as well as the interaction of various variables while taking into account cognitive as

well as social elements of individuals which is why for some social scientists, the school of thought of interpretivism is a better alternative to conduct such studies and research (Sigel et al, 1992).

Interpretivism as a school of thought emphasizes upon the contrast and differences that exist between the social (human) compared to the natural world (Guba, 1990). Its essence and core resides on its subjectivities and it is a useful paradigm to tackle and capture problems of subliminal differences when understanding human cognition as well as hermeneutics. It also allows a better understanding for humans for the world around them which is considered as Phenomenology. The school of thought of interpretivism focuses on people and objects and their difference. This allows the use of 'constructivism' which is an ontology which provides a platform for social scientists to investigate reality as a 'reconstructed' idea which is fundamentally shaped by human experiences, subjectivities as well as actions.

This paradigm is important as constructivism illustrates the significance of human actions and it views it from the lens that reality should only be understood through the lens of human observers. This paradigm is quite different from the logical and rational paradigm of positivism yet it gives scientists and opportunity to explore and understand the nuances attached to 'illogical', 'irrational' behaviour of humans which positivistic studies would generally fail to ever take into account. Therefore, this study's research design is in line with the interpretivist school of thought as the researcher finds it most suited for the nature of this research, due to the abovementioned properties of interpretivism.

3.4 Research Design

Controlled Group versus Test Group experimentation is a fairly common practice in fields like Biology, Physics and Chemistry. In contrast when it comes to research in the field of education, controlling variables becomes a monumentally difficult and many a times an impossible task. Seemingly simple or intricate factors may influence an educational study. Factors like demographics, personality traits, educational history, culture and traditions, religion and sects, mother tongue, secondary and tertiary languages and dialects are just some of the examples of complex variables that can affect the research

favourably or adversely. It is due to this inability of controlling variables that some researchers question and doubt the strength of execution of such research (Botha, et al., 2005).

In an educational research the researcher always has to balance the scale between pragmatic and valuable. Some information that might seem extremely valuable may turn out to be very impractical to acquire. Similarly, information that seems very practical and easy to obtain might be fabricated, shallow or just not rich enough to be of any value to the research. Achieving this balance is crucial to the success of the study given the fact that the researcher is bound by the schedules and rules set forth by the participating schools.

As opposed to quantitative research, qualitative research does not focus entirely on numbers and statistics to infer meaning and derive conclusions. It, instead, tries to comprehend the phenomena in "natural settings" (Hoepfl, 1997). Due the complexity of variables involved in the field of educational researcher, many scholars argue that educational research should be done through qualitative methods (Botha, et al., 2005). This is not always true. Both qualitative and quantitative methods can be used in the field of educational research.

However, this research studies an intricate phenomenon of educational change (integration of technology in three types of schools; public, private, and PPP) the research questions are exploratory in nature (variables cannot always be quantified), and because there is a need to present this topic in detail, the qualitative research design is chosen for this research (Creswell, 1998).

Qualitative Research is a big umbrella encompassing various research methods. Therefore different experts and researchers have define it in varying terms using differing jargon. Denzin & Lincoln (2011) have described qualitative research as:

A set of interpretive, material practices that make the world visible.
 These practices transform the world. They turn the world into a series
 of representations including field-notes, interviews, conversations,
 photographs, recordings, and memos to self... qualitative researchers

study things in their natural settings, attempting to make sense of or interpret phenomena in terms of the meanings people bring to them.

This definition, while being simple, is highly applicable to the nature of this research. The study focuses on gaining a deeper understanding of the processes involved in using technology for teaching and learning purposes, as well as the associated perceptions with these processes. Had it been merely a study of processes then perhaps the research questions would be more suited to a quantitative form of study. Whereas, the research questions for this research seek in-depth study of human participants' thoughts and emotions while undergoing the phenomenon of using technology in schools for educational purposes.

The nature of the research question and aims of this study requires a detailed examination of how the teachers and school leaders of three different schools make meaningful use of technology of teaching and learning. It is important to note that teachers' and school leaders' perceptions about the use of technology are also important and these perceptions are often influenced by socio-cultural as well as psychological factor. So much so that some researchers stress upon the need to study various strata of depth related to the 'norms of social interaction' as well as the 'underlying pedagogical principles' when it comes to the process of analysing or gauging the initiatives that are meant to bring about change (Coburn, 2003).

A relatively long-term engagement, interacting and working with each teacher and school leader may be necessary, in order to extract internal cognitive and psychological processes and to understand the complex relationships that each teacher and school leader exhibits in school, in relation to ICT use.

As mentioned earlier, the positivist epistemology lends itself better to the quantitative methodology where collection of figures and data would be an essential part of the approach. Interpretivism, on the other hand, is an epistemology that accounts for the subjective differences between the social (human) and the natural worlds (Guba, 1990) in a relatively limited context. In other words, by emphasizing the subjectivities in human

research, interpretivism can be useful in capturing the subliminal differences when interpreting human cognition and perceptions of the private school teachers in School as compared to positivist research.

Given the emphasis on the social and cultural elements of the environment, the interpretivist paradigm where the interactive nature among the three actors and the environment is an area of importance would better fit the nature of the study. The perspectives of the actors and the relationships among them form a key part of the research focus and this is consistent with the ontological assumption underpinning the interpretivist paradigm that social reality is constructed based on interactions between actors in a setting or context. As a result of the focus on the teachers' personal thinking processes, belief systems and experiences and the specificity of the private school culture, the study does not intend to generalise the findings to other schools as there are not many schools with exactly the same culture and teacher profile.

3.4.1 Explanation for Using Comparative Case Study Approach

While remaining mindful of the idea that qualitative research comprises a myriad of different methodologies it is important to note that the nature of this research is conducted in such a way that a close investigation of the nature of research questions while exploring the underlying issues related with teacher's perceptions of using ICT as well as the engagement amongst school management, leadership and staff during the implementation phase of these ICT interventions. It is important to understand that survey methods alone may not be sufficient enough to assess the notion of classroom implementation. In order to have more 'depth' what is required is insightful interviewing as well as classroom observation, assessing indicators such as nature of instructional tasks, discourse patterns and teachers opinion related to knowledge and learning (Coburn, 2003).

Hence for the sake of this study, relying on a survey method alone would make the study more representative of a quantitative study and such a study would ultimately fail to cater towards the vision and purpose of the study where it is essential to analyse a deeper analysis of the processes required in order to understand the data. In this regard an interpretivist approach is an appropriate paradigm to follow since the study focuses on the

examination of various social, psychological and cultural factors that affect teachers within the context of their respective schools.

Furthermore if the research is satisfying conditions such as questions related to ‘when’, ‘how’ or ‘why’ then it is important to understand that there may be extraneous factors which are not in the control of the investigator as the investigator has no autonomy over such variables especially if the phenomenon in question is based on a real life context especially schools which possess different characteristics, during such circumstances it makes sense to use case studies as the preferred mode of approach (Yin, 2009).

To a large extent, the study in question seeks to investigate the processes involved with the phenomenon of meaningful use of technology and its relation with teachers and school leaders and how it varies in different types of schools whether be public, private or public-private-partnerships. Such a scenario then allows us to use the case study approach (Ellinger, Watkins & Marsick, 2005). Given the limited resources available it is viable to go for this approach despite its limitations. For example the main hindrance with regards to the case study approach is its limited generalizability (Chatterji, 2002) however through this approach the study attempts to understand the current practices and related problems when it comes to meaningful use of technology to promote 21st century skills.

After establishing the logic behind the use of the case study approach it is important to understand the two types of case studies that exist which are holistic and embedded designs (Yin, 2009). The holistic design is a quintessential case of a typical case study in which the subject may be an individual and the individual is considered as the primary unit which is analysed and hypothesized. This definition is character of a holistic design where as an embedded design constitutes of several individuals, events or entity that is not as well defined than a single individual (Ellinger et al., 2005). In essence an embedded design is made up of multiple units for example individual teachers found in a particular case (for example a school) and an analysis would be made between how teachers engage and interact with the context of the case which is the school in this context. In contrast, a holistic design the main analysis would be on the case rather than the individual parts and units.

For the sake of this research, the embedded design is more suitable as the main focus of the study is to emphasize how teachers engage and interact with not only each other but the school management and leadership as well. However, the study could focus on restricting itself by failing to analyse the larger unit of analysis which will be the schools in this regard (Yin, 2009).

For this study the cases which are the participant schools are defined through teachers, technical staff, and school management. These categories are used as units for analysis and each relationship was examined in the context of participants' responses to the interview questions. It was interesting to observe the influence of school culture on the perception and paradigm of teachers towards meaningful use of technology in their teaching practice. Furthermore in order to avoid failure of analysing the larger unit of analysis as mentioned above the study emphasized upon the relationship between teachers and school leaders into the larger context of a school culture. Through identification of patterns as well as trends present in the data, a more interpretivist approach towards the case study is followed.

The process of teacher selection for the study firstly calls for a screening of candidates before including them in the final phase of the case study. This was done in order to reduce inefficiency and irrelevant numbers present in the data (Yin, 2009). The selection of the candidates was based on a criterion which gave the optimal result. Hence ultimately pre-screening was conducted in order to ascertain whether all case units which were shortlisted are suitable for the study or not.

The criteria for the process included three different types of teachers. The first one were those teachers who have been with the school for at least a year. The second teachers were those who have been employed on a permanent basis and the third category of teachers was of those who teach a whole class instead part of a class. Teachers who have been on a trial basis, for a period of few months, teacher aides were excluded from the scope of the study. The criteria strictly includes individuals who are well aware and comfortable with the school culture and environment. After using this criteria, it was observed that two teachers were part time teachers these teachers were excluded from the sample size which ultimately included twenty full time teachers and three school principals.

Case studies typically involve various sources of evidence which could be documentation, observations (direct), participant observation, archival records, interviews and physical artefacts (Yin, 2009). Performing a case study while only utilizing one source will not be sufficient enough to have a holistic approach towards the study (Yin, 2009). It is stressed that all the sources are highly complementary with one another. For the sake of this study three different types of sources were used; which are interviews, textbooks, as well as policy and curriculum documents.

A case study method suits the purpose of this research. Creswell (1998, p. 61) states that

A case study is an exploration of a 'bounded system' or a case (or multiple cases) over time through detailed, in-depth data collection involving multiple sources of information rich in context. This bounded system is bounded by time and place, and it is the case being studied -a program, an event, an activity, or individuals.

For the purpose of this research there are three distinct cases being studied; a public school, a private school, and a Public-Private-Partnership school. To limit the scope of this research, and to ensure timely completion of data collection, only Grade 7 of all three schools will be studied to explore the nature of the usage of technology. These cases will only be studied for a fixed duration. Therefore, a comparative case-study approach is well suited for this research. This approach will allow the research to study this “social phenomenon” while retaining the “holistic and real-world perspective” (Yin, 2014).

This comparative case study of the three types of schools has been chosen for the following reasons:

1. A comparative case study will allow the researcher to identify similarities and differences among the three types of schools. These may lead to recommendations for improvement of these schools.

2. There is not much educational research available on Pakistan's various types of schools. Most of the public schools and partnership schools are not known for using technology for teaching and learning. Therefore, this is important to compare them with private schools and identify the reasons for the lesser use of technology in public and partnership schools as compared to private schools.
3. This study aims to find out the perceptions of teachers and school leaders about meaningful educational use of technology in schools and the effect of these perceptions (if any) on the learning outcomes of students. A comparative case study gives a better chance of comparing and contrasting perceptions of teachers hailing from varying educational and technological competencies.
4. This study has a very strict time constraint as it is being done for a PhD degree requirement; it needs to be completed within the deadlines. A case study by its very definition is time bound. This will allow the researcher to successfully complete the research in the allotted time and present the findings to the relevant personnel.

The researcher visited the schools under study and observed the technology integration practices in the school. Interaction with the teachers and administration occurred before, during, and after the observation visits to the schools. This interaction consisted of informal conversations, formal interviews, questionnaire based survey, and one group interview. The data collected was analysed through a five phase cycle approach that is similar to the data analysis models described by (Yin, 2014). Miles & Huberman (1994), highlight the fact that qualitative data stresses upon people's lived experience. This makes qualitative data ideal for depicting people's perceptions about an event or a process: in this case the introduction of technology into teaching practice. Qualitative data are also well suited to connect these perceptions with the social sphere in which change is taking place; therefore this research is using comparative case study approach.

3.4.2 Participant Sample Discussion

This research was conducted in selected schools across Lahore (a major city in Pakistan). Schools were selected to represent average as well as exceptional schools in the

public and private sector. All of the selected schools had recently launched the initiative to meaningfully integrate technology into teaching practice.

3.4.2.1 School selection

While selecting the schools for technology integration projects, the following factors were kept in mind:

1. The schools must be close enough so that it is possible for the researcher to commute to them every day, if needed.
2. The school administration must have given consent to carry out the research
3. The schools must have at least one Grade 7 classroom with sufficient student enrolment.
4. The teachers of Grades 7 must have provided their consent to become participants in the research.

Keeping these factors in mind, the researcher had short-listed twelve schools; four school of each of the three types. However, only one school was selected from each type. This finalisation was subject to the approval of the research from the school leaders, administration, and teachers. The need to short-list twelve schools was justified as schools in Pakistan are generally not comfortable with granting access to strangers to carry out research projects. As anticipated by the researcher, the first six schools who agreed to become research participants, later on rescinded their consent due to various reasons. Eventually, the researcher was able to select the three next schools which suited the abovementioned four criteria. For the purpose of this research document, the schools are consistently referred as:

- a) The Public School,
- b) The Private School,
- c) And The Partnership School.

3.4.2.2 Grade selection

The term Grade refers to what year the students are studying in; in some countries this term is replaced by terms like 'year' or 'class'. In all three participant schools the Grades go as follows:

1. Kindergarten, also known as its abbreviation KG
2. Nursery
3. Prep
4. Grade 1
5. Grade 2
6. Grade 3
7. Grade 4
8. Grade 5
9. Grade 6
10. Grade 7
11. Grade 8
12. Grade 9
13. Grade 10

For public and private schools there is a major change in teaching style when students move from Grade 5 to Grade 6, or in some schools from Grade 3 to Grade 4. Up to Grade 5 (or Grade 3 in some schools) students are taught all subjects by one or two teachers; these teachers are usually called 'Class Teachers'. From Grade 6 and onwards subject specialist teachers start teaching. This gives the researcher a better chance of studying subject based technology used by the specialist teachers. Therefore, for the purpose of this study, teachers, textbooks and documents from only Grade 7 were selected. The teaching pattern does not change much for the Public-Private-Partnership schools therefore, for uniformity of research, their teachers, textbooks and documents from only Grade 7 were also studied. Consequently, a compare and contrast analysis was done for The Public School's, The Private School's and The Partnership School's collected data.

3.4.2.3 Teacher selection

Teacher participation in this research was subject to the consent of the teachers and the school. As, stated above and as foreseen by the researcher, various shortlisted schools handled this differently. However, once the schools were finalized, the researcher arrived at each of the participant schools at an agreed upon schedule and informed the teachers about the nature of this research. Schools' administrators were informed about the pertinent details of the project, including but not limited to, data collection tools associated with the research. Ideally the researcher would have liked a one-on-one session with each teacher to inform them about the research and seek their consent to become research participant. However, due to this research being extremely time constrained, such ambitious plans had to be replaced with more pragmatic ones. All prospective research participants were invited to a research information dissemination session that was conducted by the researcher.

Teachers and other attendees were encouraged to ask questions during as well as at the end of that session. After the session all attendees were invited to read the Participant Information Sheet and sign the consent form if they agreed to the terms and conditions delineated by the Participant Information Sheet. Teachers were reminded to volunteer only if they did not object to the data collection methods and if they understood the relevant details of the research. Video recording for interviews was the single most objected upon tool in all three schools. Therefore, a decision was made to replace it with audio recording. All school heads and teachers appreciated this change and eagerly provided consent afterwards.

One must pay special attention to diligently examining 'case study candidates' before finalising the case study teachers from among the pool of volunteer teachers (Yin, 2014). This is an important filtering process that enabled the researcher to reduce the chance of experiencing a potentially non-viable case unit (teacher) during the data collection phase. Pursuant to this philosophy of mitigating time and resource wastage due to non-viable case units, the candidates were screened through a set of criteria to enable the researcher to choose the most suitable candidates only.

The following three operational criteria were utilised to screen the candidates prior to their selection or rejection:

1. Teachers who been employees of their respective school for at least one year
2. Teachers who are employed as full-time teachers
3. Teachers who are teaching a whole subject to a class and not part of the subject only

Due to this criteria two teachers were excused from this study due to their contract being only as part time teachers or contract based teaching assistants. Similarly, a very eager young teacher was not selected because she had only started teaching 2 months ago and did not meet the one year of employment criteria. The 23 teachers and school heads who passed the aforementioned criteria are listed in Table 3.1 along with certain details about them. Their names have been changed to protect their anonymity. These pseudonyms have not been assigned according to any particular system. For example, the starting letter of the pseudonym may or may not be the same as the participant's original name.

Table 3.4.1 Profile of the Research Participants

Code	Designation	Pseudonym	Age	Experience in years	Interview Date
The Public School					
S1H	Principal	Zahid	45	20	14-Oct-16
S1T1	English	Inayat	32	5	17-Oct-16
S1T2	Urdu	Rustam	47	20	18-Oct-16
S1T3	Islamiat	Shoukat	29	2	19-Oct-16
S1T4	Science	Ikram	39	10	20-Oct-16
S1T5	Math	Faisal	42	18	21-Oct-16
S1T6	History	Javed	50	24	25-Oct-16
	Geography				
S1T7	ICT	Bilal	20	1	26-Oct-16
The Private School					
S2H	Principal	Zareen	60	35	21-Sep-16
S2T1	Urdu	Uzma	42	18	22-Sep-16
	Islamiat				
S2T2	ICT	Sohaib	48	20	23-Sep-16
S2T3	English	Seemeen	35	8	26-Sep-16
S2T4	Math	Saadia	45	19	27-Sep-16
S2T5	History	Nosheen	27	3	28-Sep-16
	Geography				
S2T6	Science	Aisha	36	10	29-Sep-16
The Partnership School					
S3H	Principal	Sajida	47	20	14-Oct-16
S3T1	English	Zahra	33	5	17-Oct-16
S3T2	ICT	Shazia	29	3	18-Oct-16
S3T3	Science	Shahida	44	19	19-Oct-16
S3T4	Math	Riffat	26	2	20-Oct-16
S3T5	Urdu	Gohar	47	12	21-Oct-16
S3T6	History	Qurat	38	10	25-Oct-16
	Geography				
S3T7	Islamiat	Najma	45	17	26-Oct-16

3.5 Data Collection Tools

For the purpose of this study, I used the following methods to gather data for subsequent analyses presented in Chapter 4:

- a. Semi Structured Interviews
- b. Various Documents (Textbooks of Grade 7, Policy Documents, and National Curriculum Document)

Creswell (1998) states that thorough data collection, from single or multiple sources, becomes the backbone of any qualitative study. Qualitative data may come in the form of words and images (Robson, 2002; Creswell, 1998) as opposed to numbers and figures. Sources of information for qualitative data may include interviews, observations, documents and audio-visual materials (Creswell, 1998). Multiple sources of information help the researcher in triangulation of data and to derive valid and reliable conclusions. Miles and Huberman (1994) point out the power of well-collected qualitative data when they state that a major feature of qualitative data is that it focuses on events occurring in their natural settings. This richness of data empowers the researcher with a chance to gain an understanding of hidden and nonobvious meanings.

Yin (2009) states various sources of data collection tools which are most prevalent and more frequently used in case studies. Six of these sources of evidence are as follows:

1. documentation
2. archival records
3. interviews
4. direct observations
5. participant observation
6. and physical artifacts

Some researchers have also cautioned the readers to check their bias for or against any particular source of data collection as ‘no single source has a complete advantage over all the others... the various sources are highly complementary...’ (Yin, 2014). To carry out triangulation of data and to enable the researcher to maintain and uphold the validity,

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reliability and authenticity of this study, these three data collection tools were used: interviews, textbooks' analysis and curriculum and other documents' analysis. For the purpose of this study the researcher carried out a systematic data collection process. This data collection took place between September 2016 and November 2016. The collection and analysis of data was done concurrently. As more data were analysed, the researchers approach to collecting data was improved in the light of previous data analysis. This research intended to use interviews, textbook analysis, and document analysis to gather data.

This research was conducted as per the PhD degree requirements for University of Leicester's School of Education. The researcher asked the University of Leicester to provide an authority letter; this empowered the researcher to carry out research as a university degree candidate. Section 3.7 discusses ethical concerns related to this study. The researcher printed out consent forms that clearly stated the terms and conditions of this research to the potential research participants. These forms were written in English language and diction was kept to a simple enough level so they were easy to understand by most research participants. Even then some necessary jargon was explained in detail or translated to Urdu to facilitate the participants' understanding of the terms and conditions.

3.5.1 Decision of not using classroom observation as a tool

Classroom observation can be a very useful tool of data collection if the participants' performance, attitude, and behaviour is not affected or influenced by the presence of an observer. The researcher planned to observe and record (if consent was given) teachers while they used technology in various forms during their teaching. However, upon reaching the schools, all three participant school heads withdrew their consent to allow classroom observations. All schools stated that observations are a very formal and often a fairly stress-inducing tool used by educational inspectors and school leadership alike to assess a teacher's quality of teaching. Therefore, teachers generally do not feel comfortable allowing a stranger to observe their lessons.

Classroom observations can be informed and planned, or they can be a surprise for the teacher. If they are informed and planned there is always a chance that the observed teacher's practices, demeanour, and interactions are not a representative sample of their behaviour for the whole academic year. If the observations are done in a drop-in manner and turn out to be a surprise for the teacher, there is again this risk that the teacher who is being observed may become rattled by the sudden presence of an authority figure in their classroom. This shock of a sudden observation may distract and disturb the teacher's focus, eventually resulting in aberrant behaviour which cannot be considered a regular occurrence and thus cannot be generalised as the teacher's behaviour for a longer time period.

In order to avoid alienating teachers and to keep them interested in this research, the researcher decided to renege upon classroom observation as a data collection tool. Consequently, to conduct a meaningful data analyses for this research, Textbook Analysis and Document Analysis was given more focus since classroom observation was being scrapped as a data collection tool.

3.5.2 Interview

Interviews are a common method of data collection in qualitative case study designs. Marshall & Rossman (1999) describe interviews as an extremely powerful tool for qualitative data collection as it allows the researcher to collect variety of information from numerous participants, allows for follow-up and empowers the researcher to examine the meaning people hold for their routine practices. For this research, interviews will be used to bring forth the values, beliefs, perceptions and attitude of teachers and administrators towards technology integration in their schools.

The interview questions were derived from the research questions of this study. The semi-structured nature of the interview, however, allowed the researcher to handle unanticipated responses. Since the interviews follow the constructivist-interpretive spirit of the research, (Miles & Huberman, 1994) describe this form of data collection as "a co-elaborated act on the part of both parties, not a gathering of information by one party".

The questions asked teacher participants to state their experience of using technology, in detail. They were asked to reflect on their teaching practice prior to the research and compare it with any possible changes in their teaching style after they were asked to use technology. They were encouraged to give elaborate accounts of their successes and failures while implementing technology based lessons.

3.5.2.1 Constructing the Interview Questions

The purpose of interviews is to gather, collect, record and analyse qualitative data. This data will be scrutinized in order to examine and investigate different narrative accounts of individuals, their experiences as well as gain insight into understand the variety of problems and challenges that are faced (Miller & Glassner, 2009). The interview will be used as a research methodology but it can also be considered as a social interaction which must be sustained, established, nurtured as well as end elegantly (Seidman, 1998).

While conducting interviews the researcher should always treat the interviewee with respect and dignity. Consent needs to be taken before conducting any interview. An effective interview is one in which a level of trust is established between the interviewer and the respondent. Trust building is important in order to engage in an effective conversation and gain an insight into understanding the world of the interviewee. The trust eventually will lead to meaningful questions as well as truthful answers (Merriam, 2009).

3.5.2.2 Formulating Interview Questions

At the same time the interviewer needs to be mindful of the notion that interviews could be considered as a one way dialogue in which the interviewer has absolute control and monopoly over the meaning of its interpretation (Kyale, 2006). Interviewer holds a lot of power and autonomy and the power needs to be treated carefully and not be abused. The participant or respondent should remain comfortable at all times and no questions should coerce or force the participant to give an answer. Such indicators are necessary to maintain validity as well as reliability of the interview. After establishing the code of conduct needed to establish a cordial interview, the next part of the process is to finalize the content and

type of interview. There are multiple types of interviews such as an in depth interview, survey or focused interview.

In-depth interviews are focused on those participants who provide an insightful detail about certain events or processes. Important information is gathered from these respondents and the data is crucial in understanding nuances attached to the particular case study. In-depth interviews are never a one-shot interview and take place over a course of multiple visits and meetings and sessions. These respondents are crucial for evaluating the success of a particular case study (Yin, 2009). At the same time in-depth interviews should not be the only source of interview and case studies shouldn't solely rely on a single source of evidence. Evidence from in-depth interviews needs to be complemented by documentary evidence and analysis. For example in this study there were numerous teachers who agreed to be interviewed across multiple sessions as well as over a long period of time. These respondents became crucial for the study as they provided valuable insight and data which later was scrutinized.

The other source of interview is the focused interview, the aim of the focused interview is to ask questions regarding a certain theme and within a certain time limit. They last for a shorter period of time for example typically they could last for an hour (Yin, 2009). For our study, the focused interview was an important source where data and qualitative information was gathered due to the tight schedule and availability of teachers. The process of the interview is mostly colloquial in nature and it involves more of a 'conversation' rather than a one-way dialogue (Yin, 2009). For our study, an 'interview schedule' (Merriam, 2009) was established which was then used to evoke responses from respondents. The style of asking the questions was probing in nature and the interview question list consisted of questions created in a semi-structured manner.

At the same time other approaches were also considered for the interview such as creative interviews, survey interviews and active interviews. For example in survey, interviews an objective, unbiased and non-judgemental methodology is utilized when working with the respondent. The interview has to avoid in suppressing his/her personal opinion as well as be objective in its evaluation of the respondent (Holstein & Gubrium,

2009). On the other hand, creative interviews are one which aim to go beyond the surface of the experience and dive into ‘emotional wellsprings’ (Douglas, 1985). An intimate and straightforward conversation is taken place during creative interviews in which the interviewer freely expresses his/her opinion and expects the respondent to reciprocate in the same way. Creative interviews help in investigating the emotional thoughts attached to the respondents (Douglas, 1985).

In active interviewing, the interviewer plays a free hand by alternating and switching his/her paradigm and position throughout the interview in order to explore all the sides of a specific case and gain insight into different perspectives and beliefs. Compared to the survey approach and creative approach, this method can only succeed with mutual collaboration between the interviewer and the respondent as they engage in meaningful conversation (Holstein & Gubrium, 2009). The interview bias which results from this sort of interview can be used to gather and investigate useful data. However strict consideration needs to be taken during analysis through active interviewing as context needs to be interpreted with caution. For the sake of this study, active interviewing was used to create a meaningful conversation between the teacher and myself. The justification for this interview is that since due to my past work experience I am quite comfortable and familiar with the school teachers as well as already have an established relationship with some of these teachers. Also research indicates that interviewers should be familiar or be part of the group that they are studying for effective results. It is believed that subjective knowledge about the study topic is necessary for the interviewer in order to engage and understand the experiences of the respondents. (Miller & Glassner, 2009).

At the same time adopting a survey interview might yield an apathetic response. Similarly the ‘creative interview’ might emotionally charge the teachers and hence in such a scenario, the active interview makes the most sense. However, trust deficit could rise from active interviews as well as authenticity of the answers made by the respondent. It must be ensured that the interviewer does not influence the thought process of the respondent in order to avoid a skewed or biased response.

3.5.2.3 Administration of the Interview

This section explains the step by step process of the interviewing phase. On the day of the interview each participant (in this case, teachers) were given a consent form and asked that they did not have to answer all the questions in the interview especially if they feel uncomfortable regarding a certain question. The interviewees have a right to decline to answer any of the specific questions asked. At the same time issues of confidentiality were also addressed to the teachers such as the use of pseudonyms in the final version of the report (Patton, 2002). The names of these pseudonyms were carefully selected in order to rightfully represent their age, context of their life as well as ethnicity (Seidman, 1999). Permission was gained from the respondents to audio record the interview as well.

Literature review indicates that there has been some level of controversy allowing the use of audio recorders as the use of audio recorders might influence the respondent to hide or conceal some aspects of the information. Also the possibility of technical failure can also not be ignored. However one big benefit of audio recorders is that it provides a good medium to encourage the participants to speak more as well as voice recording helps in the study being accurate especially in terms of transcription.

Before the start of the interview a sound check with the audio recorder was conducted before formally conducting the interviews. The recorder was placed initially on the side of the table and sometimes concealed under a piece of paper especially when teachers would easily get distracted by the device. A quiet and isolated room was generally used for the interview as the place did not suffer from any logistical problem or distractions which would disrupt the interview process. However, due to the lack of a proper meeting room in any of the schools, sometimes, interviews were conducted in a room that was not quiet or isolated. This at times distracted the participant from staying focused on the interview question. If the ambient noise was too distracting or the interruptions to the interview process were happening repeatedly the interviews were rescheduled to another day and time.

A sound check on the quality of the recording was made before the interview formally began. The audio recorder is usually placed to the side of the table or under a piece of paper especially if the teacher showed signs of being distracted by it.

A quiet room or a closed school café were used for the interview. It was ensured that there were no non-essential individuals involved during the interview process and the respondents were asked to keep their phones on silent. During the course of the interview, nodding and other non-verbal cues were used to portray to the teacher that they were being listened to and that their response has been acknowledged. A friendly and cooperative atmosphere was established right at the beginning of the interview. The interview started with basic and simple questions before delving onto details. It was very important to establish a level of trust with the respondent as well as make the respondent comfortable. As part of the active viewing strategy, jokes and humour was included in order to make the respondent comfortable with the surrounding (Yin, 2009).

Since the interviewer in this case already had prior knowledge and information about the topic, a strategy was planned out to make sure that an element of shared knowledge is present throughout the interview in which the interviewer uses his/her existing expertise into formulating better questions and in turn better answers from the respondent. For example the interviewer may initiate a new discussion regarding the use of tablets to record student attendance and data and how teachers in Punjab might not be interested in using this method or show their dislike towards it. Throughout the course of the interview, the respondent was allowed to make a negative or harsh opinion. The way the interview was phrased was such that explicit questions were asked rather than statements in order to make it easier for the respondent to analyse the issue and present his/her respective perspective. This helped in curbing any unintentional impact of active interviewing influencing the responses of the teachers.

After the interview it was important to transcribe the interviews. Transcripts were based strictly from the audio recording. Random noises and irrelevant pauses were removed in the final version of the transcript in order to present transcripts which can be easily read or edited for accuracy (Miles et al, 1994). After the transcripts were written they were emailed to the respective teachers in order to verify the statements and opinions they presented and if necessary amending those. In our case study, the changes that teachers wanted to make were mostly editorial and technical in nature for example spelling errors,

grammatical mistakes or punctuation problems. The essence of the content remained the same and no changes were made regarding that.

3.5.2.4 Development and First Piloting Exercise of Instruments

The initial piloting exercise of the interview and survey instruments was implemented with two teachers as well as an ICT technical support staff from the partnership school. The teachers selected had more than 5 years of teaching experience and were well versed with ICT and had effectively utilized it during the course of their work. One of these teachers was the ICT, Head of Department whereas the other teacher was a team leader responsible for ensuring a group of 10 teachers who were primarily Grade 7 teachers had adequate access and training with regards to ICT tools. It is important to note that both teachers taught different subjects. The objective of these pilot interviews was to ensure that the questions asked were simple, easy to communicate, understand and interpret for the teachers that were selected for this case study. It was to test out the reliability of the questions that would be asked as well as its effectiveness with regards to the topic of the study

3.5.2.5 Modifications to Interview Questions for Main Study

After gaining valuable insight from the experienced ICT teachers as well as the technical staff. It was decided that some changes are in order for the interview checklist and certain modifications were made in this regard in the following:

1. It was identified that most questions tackled only the surface of the problem and did not delve deeper into understanding the various reasoning's and processes. Most of the questions had a 'Yes/No' response which was considered as inadequate to conduct detailed qualitative analysis. According to the experienced ICT teachers, the questions should be phrased in such a way that they are probing in nature and help in eliciting responses which talk about processes and reasons for example the question 'Do you have any history behind your use of technology?'" was modified to 'How did these experiences affect your usage of technology now?'"

2. Questions related to the availability and easy access to technical support were added for example “Do you have a mentor to help you plan and carry out lessons using technology?”
3. In order to understand the attitude, trends and perspective of school teachers involved with the usage of technology, some changes in the questions had to be made. For example, it was realized during our initial interview sessions that the school management of these private schools gave teachers the independence and autonomy to decide whether technology use should be allowed or not depending on the comfort of the teacher. For example, “Do you see the technology based lessons as similar to other changes implemented by schools? Do you respond to them in the same way?”

3.5.2.6 Personal Reflections on Interview Checklist

After reviewing my interview checklist I came to the conclusion that most of my questions were ‘fluid’ in nature as they did not guarantee a strict or a rigid response from the teacher. A level of on-the-spot thinking was required for the course of the interview. I also realized that writing down answers while engaging with the respondent requires a certain amount of skill and is no easy task which is why it was easier when the option of audio recording the interview was included. The interviewee needs to be well versed with the questions present and should be comfortable with the interview instrument to avoid repetition or omission of questions.

3.5.3 Document Analysis

Documents can become an important source of data for any qualitative study: as Marshall & Rossman (1999) state, at times the context comes in part from reviewing the documents. Such secondary use of documents is supported by McMillan (2002). However, for this research document analysis was carried out not just to corroborate or verify

information from the other sources, but also to gather first-hand knowledge of the resources available to teachers in the form of textbooks, curriculum documents, policy documents, and some lesson plans. It is important to note here that all of the teachers from The Public School as well as from The Partnership School, did not make any tangible lesson plans and relied heavily on the textbooks' contents to deliver their lessons. The researcher analysed the current curriculum of sixth and seventh grade, some of the technology based lesson plans, the school's timetables, and the computer lab schedules. These documents were uniquely useful in understanding some of the problems faced by teachers while using technology in their teaching practice.

3.6 Data Analysis

3.6.1 Interview Data Analysis

The data collected from interviews, and documents, was analysed using “Five-Phased Cycle” suggested by (Yin, 2014). The five stages are, “Compiling, Disassembling, Reassembling (and Arraying), Interpreting and, Concluding.”

Compiling. The researcher compiled the gathered data in electronic format. Interviews were digitally transcribed using MS Word software. All interview responses were juxtaposed with each other. This was rather complicated to achieve since the interviews were not purely structured. The semi structured nature of interviews resulted in unique probing questions for all participants. Therefore, some data resulting from the probing questions had to be placed in a separate category as these responses did not coincide directly with the research question but they supported ideas pertinent to the research questions. This data was then juxtaposed with similar data from the probing questions which consequently helped with the subsequent phases of Yin's model.

Disassembling. In this phase of data analysis, data was broken down into smaller more discernible parts. Interview transcriptions were generally in the form of relatively lengthy sentences. These transcriptions were diligently scanned several times to identify themes and then to code them.

Coding. The compiled interview document was disassembled into a coded document. All interview responses were tagged with the identified codes.

Reassembling. This phase utilized the themes identified by the previous phase. The themes from disassembling phase were then put together to find out commonalities and differences. The reassembling phase clustered similar looking themes together to create bigger overarching themes. This phase reduced the overall amount of themes while keeping the original information intact.

Interpreting. This phase is the essence of the data analysis process. All reassembled themes were viewed holistically, in the context of this research, to make broader inferences. When themes were found to be standalone or irrelevant they were disassembled and reassembled for further refinement.

Conclusion. This is the wrap up phase of data analysis where it was ensured that all data no matter how small or big, had been diligently processed through the model and had been scrutinized, tagged, and interpreted. In this phase of data analysis major conclusions and findings of the study were finalised.

3.6.2 Document Analysis

3.6.2.1 Textbooks

The books of all subjects were examined for similarities and differences among the ones used by the public school, the private school, and the public-private partnership school. Books were purposefully reviewed to find any and all support they offered to the teachers to use technology meaningfully in their teaching practice. Chapter-wise analysis was carried out to identify all potential teacher support mechanisms for books of the following subjects:

- a. English
- b. Urdu
- c. Science
- d. Mathematics
- e. History

- f. Geography
- g. Islamic Studies (commonly called ‘Islamiat’)
- h. Information and Communication Technologies

3.6.2.2 Curriculum Documents

The curriculum documents were the hardest to acquire from the schools. The public school did not have any hard copies of the curriculum document. During the interviews as well as during informal and off the record verbal communication, teachers as well as the schools heads were often using the terms ‘syllabus’ and ‘curriculum’ interchangeably. This seemed to suggest that they either did not have a clear understanding about the differences between the two terms, or they were never provided with anything but a syllabus in the name of a curriculum. The public school claimed to be using the national curriculum. Therefore, the official national curriculum document was acquired from the official website of Ministry of Education.

The private school was reluctant in sharing their curriculum for the purpose of analyses in this thesis. Their major concern was unwarranted scrutiny of a proprietary document and also the risk of potential divulgence of confidential document to the competitors. However, after a detailed information gathering session with the researcher, the school head allowed the use of some of the curriculum documents sections as long as no direct quotations from the documents are included in the thesis. The school head also did not allow the researcher to include any paraphrased information that could reveal the school’s identity. This was a concern that was addressed by the researcher when the research proposal was passed by the ethics committee. In order to keep the anonymity of the participating schools, any revealing nouns or pronouns were assigned pseudonyms so readers of this thesis cannot trace the information back to its source school or personnel.

3.6.2.3 Policy Documents

Two policy documents were studied and analysed for this study.

- a. National Education Policy
- b. National Professional Standards for Teachers in Pakistan

Both these documents are meant to guide the curriculum developers, textbook writers and teacher educators to streamline their work products with the guidelines provided by these policy documents.

3.7 Data Validity and Reliability

Three data collection tools were employed to enable triangulation based on the collected data. This triangulation was significantly helpful in establishing data reliability. The researcher presented the participants with a written declaration that their anonymity will be protected at all levels. Moreover, participants were assured that the information provided by them will only be used for educational purposes of this research. This confidence bestowed upon the participants helped them to provide accurate and valid information. In addition the research conditions and environment were clearly stated to the participants. Only those professionals who agreed to the terms and conditions of this research were selected as research participants. Since, this selection condition limited the participant pool therefore, it prevents the researcher's ability to draw valid broad generalizations from the findings of this research.

3.7.1 Trustworthiness

Albeit a rather simple and highly valued concept in daily life, trustworthiness is also very important when it comes to this qualitative comparative case study. A study can be considered trustworthy and valid if it accomplishes its measurement goals; it measures those variables that was the researcher's intention to measure during the design phase (Toma, 2006). Hence, the researcher should plan to counter any and all potential biases that may arise during data collection, discussion and data analysis. The study should state all findings in the way that they were measured. This means that facts should not be assumed unless there is evidence for that fact. Moreover, the researcher should report all implications of the findings in an objective manner. However, absolute objectivity is an unrealistic goal in qualitative research. Unintentional bias has a tendency of seeping in if the researcher does not safeguard against it in the data collection and analysis process.

According to Lincoln and Guba (1985), the value and worth of a study can be strongly impacted by its trustworthiness. Trustworthiness includes establishing the following four criteria:

1. Credibility
2. Transferability
3. Dependability
4. Confirmability

3.7.2 Achieving Trustworthiness

In order for this research to have trustworthiness several techniques were used to achieve the four criteria of trustworthiness; Credibility, Transferability, Dependability, Confirmability.

a) Triangulation – In order to achieve triangulation data is checked and matched with data from other sources to establish its accuracy. Data from the interviews, textbooks, and policy documents was cross matched to check the validity of relevant themes; thus achieving triangulation of data.

b) Member checking is another technique used to ensure accuracy of the data collected. According to Lincoln and Guba (1985) ‘member checking is the most crucial technique for establishing credibility’. The collected data is ‘played back’ to the teacher to check for perceived accuracy and reactions either by asking the teacher to verify that the transcript of the interview is accurate or to email the teacher for verification once the transcript is complete. For this study all interview transcripts were provided to the pertinent participants to check for accuracy. Not only did teachers plug in the missing words in their transcripts they also, in few instances, provided further explanation of what they initially stated in the transcript.

3.7.2.1 Credibility

Voice recordings and member checking of transcripts are techniques that not only help in ensuring data accuracy but also help in establishing research’s credibility. Further investigative questioning and in some cases seeking several perspectives on one teacher’s

claims helped in determining if the data presented by a certain teacher were reliable (Yin, 2014). Analysis of data from several differing types of sources, for example, interviews, textbooks, curriculum, lesson plans, and policy documents from the ministry of education, provided a ‘convergence of evidence’ which positively affects the process of constructing validity.

As previously discussed in the section about active interviews, active interviewing can damage the credibility of the research. This unintentional undermining of the credibility happens when the participants may form their responses in relation to what they believe is being desired by the researcher. To maintain credibility, data triangulation was conducted in various aspects; school heads’ interview data was cross checked with data from different subject teachers to check for credibility. Teachers’ statements about excessive workload was checked for credibility by asking all participant teachers about their workload and then verifying it by checking some class’ timetables. Similarly, corroboration of teachers’ claims about lack of resources was done by asking principals about them and also through checking policy documents on what sort of assistance is provided by the school administration as well as the government.

3.7.2.2 Transferability

This study makes use of ‘Thick’ descriptions of the findings so that reader can make their own minds about the relevance of the contexts for themselves. Alongside answering the question of how technology is being used, other research questions deal with in depth reasons of various factors affecting attitudes of participants towards meaningful use of technology. These detailed discussions of how’s and whys are clearly articulated to pique the readers’ interest.

3.7.2.3 Dependability

The concept of dependability hinges on the provision of sufficient data which enables the reader to make an informed judgment about the findings of any study. This can be done through a process called ‘audit trail’ (Yin, 2003). An audit trail delineates and explains the rationale behind any and all significant changes made to the study. For example this study explains why several schools were accosted to participate in the research due to anticipated participants’ withdrawal of consent. Moreover, the study also explains how interview

questions as well as interview taking techniques were adjusted and improved during the data collection process. Most importantly the study mentions the justification for selecting the three schools for a comparative case study, as it informs the readers about the significant role public, private, and partnership schools play in Pakistan's school education domain. It is important to note that some of the active interviewing concerns are also applicable when it comes to ensuring the dependability of a study. Some solutions are applicable in this case as discussed in the initial section covering credibility of the study.

3.7.2.4 Confirmability

Audit trail not only affect dependability but they also contribute to increase a study's confirmability but Audit trails have the purpose of increasing confirmability by reconsidering facts, feeling and beliefs encountered and collected during data collection and viewing them through the lens of reflection. The research takes particular note of his personal biases by recording them prior to and during the study, in the hope of catching and correcting any biases or subjectivity in data collection and analysis. This helped in developing timely and effective techniques to prevent any loss of confirmability of this study. For example, the researcher's amicability with the participant schools' administration helped the researcher in relatively unfettered access to the schools' teachers. However, the same relationship also made some teachers hesitant about disclosing too much information. More trust-building was done with those teachers. Longer interviews were the obvious choice as some teachers were probed with explorative and detail seeking questions if they were deemed hesitant to divulge information.

3.8 Limitations and Challenges of this Study

This research has a specific timeline associated with it. This timeline did not allow the researcher to extend the research beyond the assigned deadlines. Due to this time constraint the scope of the study was focused down to three types of school in one major city of the country. It is important to note that Pakistan is a multi-ethnic and multicultural country. The research was conducted in only one of the cities (Lahore) in Punjab province. Other provinces may have different attitudes towards education and the use of technology in education. However, due to the limited time as well as financial restrictions the data was collected from a sample which is diverse enough yet manageable for this study. Lahore is a

city that attracts a lot of professionals from all over Pakistan. Therefore, it is possible that some of the participants will hail from other cities and represent that region's cultural attitude towards education.

Teachers in Pakistan's schools may show hesitancy towards interviews and observations, especially female teachers. Many teachers who agree to being observed are those who are forced by their school heads. Some teachers are exceptionally confident of their skills and do not mind being observed during their lessons. However, some teachers tend to refuse to become a participant in such studies. This research will not be able to study the teachers who refuse to participate in the research. Therefore, the findings will be based on the data collected from the teachers who were willing to participate or those who had to participate due to peer pressure or school head's pressure. Teachers who did not give their consent to participate in this study were not included in this research.

Curriculum document maybe difficult to acquire from many schools. The latest official curriculum documents for Science, Mathematics, and English date back to 2006. Almost 13 years have elapsed and official revised curriculum documents are still unobtainable. This maybe one of the reasons that private school systems like Beaconhouse School System, The City Schools, Lahore Grammar School, and others prefer to develop their own curriculum to suit their students' needs. However, this curriculum is generally developed in a head office and then disseminated to all branches of the school system. It is then up to the school heads and teachers to transform the curriculum guidelines into daily lessons and achieve the learning outcomes through their teaching. Unfortunately, many teachers hesitate in developing technology based lesson plans as they are more comfortable with their traditional lectures. This research encouraged all teachers to become participants despite their teaching experience. It was still feared that only those teachers will agree to participate who are either new to this profession or those who have enough exposure to the use of technology in their teaching. This still left out a big cluster of teachers. To ameliorate this situation school leaders were asked to encourage all teachers to participate regardless of their expertise in the field of technology. School leaders' motivation ensured a far diverse group of participants yet it was not diverse enough or big enough to be called a

representative sample. Therefore, the results of this research cannot be directly extrapolated to represent the educational situation of the whole country. It still has to be seen and understood as a comparative case study of three different yet similar schools.

3.9 Ethical Concerns

Research ethics are of paramount importance in any research but they become even more important when human participants are involved. For the purpose of this thesis the researcher sought guidance from the University of Leicester's ample resources available on its website. Before starting the process of data collection, the researcher sought formal approval from the University of Leicester's Research Ethics Committee. This application provided all the relevant details of the research, including but not limited to, research methods, research participants as well as potential benefits of this research to the participants. This application also stated foreseeable ethical concerns while also stating measures taken by the researcher to counter them.

3.9.1 Respecting Participants' Right to Privacy

It is important to uphold the integrity of the research and in order to do so the research must also maintain respect for the 'participants' confidentiality, dignity, interests and rights' (Council, 2019). Participants as well as schools were assigned pseudonyms so that their identities are never disclosed in the thesis. Using pseudonyms also allowed for a more meaningful use of interview data as participants could still be assigned unique identities in any arguments or debates being used in any section of the thesis. For example, using the phrases like 'one participant' or 'some participants' is far more impersonal and ambiguous and thus yields less meaningful conclusions as compared to terms like 'P1 and P4 of private school'. Pseudonyms as well as codes allowed the readers to relate to the participants better while completely respecting their right to privacy and anonymity.

3.9.2 Access to Proprietary Content

Private school was especially reluctant in sharing its curriculum for they feared reproach and wanton criticism. They were also uncomfortable with the thought of having the curriculum sections published in future along with the research document. School was given assurance that curriculum would only be used for comparative purposes and most

references would be paraphrased before they are mentioned in the research. In case a direct quotation is needed, it will be trimmed to remove any words or phrases that might reveal the school's identity. Despite the reassurances the school only provided limited access to its curriculum document.

3.9.3 Informing Participants

While seeking schools' approval to participate in this study, school heads were provided with a research proposal detailing all the research methods. School heads were informed about the confidentiality and anonymity issues. Even when the school head had agreed to become a research participant, the teachers as well as the school heads were provided with a Research Participant Information document. This document was written in light of the guidelines provided by the University of Leicester's Research Ethics webpage. Keeping in mind that many of the research participants were not fluent in English language, some editing and rephrasing was done to the document in order for it to be more understandable for the research participants. Consent was sought in a manner which was as close to being comprehensively informed as the research's limitations allowed. Spending an hour or more with each participant to explain the nature of research to them was an impractical approach that my time bound research could not afford. Therefore, teachers and other participants were invited to a short presentation where the nature of research was explained to all potential participants, in English, Urdu and in Punjabi or Saraiki (a regional language) language as deemed necessary by the researcher. They were given the option to withdraw from the research within 2 weeks of giving consent. Participants were informed that data collected and the eventual analysis will be used for academic purposes and maybe published in academic journals in future.

3.9.4 Addressing Potential Conflicts of Interest

There is ample research on insider researcher, delineating both the advantages and disadvantages on being an insider researcher. One such benefit of being an insider researcher is professional development for the researcher (Jaworski & Goodchild, 2006). Moreover, being an insider research also results in an acquaintance or 'pre-understanding of the issues being discussed' (Mercer & Littleton, 2007). It is important to distinguish that

the researcher does not consider himself as an insider researcher. However, having worked with the participant schools in several different capacities, the researcher is in a unique position to be familiar with the schools and their general operations. This intimate exposure with the schools' core workings allowed the researcher with an inside context to evaluate and analyse the findings with a deeper meaning. However, the same intimate knowledge can also result in researcher bias as the researcher may ignore certain observations due to being overly familiar with what the participants are stating in their interviews. The researcher is well aware of the fact that his pre-conceptions may hinder his ability to decipher and understand the interview responses in the way that he wants to understand them rather than the way they should be perceived (Mercer & Littleton, 2007). In order to reduce and counter this researcher bias special attention was paid as to how the researcher would respond to certain jargon based or opinion based responses. Participants were probed for further explanation even when the researcher knew what they meant. Researcher made concise and regular notes during the interviews. These notes allowed the researcher to reflect and ponder if the line of questioning or the reaction from researcher had unconsciously influenced the participants' responses.

Interviews' audio recording enabled the researcher to come back to the interview and reflect further to examine the interview process for pre-conceived or researcher bias. During the initial interviews the researcher noticed that sometimes he would interrupt the participant responses by finishing the response with what the researcher believed was going to come from the participant. This was quickly corrected by the researcher in future interviews as he allowed the participants to complete their responses even if it resulted in several silence moments during the interview.

As previously stated, all the three participant schools for this research had been visited by the researcher to conduct some professional development workshops in the past. Therefore, some of the participant teachers knew the researcher already and were more open to sharing their teaching practice with the researcher. Especially the successes and failures of their attempts to make meaningful use of technology in their teaching practice. Conversely, some teachers were more reluctant to share too many details. One possible explanation for that hesitancy could be that they saw the researcher as being too close with

the school administration and feared administration's retribution in case they divulged too many examples of failures in their teaching practice. These teacher perceptions can create some form of participant bias in the collected data. However, effort was made using probing questions to enable the researcher to gather as much in depth information as the participants allowed. This bias cannot be completely removed however the researcher was particularly careful in asking pertinent questions and keeping the responses pertinent too. If the participants digressed into anecdotal responses that were irrelevant to be within the scope of this study the researcher guided the participants back on track by reiterating the question or by providing a translation of the question, in case the participant did not understand the original question in English language.

3.9.5 Gender Concerns

This research interacted with teachers, school administrators and school leaders. As a male researcher, it was anticipated that the researcher will face a peculiar problem. A large number of teachers in the case study's selected schools were expected to be females. It was feared that they may not be comfortable with the idea of a male researcher interacting with them and recording them during the interviews. In order to overcome this barrier the researcher employed the 'gatekeeper' technique. School leaders and school principals were requested to establish the researcher's rapport with the teachers before any data collection tools were employed. Moreover, special attention was paid to the fact that teachers never felt threatened during the data collection process. Even when probing them for more information the researcher gauged their responses to assess their level of discomfort and proceeded appropriately. Facial expressions were kept to a friendly neutral theme so as to neither encourage nor discourage any particular line of responses. During one interaction one of the female participants expressed her concerns about doing a face to face interview with a male interviewer. She was given the option to sit behind a screen that would stop the interviewer and the interviewee from seeing each other yet allowing verbal communication. She gladly accepted the suggestion and fully participated once her gender based concerns were duly assuaged.

CHAPTER SUMMARY

As mentioned in Chapter 1 this chapter restates the research questions to remind the reader about the focus of this study. It delves into the philosophical argument of which ontological and epistemological stance is most suited for this research; eventually choosing interpretivism as the guiding entity for research design and subsequent data analysis. Section 3.4 describes and justifies the choice of a qualitative comparative case study approach as opposed to many other possible approaches. Section 3.5 stated the data collection tools and justified the selection of interviews and document analysis as the data collection tools. It also explains why classroom observation was not pursued despite being selected as a tool in the earlier phases of planning for this research.

Section 3.6 explains in depth how interviews were conducted and how their data was analysed. Moreover, it also explains which documents were analysed as part of the document analysis component of this research.

The next section explains measures taken to ensure data validity and reliability. It emphasizes on the four steps to achieve trustworthiness. Limitation and challenges of this study were explicitly stated in section 3.8

Finally the chapter concludes with discussing the ethical concerns pertaining to this study and what measures were taken to uphold the ethical standards of research.

CHAPTER 4: DATA ANALYSIS

This chapter analyses the collected data by thoroughly examining the policy documents (section 4.1), critically studying the national curriculum (4.2), examining grade 7 textbooks to identify their effect on the use of technology as they are being used as a surrogate to lesson plans (4.3). It goes on to have a critical look at some of the technology integrated lesson plans of the private school (4.4). Finally this chapter analyses the interview data in light of the research questions (4.5).

Before one can thoroughly examine participants' use of technology in this case study, one has to consider pertinent variables and important factors that are common to all three types of schools. For the purpose of this discussion the researcher analysed interview data, and data from documents such as textbooks, curriculum and some lesson plans, and official policy documents.

4.1 Analysis of policy documents

4.1.1 Analysis of National Professional Standards

Teacher training, whether it is preservice training or in-service training, is an important way of ensuring teachers' professional development. Pakistan's ministry of education has developed a set of teacher training standards.

4.1.1.1 The ten professional standards and their subdomains

This professional standards document aims to guide any and all personnel involved in teacher training and teaching practice. It states the following ten standards for teacher preparation in Pakistan (UNESCO, 2009):

1. Subject matter knowledge
2. Human growth and development
3. Knowledge of Islamic ethical values / social life skills
4. Instructional planning and strategy
5. Assessment
6. Learning environment
7. Effective communication and proficient use of information communication technologies

8. Collaboration and partnerships
9. Continuous professional development and code of conduct
10. Teaching of English as second/foreign language (ESL/EFL)

All ten of these standards have the following three subsections:

- a. Knowledge and Understanding (content); what teacher knows
- b. Dispositions; Behaviours, attitude and values
- c. Performance (skills); what teacher can do and should be able to do

4.1.1.2 National Professional Standards' link with the research questions

Even a cursory look at these standards reveals their relevance to this study. Some of these are directly related to the research questions while the others have an indirect impact on the answers of the research questions. Before establishing the link between standards and research questions it will help to revisit the five research questions that guide this study:

1. How are public, private, and partnership schools using technology for teaching purposes?
2. What is teachers' and school administrators' attitude towards the use of technology for teaching and learning?
3. What factors influence their attitude?
4. How is their attitude affecting the schools' teaching and students' learning?
5. What can be done to effectively train the stakeholders in using technology meaningfully for the teaching and learning process?

Table 4.1 states the relationship of all standards with the research questions.

Table 4.1 Relationship of all standards with the research questions

	Related Research Questions	Description of the link between standard and Research Question
Standard 1: Subject matter knowledge	RQ 1, 3 and 4	Knowledge of subject matter is a prerequisite for designing a lesson based on meaningful learning with technology. Therefore, it is one of the

		more important factors that influence teachers' attitudes
Standard 2: Human growth and development	RQ 3	While this is not directly related or focussed on any of the research questions this is still one of the factors that impacts teachers' attitudes towards meaningful use of technology; as discussed in section 4.2.3
Standard 3: Knowledge of Islamic ethical values / social life skills	RQ 3, and 5	The way this standard is phrased it sounds biased towards Muslim teachers only. However, the next section will provide details that this standard only talks about values and ethics; which are not bound by religious boundaries and are considered core human values. Therefore this standard talks about a very important factor of ethics and values that impact teachers' attitudes. Moreover it also emphasises that all teachers should be trained to uphold and disseminate the culturally and globally accepted notions of values and ethics
Standard 4: Instructional planning and strategy	RQ 1,2,3,4,5	This standard is directly or indirectly addressing all five research questions. It is talking about how to plan for

		technology usage and how to use it in class (RQ1). It talks about planning and strategy and thus alludes to the users' attitude towards this initiative (RQ2). Planning and strategizing are key factors that may influence attitudes and behaviours (RQ3 and 4). For most professionals planning and strategy development does not come naturally and has to be learnt through some form of formal or informal training (RQ5).
Standard 5: Assessment	RQ3	Assessment centric school environment is one of the factors that may affect teachers' attitudes
Standard 6: Learning Environment	RQ1	directly deals with the question of how technology is being used for meaningful learning experience
Standard 7: Effective communication and proficient use of information communication technologies	RQ1,2,3,4 and 5	This standard talks explicitly about the use of technology for teaching and learning purposes, thus directly or indirectly relating to all research questions
Standard 8: Collaboration and partnerships	RQ5	while this is more related to 21 st century skills, it also alludes to one of the five components of meaningful learning with technology

Standard 9: Continuous professional development and code of conduct	RQ5	This standard talks about things that needs be taught to the teachers to make them more effective professionals and life-long learners
Standard 10: Teaching of English as second/foreign language (ESL/EFL)	RQ3	Language barriers need to be brought down if teachers are to become global leaders and researcher-practitioners

This table highlighted the relevance of this policy document to this study. Furthermore, the next subsection will discuss in detail, some of the descriptive bullet points for each of the ten standards.

4.1.1.3 Detailed analysis of relevant clauses of the ten National Professional Standards

It is important to note that these standards document is repeatedly referred to by all three school leaders. The private school principal in her interview stated that this document provides the guidelines based on which her school system aligns their own training programs. The public school principal highlighted in his interview that any school head who wants to get promoted to the next salary scale needs to undergo an interview; questions in the interview are sometimes related to this National Professional Standards document. One of the school leaders of the partnership school also mentioned that they use this document as a navigation compass while designing any training module for their teachers.

Standard 1: Subject matter knowledge

As discussed towards the end of Chapter 2, surveys have shown that a majority of teachers lack the essential subject matter knowledge needed to become effective at their jobs. While school heads and leaders claim to seek guidance and inspiration from this standards document, even they have not been able to eradicate the problem of teachers' insufficient subject matter knowledge. This knowledge, according to the document,

includes “The national curriculum framework.” (Wing, 2009). Yet the interview data reveals that most of the teachers, at all three participant schools, had not even seen the national curriculum document.

In the section of Knowledge and Understanding of Standard 1 it emphasizes that teachers must be up-to-date on the recent advancements in their respective field. This is seen to be missing in the practice of many participant teachers, more so when it comes to teaching geography from the books that use obsolete maps. Even after the name of North-Western-Frontier-Province was changed to Khyber-Pakhtunkhwa, many geography textbooks continued writing it as NWFP even though the new abbreviation was KPK.

Section B of Standard 1 makes several points that directly relate to at least one or more of the fine components of meaningful learning with technology as pointed out by Jonassen (2014) . For example it talks about teachers’ role of facilitating the construction of knowledge and not just acquisition of it; this is directly related to the constructivist aspect of meaningful learning. It also urges teachers to make knowledge “applicable to real world situation” (Wing, 2009). This is directly related to the “Authentic” aspect of meaningful learning with technology (Jonassen, et al., 2014).

Standard 7: Effective communication and proficient use of information communication technologies

This standard talks about effective communication through verbal, non-verbal, and written media. It also requires teachers to know and understand how to use technology in a classroom or a laboratory setting. At this point one can argue that this requirement is more out of optimism rather than pragmatism. Most of the teachers from at the public and the partnership school were hired based on test that did not test them for their technological expertise. Teachers at the private school were not tested at all but interviewed instead about their past experience and basic content knowledge. If any of the participant teacher fulfils this Standard 7 criterion then that is purely their own accomplishment as neither the school nor the educational policy makers undertook any measures in enforcing this standard before any teacher hiring is conducted.

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This standard requires all hired teachers to be proficient enough to use “... software for word processing, filing, research, data storage, and presentation of information.” Teachers repeatedly declared their lack of such expertise in their respective interviews (discussed in section 4.5). Moreover, all such tasks were eventually passed on to the ICT teacher since that was the only person who was qualified enough to handle technology related tasks.

The last clause in the Knowledge and Understanding subsection of Standard 7 asserts that teachers should know how to use available technical tools in their classrooms. The examples of such tools include, videos, cameras, phones, computers etc. (Wing, 2009).

Videos: This document does not explain what it means by videos and how exactly will these videos be shown to the students. Section 5.1 discusses a couple of ways videos can be meaningfully used in a classroom setting. However, it requires a certain setup that most Pakistani classrooms do not have.

Cameras: Video cameras are only available in the private school, that too only in the multimedia room. The partnership school also at times uses the video camera but it has to borrow the camera from the Parent NGO’s head office and return it immediately after use.

Phones: Most mobile phones these days have built-in cameras however, all three participant schools have a strict no phone policy for the students due to the risk of mobile phone triggered bomb threats.

Computers: None of the participant schools have computers available in the classrooms. Students have to walk to the computer laboratory or a resource room to access computers.

Given these circumstances, it is unreasonable to expect teachers to be proficient in using technology when the use of technology is made tedious and seldom impossible due to various extrinsic and uncontrollable factors.

4.1.2 Analysis of National Education Policy

National Education Policy for years 2017-2025 is a document created by Ministry of Federal Education and Professional Training Government of Pakistan. This is an extremely vital document for national education and specifically for professional training as it states that all training entities should follow the policy guidelines and achieve the goals and objectives stated in this policy document.

4.1.2.1 Contents of National Education Policy document

National education policy dedicates 13 pages of its 184 page document to the chapter called Information Technology. However, just like many other policy documents these 13 pages present more problems than solutions. Of these 13 pages only two pages present actual goals and objectives pertaining to the use of information technology for educational purposes. The content of those two pages are highly relevant to this study.

Chapter 14 talks about goals and objectives regarding the use of technology in school education. Surprisingly, the first goal explicitly states that the main focus is to start integrating technology as soon as possible without having to wait for the process of developing a relevant curriculum; as the policy document calls for “by-passing the time consuming curriculum development process” (Training, 2017, p. 91). One can understand the urgency in the matter of making use of technology to improve the state of education in the Pakistan’s schools. However, undertaking this intervention by ignoring curriculum development process seems a highly questionable choice.

Goal 3c states goals for teacher education and mentions the idea to “prepare teachers for their **new role** in teaching with ICT” (Training, 2017, p. 92). As you can notice the phrase ‘new role’ is both underlined and in boldface. This is probably done to emphasize the fact that there is going to be a new role for the teachers. However, through this voluminous document there is no definition or description of what this new role entails or constitutes.

Goal 3c (i) talks about engaging students in “meaningful and relevant learning” (Training, 2017, p. 92). This seems directly relevant to the scope of this study and encouraged me to

read further to gauge what the document means by meaningful and relevant learning. Further reading, made me come across more of such jargon and buzz words without any explanation or detailed definitions that can operationalise or contextualise these terms.

Goal 3c (ii) asks the teachers to integrate technology into the curriculum. This statement is in direct contrast to what this policy document stated earlier about by-passing the curriculum development process. In particular goal it is asking teachers to integrate technology into the existing curriculum thus, essentially improving the curriculum and doing the job of the curriculum development wing of ministry of education.

Another example of how this policy document is nothing but merely a document is given in Goal 3c (iv). It asks the teachers to “adapt to a variety of student **learning styles** to cater for individual learning differences”. One would assume that there would be some suggested strategies in the whole policy document that would enable teachers to do what is being asked. Right now teachers face many questions that need answering. For example:

- a) How does a teacher learn about students’ individual learning styles in a class of 30 or more students?
- b) What are the different learning styles?
- c) What sort of adaptation is demanded from teachers?

These and many other similar and relevant questions arise when reading this policy document. Unfortunately, the document fails to provide any answers to these questions. In fact as one reads on, more and more of these questions pop up and they do not get answered. This lack of answers made me think that what if the descriptions are not given in the policy document because all the teaching aid was provided in the curriculum document. Therefore, the next section takes a look at how the curriculum document is constructed and whether or not it has provides any specific guideline to the teachers on how to make meaningful use of technology.

4.2 Analysis of National Curriculum

The National Curriculum documents are broken down into several subject wise and class wise documents. Most of these documents are written based on thorough research and have gone through years of revision and improvement. Each document has a separate chapter for classroom methodology. This chapter instructs the teachers on general as well as specific approaches that can help their students learn the content in a better way.

It was in this chapter that I was hoping to find guidelines on how to make meaningful use of technology by using any particular framework. However, none of the curriculum documents for any subjects or grade levels have any such instructions. The curriculum documents talk about philosophy and design of the curriculum, they talk about assessment and examination, and they talk about book writing and lesson planning. But they have missed out on a huge opportunity to integrate technology into the curriculum at higher levels of Technology Integration Matrix.

4.3 Analysis of Textbooks

During the interviews teachers repeatedly stated their dependence on textbooks. Sometimes this dependence was forced upon them as in the case of Public schools. On other occasions this dependence was a result of lack of other suitable resources or support materials. Regardless of the reason, textbooks become an important factor in determining the use of technology by teachers. For the purpose of this research English, Mathematics, Science, Urdu, ICT (Information and Communication Technologies), Islamiyat (Islamic studies), History, and Geography textbooks were analysed. Only books from grade 7 were chosen for data analysis as all of the participant teachers taught at least one subject to at least one of the sections of grade 7. One grade was chosen in order to simplify the process of textbook analysis. This simplification was a result of the fact that for grades 6, 7, and 8 the public as well as the public-private partnership school use the same books, thus eliminating the need to juxtapose another set of books for comparison and contrast.

It is important to note that while the partnership school and the public school were using the textbooks prescribed by the Punjab Curriculum and Textbook Board, many of these books were not actually created by the Punjab Curriculum and Textbook Board. While these books have various independent publishers, all of books have been selected, approved, and distributed to schools by the relevant government authority; The Punjab Curriculum and Textbook Board. In contrast however, the private school was under no such obligation to get their books from the government approved organisations. Therefore, they utilise an eclectic selection of publishers as deemed fit by the schools' administration. Sometimes for some subjects the private school completely deviates from the norm and assigns a unique, never used before, book to suit a particular need in the learning objectives. Textbook analysis was conducted to not only identify any possible themes or instructions that could involve a meaningful use of technology, but to also verify the teachers' claim that books, curriculum and timetable did not provide them with any significant margin to use technology for their teaching and students' learning purposes.

Table 4.2 depicts the publishers for each of the abovementioned subjects for the public, the private and the public-private partnership schools participating in the research.

Table 4.2 Book Publishers for the three participant schools

Subject	Public School and Partnership School	Private School
English	Ch. Ghulam Rasool & Sons	Oxford University Press
Mathematics	Gohar Publishers	Oxford University Press
Science	Gohar Publishers	Panpac Education Private Limited
Urdu	Urdu Book Stall	92 Publishing House
ICT	Aquiline	Oxford University Press

Islamiat	Gohar Publishers	Punjab Curriculum and Textbook Board
History	Kitabishtan Publishing Company	Peak Publishing
Geography	Jadeed Educational Services	Peak Publishing

The Public School and The Partnership School have same publishers for all their books. However the major difference is the language in which books are written. For all three schools, the books were either written in English or in Urdu, minor content is written in Arabic as well for the Islamiat books.

Table 4.3 shows the primary language in which each book is written for the three participant schools.

Table 4.3 Primary language of textbooks

	The Public School	The Private School	The Partnership School
English	In English	In English	In English
Mathematics	In Urdu	In English	In English
Science	In Urdu	In English	In English
Urdu	In Urdu	In Urdu	In Urdu
ICT	In English	In English	In English
Islamiat	In Urdu	In English	In Urdu
History	In Urdu	In English	In English
Geography	In Urdu	In English	In English

Since all of participant teachers relied heavily on the respective subject related books, it is only natural that each of those books should be examined in detail. In the next subsections all of the eight subject books from the three participant schools have been diligently scanned in a chapter wise fashion to identify thematic coherences, cross-subject links, and any overtly stated teaching aids that involve meaningful use of technology.

Moreover, the books chapters and their subsequent exercises would also be examined for any potential missed opportunities where technology based projects could have been suggested to the teachers to aid in their teaching and augment students' learning. Both the overtly stated uses of technology as well as the missed opportunities will be looked at through the Technology Integration Matrix (TIM). Analysis through the TIM framework is essential as it will gauge the validity of teachers' assertions that books did not allow them much breathing room to make meaningful use of technology in their teaching practice.

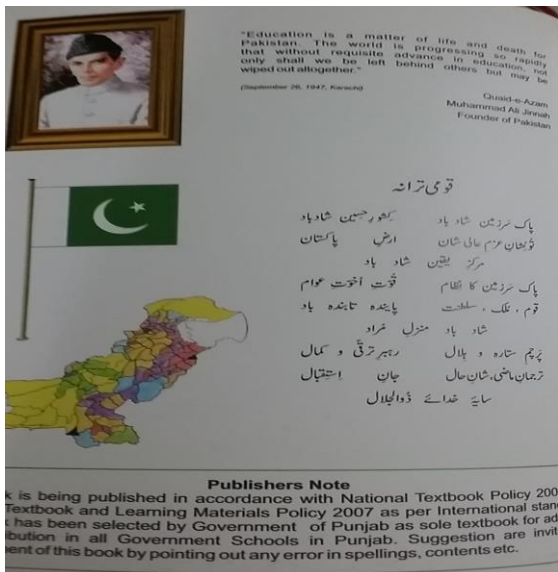


Figure 4.1 Frontispiece of Public and Partnership school's textbooks

It is interesting to note one common feature in all prescribed and approved books for the Public and Partnership participant schools. While several famous books go for a

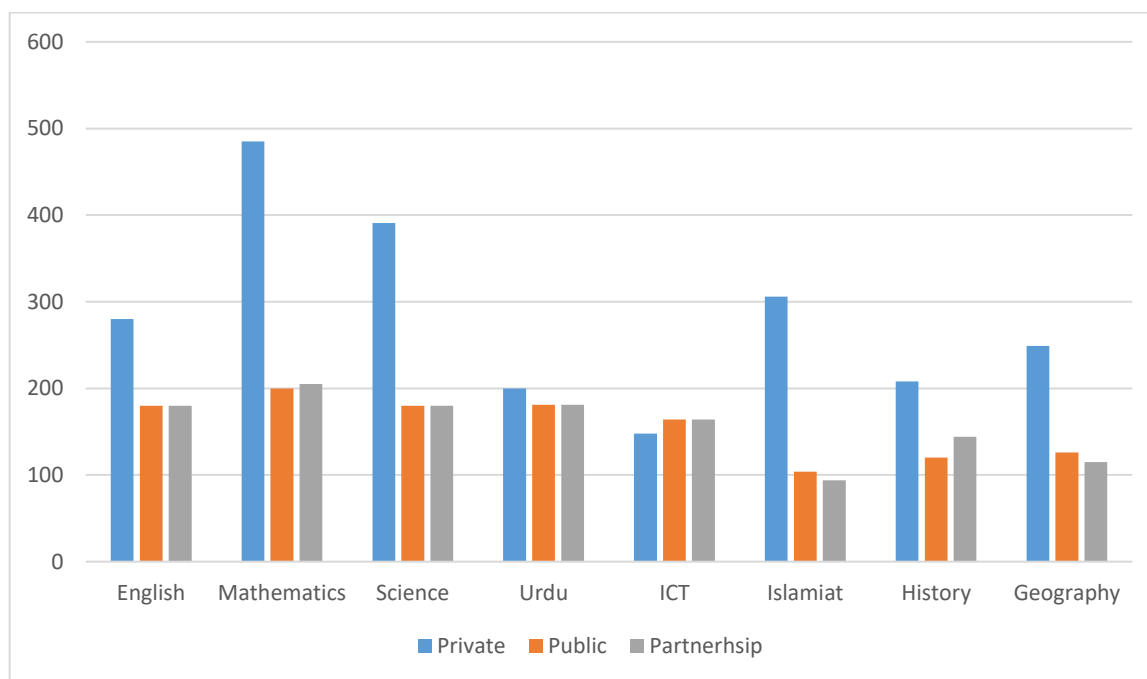
symbolic drawing as their frontispiece, the Public and Partnership participant schools' books have a common agreed upon design for its frontispiece page (Nadeem, et al., 2017).

Before delving into the chapter-wise comparison of the selective books being examined for this subsection of the research, it is important to investigate whether there are and glaring similarities or differences in the aforementioned books' page count, prices, and content to exercise ratio. Table 4.4 depicts the page count of all twenty-four books.

Table 4.4 Page Count for all Books being examined

Subject	Private Grade 7	Public Grade 7	Partnership Grade 7
English	280	180	180
Mathematics	485	200	205
Science	391	148	148
Urdu	200	181	181
ICT	148	164	164
Islamiat	306	104	94
History	208	120	144
Geography	249	126	115

Figure 4.2 Comparison of All Books Page Count



Higher page count naturally makes the books voluminous and presents the teachers with the challenge of covering the book's contents within the assigned lessons during the academic year. Interestingly, regardless of the page count schools assign differing number of lessons to each subject in their academic terms' timetables.

Table 4.5 Number of lessons for each subject

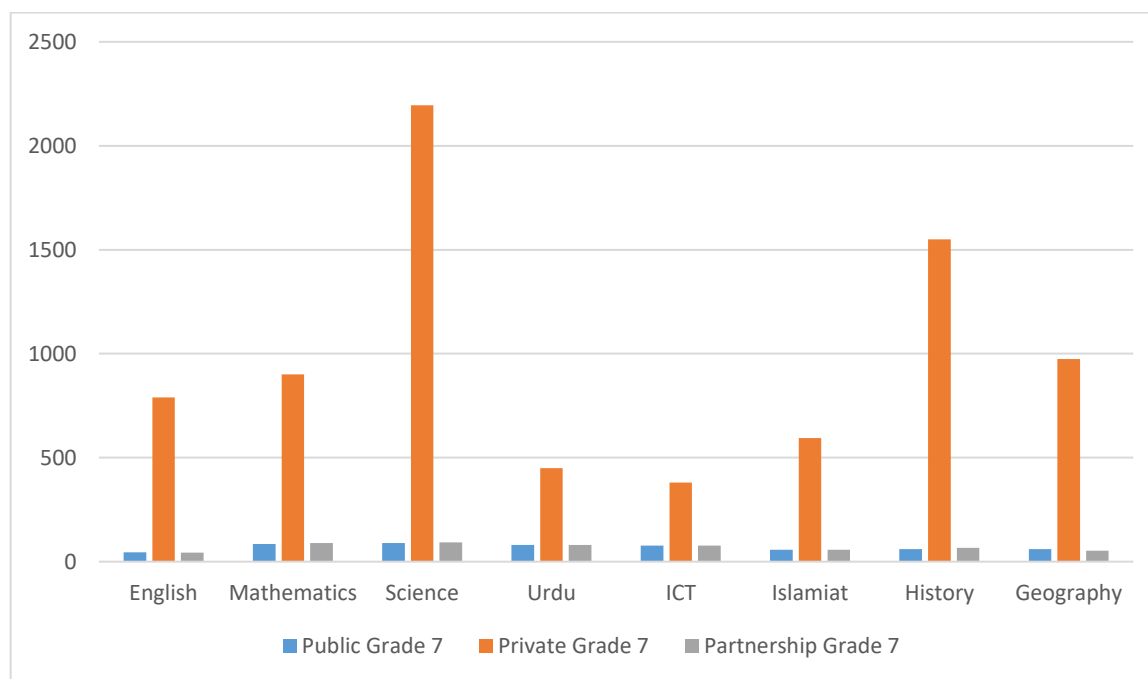
	English	Math	Science	Urdu	ICT	Islamiat	History	Geography
Public (35 min / lesson)	8	6	5	9	6	3	3	2
Private (40 min / lesson)	6	5	9	5	4	3	1	2
Partnership (35 min / lesson)	5	5	8	5	4	2	2	2

Different book publishers price their books differently. The reasons of how and why they are priced differently are beyond the scope of this study. However, cost of buying books is one of the variables that may affect the quality of education teachers are able to provide to their students. Therefore, a comparative look at the cost of purchasing the aforementioned books becomes an integral part of this chapter that intends to discuss all pertinent factors that may impact a teacher's meaningful use of technology; as highlighted by the teachers and school heads in their respective interviews. Table 4.6 juxtaposes the prices of all books being examined.

Table 4.6 Prices in Pakistani Rupees for all books being examined

Subject	Public Grade 7	Private Grade 7	Partnership Grade 7
English	45	790	45
Mathematics	85	900	90
Science	75	2195	69
Urdu	80	450	80
ICT	77	380	77
Islamiat	58	595	58
History	61	1550	67
Geography	60	975	52

Figure 4.3 Price comparison for all subjects' books for participant schools



As is noticeable from Figure 4.3 there is a stark difference in the purchase price of the textbooks for private school as compared to the textbooks of the other two schools. Furthermore, textbooks are not the only books private school students have to buy. Many subjects require students to purchase additional books as well. For example, Urdu and English language comes with its own set of workbooks, poetry books, novels and sometimes other similar books. For the sake of simplicity, these costs are not included in the comparison being made in this section. Even without the inclusion of these extra costs it is clear to notice the obvious price difference.

This price difference is an important factor when we look at books as a teaching resource. In sections 4.3.1 till 4.3.8 this price difference will be pointed out as a factor which determines the quality of the textbooks as a teaching aid and a learning resource. Therefore, it was highly pertinent to show this price comparison so that the researcher can lay the foundation of the argument that quality education in schools comes with a price tag.

The next subsection will take a detailed look at the design and content of some of the subject textbooks for Grade 7. It is important to note that the public and the partnership

schools use the same books for Grade 7. Even though the language of some subjects' textbooks changes between Urdu and English, the content essentially remains the same. For the ease of the reading whenever a table of contents for a book is mentioned, only the English language version will be stated in the upcoming sections.

More detailed discussion was provided for those subjects' textbooks that can be considered as promoters of meaningful use of technology. Succinct analysis ensues for those subjects' textbooks that are considered boiler plate in their content and design, thus they do not provide the teachers or students any explicitly stated guidance in making meaningful use of technology.

4.3.1. Comparative Analysis of English Language Books for the participant schools

4.3.1.1. Analysis of Private School's English Language Book for Grade 7

The following table depicts this book's focus on page distribution for its Units as well as the proeses and poems under each unit and their respective tasks and exercises.

Table 4.7 Chapter contents for Private School's English Language Book for Grade 7

	Chapter Title	Total Pages
Unit 1: Elephants		
Chapter 1	Revenge by A. Ghosh	7
Chapter 2	Ma Kyaw by J. H. Williams	6
Chapter 3	Elephants' flight from the poachers	5
Chapter 4	The Orphan Elephant and Kandy Perahera	10
Unit 2: War and Peace		
Chapter 1	The Paper Cranes of Peace	7
Chapter 2	A Christmas Story by M. Morpurgo	8
Chapter 3	The Battle of Panipat	4

Chapter 4	The Field Mouse by G. Clarke	5
Chapter 5	Don't Believe in War by B. Okudzhava	3
Unit 3: London		
Chapter 1	From the Diary of Samuel Pepys	4
Chapter 2	The Burning of St. Paul's Cathedral	3
Chapter 3	The Great Fire of London	8
Chapter 4	Guy Fawkes and the Gunpowder Plot	11
Chapter 5	Traditional Rhymes	3
Chapter 6	Island Man by G. Nichols	2
Unit 4: Sugar and Spice		
Chapter 1	The Krispy Kreme Doughnut	8
Chapter 2	Special Agent reveals the truth	6
Chapter 3	The Trap and Perilous Pleasure	5
Chapter 4	Lahori's Notebook	3
Chapter 5	The Spice Islands	4
Chapter 6	Tasting the Landscape by M. Alvi	4
Unit 5: Danger		
Chapter 1	Fire! by I. Southall	6
Chapter 2	Great Expectations	5
Chapter 3	Sky-surfing dream ends in tragedy	4
Chapter 4	Ascent of Nanga Parbat	10
Unit 6: Lesson		
Chapter 1	How much land does a man need? by L. Tolstoy	7

Chapter 2	Revenge by L. Godoy	6
Chapter 3	The Fishing Baboon by D. Macintosh	9
Chapter 4	Cleaning Lady to Leading Lady	3
Chapter 5	Misery	5
Unit 7: Water		
Chapter 1	Flash Flood in Cornwall	2
Chapter 2	The case of the disappearing river	2
Chapter 3	At the end of our weather	4
Chapter 4	Two Foolish Fishermen	4
Chapter 5	Dammed and Dying: The Mekong River	8
Chapter 6	Arrival of the Monsoon by T. Rafat	2
Chapter 7	Blessing by I. Dharker	2
Chapter 8	Sometimes when it rains by G. Mhlophe	5
Unit 8: Family Feelings		
Chapter 1	The Christmas Cat by F. Kendal	5
Chapter 2	I fall into disgrace by C. Dickens	10
Chapter 3	Dear Oilly by M. Morpurgo	6
Chapter 4	The Chucky by T. Latif	2
Chapter 5	Family Feeling by C. Causley	4
Chapter 6	Mum and Dad by A. Peters and P. Peters	3
Unit 9: Other Words		
Chapter 1	Stregoika Manor by G. P. Taylor	8
Chapter 2	Mary Shelley's Frankenstein dramatized	10

Chapter 3	The Tempest by W. Shakespeare	5
Chapter 4	We are going to see the rabbit by A. Brownjohn	4
Chapter 5	Some things are better left on Mars	5
Unit 10: Achievement		
Chapter 1	The Race by A. Gibson	7
Chapter 2	Better Late than Never	6
Chapter 3	Nazir Sabir: Pakistani Mountain Conqueror	3
Chapter 4	Fauja Singh: the oldest running for the youngest	2
Chapter 5	Sarah Francis: the young philanthropist	8

This particular English book that is being used by the Private School is very differently designed as compared to books of other subjects being used in the same as well as other two schools. First obvious difference is noted in the contents section of the book. As soon as you open the book the teacher or any reader is greeted with a very well designed content section (Redford, 2014). While most other books mention chapter name and page numbers, this book informs the reader about the major themes that it calls Units. Then it subdivides the Units into their relevant texts. Underneath those texts and their corresponding page numbers, this Contents section delineates the learning objectives of the stated Unit as well as potential learning outcomes for the students.

Learning outcomes are aided by the fact that activities' page numbers are stated in this section that clearly tells the reader to do those activities written on the stated page numbers of the book, in order to achieve the desired learning outcomes. The contents section also ensures that learning objectives and outcomes of Reading, Writing, Grammar, as well as speaking and listening are also mention for each Unit.

While such detailed design of the Contents section can help a trained teacher in developing efficient lesson plans, it can also become a burden in the hands of a novice

teacher. The term novice here is not only being used to describe a teacher new to the teaching profession, it is also being used to describe any teacher, experienced or new, who has not yet received any form of formal teacher training. For example, (Seemeen, 2016) in her interview explained the potential discord between the planned learning objectives and outcomes received from the school's administrative offices and the learning objectives and outcomes stated in the book for that Unit. She went on to state that it confused the students at times when she tried to follow the instructions received from the office and they did not match the instructions given in the book. She was of the opinion that it should be the teacher's decision as to when and where and how many of the learning objectives and outcomes they divulge to the students.

There is an abundance of interpretive, explorative, creative, and various other forms of tasks and activities in this book. Sometimes these activities and tasks follow their corresponding text immediately in the book. For example the first five Units follow this pattern of having the tasks immediately after the text. However, sometimes there are more activities at the end of the unit to sum up the unit, as in the case of Unit 10.

Each unit in this book is covering topics that can be taught with a meaningful use of technology. Yet none of the units force teachers to use technology. This is in line with the spirit of TIM as it allows teachers and school leaders to decide when to use technology to suit the needs of their students. Furthermore, the book's contents provide ample opportunities in each unit to make meaningful use of technology. For example Unit 7 talks about water. That is an extremely pertinent topic for the context of all provinces in Pakistan. Schools in each locality can come up with transformation level projects for all five aspects of meaningful learning with technology (Jonassen, et al., 2014).

Moreover, this book comes with a teaching guide as well. This guide aids the teacher in further understanding the purpose of section of this book. The guide is freely available online (Redford, 2014).

4.3.1.2. Analysis of Public and Partnership School's English Language Book for Grade 7

The following table depicts this book's chapter titles.

Table 4.8 Chapter Titles for Partnership School's English Language Book for Grade 7

	Chapter Title
Chapter 1	The Last Sermon of The Rasool Hazrat Muhammad (PBUH)
Chapter 2	Our Villages
Chapter 3	Eid-ul-Azha
Chapter 4	Rain in Summer (Poem)
Chapter 5	Traffic Sense
Chapter 6	Pollution
Chapter 7	A Dengue Patient Visits a Doctor
Chapter 8	A Nation's Strength (Poem)
Chapter 9	Kaghan Valley
Chapter 10	Quaid-i-Azam
Chapter 11	The Rooster and the Fox
Chapter 12	I Dream a World (Poem)
Chapter 13	Inventions and Discoveries
Chapter 14	A Terrible Earthquake

This book starts with a title page and a very familiar frontispiece just like most of the books approved by the Government of Punjab for its public and partnership schools (Baig, et al., 2018). The table of contents section seems heavily inspired by the book being used by The Private School (Redford, 2014). This book follows a familiar pattern of text followed by exercises. Moreover, during the text there are several prompts of explorative and sometimes analytical nature. These prompts ask students questions about the text. Sometimes these

prompts ask the teacher to encourage students to conduct some research on that topic and then discuss it in the class (Baig, et al., 2018, p. 17).

It is noticeable that the book's end of chapter exercises ask students to make use of mind maps to discuss various ideas. This provides the teachers with a subtle hint to make meaningful use of technology by asking students to make mind maps online or offline, using a mind mapping software. However, the book does go overboard with mind mapping exercises as every end of chapter exercises has at least one mind mapping activity. This dearth of meaningful activities gives teachers a chance to improvise and innovate and come up with something that can foster 21st century skills in students while making meaningful use of technology; ideally at a level far advanced than the entry level of Technology Integration Matrix. However, such improvisation and innovation from a teacher requires the teacher to be trained and experienced in the field of meaningful learning with technology; Section 4.4 will clearly show that teachers are far from being adept and knowing the concept of meaningful let alone be experts in implementing lessons based on Technology Integration Matrix.

4.3.2. Comparative Analysis of Mathematics Books for the participant schools

4.3.2.1. Analysis of Private School's Mathematics Book for Grade 7

The following table depicts this book's focus distribution between chapters, their contents, and their end of chapter exercises.

Table 4.9 Contents of Private School's Mathematics Book for Grade 7

	Chapter Title	Total Pages
Chapter 1	Primes, HCF and LCM	24
Chapter 2	Integers, Rational Numbers and Real Numbers	22
Chapter 3	Approximation and Estimation	22
Chapter 4	Basic Algebra and Algebraic Manipulation	24

Chapter 5	Linear Equations and Simple Inequalities	26
Chapter 6	Functions and Linear Graphs	24
Chapter 7	Number Patterns	21
Chapter 8	Percentage	20
Chapter 9	Ratio, Rate, Time and Speed	28
Chapter 10	Basic Geometry	23
Chapter 11	Triangles, Quadrilaterals and Polygons	38
Chapter 12	Geometrical Constructions	17
Chapter 13	Perimeter and Area of Plane Figures	22
Chapter 14	Volume and Surface Area of Prisms and Cylinders	28
Chapter 15	Statistical Data Handling	22

This is a very well designed book and makes use of multiple types of examples to elucidate each mathematical concept. Diagrams, charts, graphs and other various forms of visual aids are used to introduce, explain, reiterate, question, or summarise concepts being discussed (Yeo, et al., 2018).

The book is supplemented by a resource pack that gives students plenty of drill and practice exercises about the concepts being discussed in the main textbook. Similarly the workbook also provides more practice content for students to hone their concepts with. Both these support material books are published by the private school's head office. Therefore, the books' cannot be mentioned in references as the author of these books is the private school's head office and the name cannot be stated to protect the participant school's anonymity.

4.3.2.2. Analysis of Public and Partnership School's Mathematics Book for Grade 7

The following table depicts this book's focus distribution between chapters, their contents, and their end of chapter exercises.

Table 4.10 Contents of Partnership School's Mathematics Book for Grade 7

	Chapter Title	Total Pages
Chapter 1	Sets	17
Chapter 2	Rational Numbers	17
Chapter 3	Decimals	9
Chapter 4	Exponents	13
Chapter 5	Square Root of Positive Number	17
Chapter 6	Direct and Inverse Variation	12
Chapter 7	Financial Arithmetic	11
Chapter 8	Algebraic Expressions	18
Chapter 9	Linear Equations	7
Chapter 10	Fundamentals of Geometry	17
Chapter 11	Practical Geometry	15
Chapter 12	Circumference, Area and Volume	18
Chapter 13	Information Handling	9

The first thing I noticed while analysing the books for public and partnership schools was that despite being in two different languages their content was exactly the same. This was possibly due to the fact that both books were written and designed by the same publisher. Even though the writers are different for both books. The partnership school's Mathematics book is written by Professors who have a doctorate degree in Mathematics (Amin, et al., 2019) whereas, the public school's book is written by authors with only a Master's degree in Mathematics (Rafiq & Ansari, 2018). This difference in author's educational qualifications may not be a variable that affects the quality of books yet it was a significant enough difference that it was worth mentioning.

The public school's book is written in Urdu language. This means that all the mathematical jargon is also in Urdu language. This presents the teachers and students with a monumental challenge of finding appropriate technological resources using a search engine like Google.com. For example, Chapter 5 talks about square roots. This is a very commonly known jargon in the field of mathematics and plenty of resources can be found using the keyword square root on any search engine.

However, in the public school's book the same word is translated into Urdu and there is no mention of its English translation. Square root is called 'jazar' in Urdu. Jazar is also the translation for the English term 'low tide'. Being a homonym, it causes even more confusion for anyone who is trying to find appropriate resources for technology integration related to square roots. This problem persists through all chapters of this book as more and more jargon is presented in Urdu language.

In terms of collaborative learning this Urdu / English divide hampers the public school students to collaborate or even meaningfully communicate with Private or Partnership school students. As one school will say 'jazar' and the other two will not be able to understand that it means square root.

This language difference is a huge barrier in teacher development and teacher collaboration as well. Any teacher that wants to share their work or learn from other teachers' work has to ensure that they both understand and explain any jargon being used in their lesson plans and projects. This not only makes their tasks more laborious it can also demotivate the teachers from using technology at all, let alone meaningfully.

4.3.3. Comparative Analysis of Science Books for the participant schools

As is the case with most of the books, private school's science book is far better in content, design, and general user friendliness. The following sections compare the three science textbooks to identify how much leeway these books allow for technology integration based on TIM.

4.3.3.1. Analysis of Private School's Science Book for Grade 7

This book has several features that assist the teacher in engaging students in critical thinking, researching, collaborating, and problem solving. Each chapter has at least one of the following features:

- a) **Science Tidbits:** This provides extra but highly relevant information to pique students' interest in that particular topic. For example in chapter 1 when talking about cell division it tells the reader that their cheek cells divide into two once every 24 hours (Leng, 2010, p. 14).
- b) **Think About It:** This section allows the readers to discuss a particular concept through a scenario or open ended probing questions
- c) **Try it out:** Throughout the book these inserts allow the teachers and students to make meaningful use of technology to do research on various concepts, in order to provide answers for the problem being stated in this section. Sometimes these inserts also provide non-technological exercises to stimulate the readers minds
- d) **Think-tank:** These sections are mostly placed at the end of the each chapter. These provide a perfect opportunity to teachers and students to utilise and develop 21st century skills and make meaningful use of technology. For example, one think-tank asks the students to conduct secondary research to know more about cancer and its relationship with cells (Leng, 2010, p. 26). Overall, this section encourages readers to employ critical thinking, research and data fluency, communication and collaboration, and various other 21st century skills to construct deeper knowledge about the concepts being discussed in that chapter.

4.3.3.2. Analysis of Public and Partnership School's Science Book for Grade 7

As far as quality of content is concerned, science books for Public and Partnership school stand head and shoulders above the other books for these two schools. Despite a stark difference in visual appeal these books can be considered a cheaper replacement for the private school's science book.

Both books are written by the same writer and published by the same publication house. This results in far more similarity in the content selection and design of both books. What was missing in the Mathematics books due to different authors working on Urdu and English versions, has been rectified in the Science textbooks. Not only does the Urdu version provide English translation for all its jargon, most of the jargon is actually stated in English language despite the usage of Urdu alphabet. For example, Digestive System is

called ‘Nizam-e-Inhazaam’ in Urdu language. However, the science book just calls it digestive system in both versions of the book (Malik, 2019, p. 4).

This is one way to counter the language barrier faced by many teachers. Using the English version of jargon in the book that is primarily written in Urdu allows both teachers and students to conduct Internet based, as well as library based research, efficiently and effectively. Consequently, enabling them to make meaningful use of technology to learn scientific concepts; without having to worry about translating everything from one language to another just to be able to conduct a Google search.

Similar to the private school’s book these books also prompt the user with engaging content that is inserted in special textboxes alongside the chapters’ main content.

- a) Extend your thinking: Asks questions like, is it possible to eat food while one is standing upside down? Questions like these and many more allow the teacher to make use of practical demonstration, video tutorial, or software simulation to expand on the concept. Even though the book does not ask the teacher to use technology, it empowers them with a prompt based scenario so the teacher can decide for themselves whether the situation warrants a meaningful use of technology or not (Malik, 2019, p. 5).
- b) Akin to its private school counterpart it also provides the titbits section which serves the same purpose as stated in the previous section
- c) Each chapter has several Activity based prompts inserted within the text. These activities are normally related directly to the concept being discussed. The quality of some of these activities can best be described as rudimentary. However, this again provides the teachers with the margin to be innovative and come up with activities of their own to suit specific learning needs and styles of their students.

4.3.4. Comparative Analysis of Urdu Language Books for the participant schools

Urdu language books did not inspire an in depth analysis as they were following a commonplace model of Text followed by exercise. Even the private school’s Urdu textbook

was far cry from their English textbook. While the latter encouraged teachers and students to think and process information and come up with meaningful ways of using technology; the former lacks any such inspiration. Some of the content has the potential to create meaningful cross subject and multi-school projects to come up with extremely informative and meaningful conclusions. For example one chapter talks about rural and urban lifestyles (Kawish, et al., 2019, pp. 11-15). This can be discussed to promote active, collaborative, authentic, constructive, and goal directed learning while using highest levels of TIM. However, reading this chapter's text gives the reader a bad taste as it openly and repeatedly criticises rural to urban migration and censures the urban lifestyle. The chapter puts both rural and urban lifestyles in a very stereotypical way and does not encourage students or teachers to research these lifestyles to verify or refute the arguments presented in the chapter.

While these books are supposed to be language books, they are promoting religion in every other chapter. Questions like, as a Muslim what do you believe about this, marginalise the students and teachers who do not belong to the Islamic faith. These books also fail to utilise the opportunity to encourage students to participate in cross-subject projects while discussing topics that fall under the category of another subject.

4.3.5. Comparative Analysis of ICT Books for the participant schools

The term ICT generally stands for Information and Communication Technologies (Terms, 2010). While the term is widely used in private school systems across Pakistan, the public and Partnership schools in this study called their ICT education, 'Computer Education'. Computer Education is the title of the assigned books as well for the Public and Partnership schools participating in this study (Nadeem, et al., 2017).

For the purpose of clarity in this research and especially in this document, ICT and Computer Education are both being referred to as 'ICT'.

4.3.5.1. Analysis of Private School's ICT Book for Grade 7

This book follows a familiar pattern of text followed by questions. The following table depicts this book's pages' distribution between chapters, their contents, and their end of chapter exercises.

Table 4.11 Contents of Private School's ICT Book for Grade 7

	Chapter Title	Total Pages
Chapter 1	The Data-Processing Cycle	12
Chapter 2	Binary Computing	14
Chapter 3	System Software	10
Chapter 4	Application Software	10
Chapter 5	More on Word	14
Chapter 6	More on Spreadsheets	12
Chapter 7	Algorithms and Flow Charts	12
Chapter 8	Introduction to Programming Languages	10
Chapter 9	Computer Networks	10
Chapter 10	The Internet	12
Chapter 11	Communicating through Email	14
Chapter 12	Introduction to Animation	10

This book is not only appealing to look at but it also provides the students with a CD that serves as an additional resource tool for drill and practice.

The book's table of contents uses chapter wise division but it also mentions the learning objectives and outcomes of each chapter (Anwar & Rasheed, 2014) thus making it easier for students to target and achieve the specific learning outcomes.

The book makes good use of pictures, graphs, flowcharts, diagrams and other visual aids to highlight or explain certain concepts. Just by a cursory visual comparison one can see the difference in the level of visual appeal that this book has as compared to the ICT books from The Public School and The Partnership School. The depth and modern day

relevance of content covered in this book also makes its content quality far superior than its Public and Partnership School counterparts.

One can surmise that meaningful use of technology in ICT classes would be much easier than any other subject. However, the teacher teaching this book to his students believes it is far more complicated to achieve meaningful use of technology in ICT than in other subjects such as, English and Science (Sohaib, 2016).

Even though all chapters of this book can be used to demonstrate meaningful use of technology to promote 21st century skills in students, some chapters lean naturally towards such integration. For example, when talking about Chapter 10: The Internet, it would be remiss to ignore the opportunity to discuss the following 21st century skills:

- a. Communication
- b. Collaboration
- c. Information Literacy
- d. Media Literacy
- e. ICT Literacy
- f. Social and Cross-Cultural Skills

Many chapters in this book end with a project that asks students to utilise their learnt skills and acquired knowledge to create some form of a presentable project. This is a great opportunity for cross-subject projects to achieve meaningful use of technology with multiple teachers of various subjects.

One major constraint would be the time that students will be able to give to ICT during any academic week. ICT is only given, at most, 4 lessons per week. Even from those 4 lessons sometimes a lesson is consumed by an examination or another core subject like English or Science (Sohaib, 2016). Such misbalance in lesson slot distribution results in added pressure on the teachers to finish the syllabus rather than think and plan about promoting 21st century skills through the meaningful use of technology.

Despite all these constraints and occasional setbacks this ICT teacher has successfully completed over 100 technology integrated projects over his 15 years of service with The Private School. However, the projects were not designed on any established meaningful learning techniques. After having attended the research information dissemination session the ICT teacher stated that his projects were primarily meant to be engaging and fun so students can develop a liking towards ICT as a subject (Sohaib, 2016).

ICT books generally focus on imparting the skills to handle computers and other technologies. This book is not different in that regard. The chapters provide ample information which is later on tested in the end of the chapter questions. However, most of these questions ask the reader to recall and restate whatever they were told to memorise in the chapter. Perhaps a few more activities and tasks involving some of the 21st Century Skills would make this book much more amenable to seamless and meaningful integration of technology to inculcate 21st Century Skills in the students.

4.3.5.2. Analysis of Partnership School's ICT Book for Grade 7

The following table depicts this book's focus distribution between chapters, their contents, and their end of chapter exercises.

Table 4.12 Contents of Public and Partnership School's ICT Book for Grade 7

	Chapter Title	Total Pages
Chapter 1	Hardware Basics	20
Chapter 2	Software Basics	15
Chapter 3	Customizing a Word Document	77
Chapter 4	Multimedia Presentations	23
Chapter 5	Electronic Mail	18

As opposed to the remarkably well designed private school's ICT book, the public and private school use a much simpler book to teach ICT. Not only is this book not as pleasing

to look at as its private school counterpart, it also lacks the nuances and meaningful learning opportunities as afforded by the private school's ICT book. All the topics mentioned in this book have the potential for cross subject integration projects. They can also be taught in a way that promotes meaningful use of technology at Adaptation level or higher. However, due to limited number of lessons per week teachers tend to focus on content coverage through the traditional lecture and exercise method.

4.3.6. Comparative Analysis of Islamiat Books for the participant schools

4.3.6.1. Analysis of Private School's Islamiat Book for Grade 7

While this Islamiat book introduces and explains the religious concepts in detail, it does not appear to have any sort of questions, activities, tasks, or projects in it. If teachers are religiously following the book from chapter to chapter, then students would never encounter any cognitive exercises at all. So it is at the discretion of the teacher to improvise and come up with innovative ways of making meaningful use of technology. As revealed during the interview with the teacher teaching this book, it has been a perilous journey so far whenever the teacher has tried to make meaningful use of technology to promote 21st century skills in Islamiat students (Uzma, 2016).

4.3.6.2. Analysis of Public and Partnership School's Islamiat Book for Grade 7

Despite being written in Urdu and Arabic, these schools' book makes their teachers face similar issues as discussed in the previous section. The book is not conducive to critical thinking or even healthy debate. Even topics that discuss globally accepted ethics are taught in a way that is considered safe and risk averse. This is done to protect teachers and students alike from the risk of committing the crime of accidentally insulting Islam or The Prophet Muhammad (Peace be Upon Him). As such an act is punishable by death according to Pakistan's Shariah Law. Therefore, the books are written in a way that it is very prescriptive in nature and does not provide much room for experimentation.

4.3.7. Comparative Analysis of History Books for the participant schools

4.3.7.1. Analysis of Private School’s History Book for Grade 7

This Book does not follow the pattern of text followed by questions, as many other books do. Here the book author provides the students with Cambridge International Examination type questions whenever a popular topic, which is likely to appear in exam, is concluded. Sometimes is just a solitary question right at the end of an important subchapter (Kelly, 2018, p. 20), while at other times is two or three questions at the end of the Chapter (Kelly, 2018, p. 26). The book is written in a way that its primary focus is on examination preparation and practicing examination taking techniques. This doesn’t leave much room for the teacher to experiment and improvise with meaningful use of technology to inculcate 21st century skills in students. For example, one of the end of chapter question asks, “What was the ‘EIC’? [4]”. This question is only seeking a short description of the East India Company. The 4 in the square brackets depicts the assigned marks for this question when it appeared in the CIE History examination at some time. Students are encouraged to memorize the answers of such questions. In order to instil a time management habit in them they are told to not spend too much time thinking about questions that ask for a description and just write the previously memorised answer in the examination. This technique works for students and helps them to manage time during their eventual CIE examination (Nosheen, 2016).

Upon a closer examination of this book’s text one can find several topic and issues mentioned in various chapters that can be used as a basis for the highest levels of meaningful use of technology, especially when it comes to active and collaborative learning. Such topics can be used to instil 21st century skills like Communication and Collaboration, as well as Research and Information Fluency.

4.3.7.2. Analysis of Partnership School’s History Book for Grade 7

Both the public and partnership school’s history books suffer from the problem of trying to say too much in too little time. As mentioned in section 4.3 history subject does not get more than two or three lessons per week. This leaves the teachers in a predicament

of balancing between depth of learning and content coverage. Both books do not provide any explicitly stated guidance to make meaningful use of technology. Therefore, it is in the hands of the teachers and school leaders to come up with the balanced approach to make meaningful use of technology while ensuring content coverage in the academic year.

It was noted during the interviews that teachers opted for the safer route and went with conventional teaching to ensure syllabus coverage and consequently proudly presenting their students' good grades in the exams; regardless of the fact whether there was any deeper learning or not.

4.3.8. Comparative Analysis of Geography Books for the participant schools

4.3.8.1. Analysis of Private School's Geography Book for Grade 7

The following table depicts this book's focus distribution between chapters, their contents, and their end of chapter exercises.

Table 4.13 Contents of Private School's Geography Book for Grade 7

	Chapter Title	Total Pages
Chapter 1	The Natural Topography, including drainage	27
Chapter 2	Climate	20
Chapter 3	Natural Resources – an issue of sustainability water	23
Chapter 4	Forests	15
Chapter 5	Mineral Resources	13
Chapter 6	Fishing Industry	10
Chapter 7	Agricultural Development	27
Chapter 8	Power Resources	22
Chapter 9	Industrial Development Secondary and Tertiary Industries	23
Chapter 10	Trade	15

Chapter 11	Transport and Telecommunications	21
Chapter 12	Population and Employment	21

This book is designed to prepare students to take their O level examination. While the book makes use of tables, pictures, flowcharts, dialogue boxes and other tools to explain a particular topic, its primary focus is on covering the syllabus for the eventual examination that students will be sitting in. This is apparent from book's features like Notes in the footer that state 'A vertical blue line in the margin of the text indicates the Extension material that is not specified in the 2059/2 syllabus.' (Sethi, 2014, p. 26). Moreover, the book also highlights any questions that have been taken from the past geography examination papers.

The book in itself doesn't have too many tasks or activities written in it. This dearth of active learning was intended to be countered by its companion exercise book called the "Skills Book". Every now and then in the main book there is a reference to the Skills Book (Sethi, 2014, p. 19). However, neither students nor teachers were asked to purchase this skills book. Thus all Skills Book related references in the main book become moot as neither students nor the teacher have access to that skills book (Nosheen, 2016).

This book covers several topics that provide the basis for potentially meaningful use of technology to aid students' learning. The book makes frequent use of pictures to show a relevant concept from the topic being discussed. Unfortunately, all of the pictures being used in the book seem to be of poor quality thus rendering their visibility rather low. This hampers the teacher's job of using those pictures for any task that involves meaningful use of technology or 21st century skills. The subject teacher realised that poor quality of pictures in the book and came up with a technology based solution that empowered students to take control of their own learning. Teacher assigned several tasks to the students where they were to use Internet to come up with resource material in addition to the content available in the book. This not only exposed students to better quality of pictures that were pertinent to the topic being discussed, it also instilled a sense of project based learning and group based learning. This approach ensured meaningful use of technology to promote

several 21st century skills in students; desired result was achieved even though it was not properly planned or intended.

Topics like population growth in Chapter 12 discuss important issues and depict various problems and potential solutions in interesting formats like posters, tables, diagrams, dialogues, imagery and statistics (Sethi, 2014, p. 223). Such topics provide a diverse and stable base for multi-subject projects. For example, population growth can involve English language teacher to achieve learning outcomes from both subjects. Similarly, Urdu language teacher can be included in this project to make it disseminate information for public awareness in a bilingual setting. Islamiyat can be included as well to discuss the importance of moderation. Students can be encouraged to see the how living a balanced life in a country this is not overpopulated can lead to prosperity and better quality of life. This ties in directly with several Islamic values which teach us to treat our lives as a gift from Allah. Chapter 12 also uses tables and charts to convey certain points. Students can include Mathematics teachers to come up with efficient means of representing data or they can design new graphs and charts to depict dangerous trend of national importance; for example population growth rates, or excessive rural to urban migration. Science subject at this level is already introducing sexual reproduction in humans as well as birth control and contraception methods. This topic forms a natural ally to the population growth topic being discussed in Geography.

However, it is important to note that Pakistan' populace are largely considered a religious people. Many topics, reproduction and contraception included, are deemed inappropriate by many parents, to broach to students. This geography subject teacher stated a few unpleasant incidents with parents when they even mentioned birth control as a technique to control population growth rate (Nosheen, 2016). Not only did parents ask the principal to terminate this teacher's job contract, the principal also apologised with the excuse that the teacher is still inexperienced and will learn quickly from her mistakes (Zareen, 2016). The Geography teacher in these incidents only made the 'mistake' of answering a few of questions from the students who wanted to come up with some solutions for the population growth rate problem. This was an example of an educational

discussion taken totally in the wrong context by parents who were not even participating in the discussion to have first-hand knowledge of relevant facts and details.

4.3.8.2. Analysis of Public and Partnership School's Geography Book for Grade 7

The following table depicts this book's focus distribution between chapters, their contents, and their end of chapter exercises.

Table 4.14 Page Focus Distribution for Partnership School's Geography Book for Grade 7

	Chapter Title	Total Pages
Chapter 1	Physical State of the Earth	14
Chapter 2	Denudation	10
Chapter 3	Introduction to Atmosphere	10
Chapter 4	Atmospheric Temperature	10
Chapter 5	Atmospheric Pressure & Circulation	12
Chapter 6	Atmospheric Humidity & Precipitation	10
Chapter 7	Agriculture	14
Chapter 8	Mining and Power	12
Chapter 9	Industry	10
Chapter 10	Trade	10
Chapter 11	Transportation	10

This book follows the familiar pattern of content followed by questions. Each chapter has its own exercises section at the end of the chapter. Unlike the book from The Private School, the earlier of this book talks of general geography of the Earth rather than specific landforms of Pakistan. The latter half of this book's topics are of similar nature to the book being used in The Private School. Agriculture, mining and power, industry, trade and transportation are mentioned in Grade 7 book for The Private School as well as this Grade 7 book for The Partnership School. However, one significant omission from this

book is the chapter on Population and Employment. It is hard to fully understand the reason for that omission without delving into the world of speculation. However, according to the subject teacher, 'religious sensitivities' might have a role to play here (Qurat, 2016).

Similar to The Private School's book, this book also discusses topics that are rich enough to warrant a meaningful use of technology to promote 21st Century Skills in students. However, the lack of sufficient number of lesson plans per week renders the teacher's ideas and efforts, futile. In her 10 years of service with The Partnership School this teacher has been able to complete 9 projects that involved meaningful use of technology. When it comes to topics like agriculture, mining and power, and industry the teacher wants to arrange school trips to relevant places and landmarks so students can make use of technological tools to take part in active and collaborative learning at the transformation level (Qurat, 2016). However, monetary concerns and most importantly, security issues have stopped any elaborate educational trips from getting the approval from school administration.

4.4 Analysis of Data from Interviews

Themes from the interview data presented very relevant and at times alarming concepts. However, before delving into the details of interview data it is important to recall that interview questions were directly related to the research questions; even the probing questions stayed within the scope of the study to justify their existence and later on to be able to be coded for analysis purposes. Naturally, this section will discuss the interview data in segments; each segment referring to one of the following research questions.

1. How are public, private, and partnership schools using technology for teaching purposes?
2. What is teachers' and school administrators' attitude towards the use of technology for teaching and learning?
3. What factors influence their attitude?
4. How is their attitude affecting the schools' teaching and students' learning?
5. What can be done to effectively train the stakeholders in using technology meaningfully for the teaching and learning process?

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4.4.1 How is technology being used in participant schools?

From the interview data it was apparent that participants were engaging in two types of technology usages:

1. Professional
2. Personal

However, sometimes the lines were blurred between the two types and personal use of technology resulted in its implementation in the professional domain as well, and even vice versa.

4.4.1.1 Technology as a research tool

Some participants were regularly using technology as a research tool to prepare lesson plans as well as to answer some unexpected and novel questions from their students. At times this use was instantaneous by accessing their mobile Internet and finding out the desired information from Google.com. The ICT teacher for The Private School is often faced with questions about the latest technological advancements. Since the book does not keep up with the innovations in the field of technology, it falls on the teacher to research answers for any and all questions from their students (Mr. Sohaib, ICT teacher at The Private School, 48 years old). On some occasions technology was used to make a better lesson plan by researching innovative ways of teaching a mathematical concept (Saadia, 2016). Sometimes the research was of personal nature as to finding the appropriate vendor after comparing their costs from different websites (Zareen, 2016). However, using technology for activities like vendor search was beneficial for organizing many school events as well. Affordable and good quality vendors found from personal research were also called upon when it was time for school's fun fairs, book fairs, sports days, bake sales, charity and blood drives etc. (Aisha, 2016).

A rather interesting use of technology as a research tool came from participants from The Public School. The ICT teacher explained how he was entertaining requests from three teachers to help them prepare for a promotion examination. So he would spend a lot of time downloading resource material for these three teachers who wanted to appear for an

examination next year to upgrade their pay scale and move to a school near their domicile city (Bilal, 2016). This was neither a personal nor a professional use of technology as a research tool. At best it can be described as an act of altruism or perhaps naiveté.

4.4.1.2 Technology as an assessment aide

All three school's participants make regular and extensive use of technology during the examination weeks. Computers as well as ICT teachers are constantly busy with composing examination papers, worksheets, answer keys or any other assessment related material that is needed by the subject teachers. This is done far more frequently in The Private School as compared to the other two schools.

4.4.1.3 Technology as a motivational tool

The Partnership School leads the way when it comes to using technology as a motivational tool. This school regularly engages its students to watch motivational films, lectures, and videos to inculcate a love of learning in them (Sajida, 2016). One of the most memorable, controversial and yet successful use of technology as a motivational tool was the school's campaign to motivate and educate the female students as well as their mothers about feminine hygiene and products that can help maintain that hygiene. The school regularly engages its students in several other campaigns. Some of the notable ones involve engaging community in a cleanliness campaign, vaccination campaign, voting campaign etc. (Mr. Sohaib, ICT teacher at The Private School, 48 years old)

4.4.1.4 Technology as a professional development tool

The Private School's participants were the only ones who were making use of coursera.com as a professional development tool. Several participants disclosed that they are using the website every now and then to study online courses that pique their interest. The Private School's head office also puts professional development resources on their FTP server. These videos, presentations, podcasts, and text files can be accessed from the school. Teachers can request the ICT teacher to download relevant content for them (Sohaib, 2016).

The Private School's and The Partnership School's participants thoroughly enjoy watching TED Talks about topics of their interest as well.

4.4.1.5 Technology as an Informational tool

As per government of Pakistan's instructions, all schools have been ordered to educate students and parents about dengue fever. All three schools have taken steps for motivating the community to counter and safeguard against dengue fever by taking the necessary precautions. The Partnership School and The Public School made use of informational videos and educational presentation session to education parents about mosquitoes and dengue fever related issues.

4.4.2 Factors influencing participants' attitude

During the interviews participants disclosed several factors that have shaped their beliefs and attitudes towards technology usage. While this section does not claim to have compiled a categorical and comprehensive list of all factors that can influence an educator's beliefs and attitudes, it does describe every factor that participants mentioned in their respective interviews. Some of these factors were overtly stated during interviews while the others had to be inferred, by the researcher, from participants' responses. Overall, the factors have been divided into two categories: Intrinsic and Extrinsic. For the purpose of this section of the thesis Intrinsic factors are those that are directly a result of participants' own perceptions, belief systems, attitudes, and behaviours. Extrinsic factors are those that are not entirely in the participants' control and they are merely experiencing those factors as a result of their professional life or social life.

4.4.2.1 Intrinsic

As stated above, Intrinsic factors affecting participants' attitude towards technology are those factors that are a result of participants' own thought processes. This subsection will describe the Intrinsic factors as inferred by the researcher from the interview data.

4.4.2.1.1 Fixed mind-set

None of the teachers actually used the term 'Fixed Mind-set' during the interviews. However, many of their remarks towards learning and using technology meaningfully to

promote 21st century skills, were indicative of their fixed mind-set. Fixed and growth mind-sets are concepts identified by Dweck (2007). Figure 4.4 provides a vivid yet concise summary of a comparison between the two concepts.

Figure 4.4 Comparison of the two mind-sets



Five of The Public Schools' participants stated at least one of the five signs stated in the Figure 4.1. The Principal of The Public School mentioned four of the abovementioned traits of a fixed mind-set. He stated that his professional life is already laden with responsibilities that he does not go out of his way to embrace new challenges and conquer them (Zahid, 2016). He also expressed his disappointment with the stagnation of current education system in which 'any new idea or innovation is useless since it will die before you see it bear fruit.' While talking about his relationship with his teaching staff, he said that every now and then there are these newly hired teachers who want to overhaul the current system as soon as possible. These teachers end up challenging him about several school based systems and policies. His strategy of handling these 'trouble makers' is to 'just ignore them till they get tired and get back in line' (Zahid, 2016). One of the reasons for The Principal's nonchalant attitude towards criticism is that he feels threatened by confrontational teachers.

He stated incidents in the past where teachers who were unhappy with the way school was being run, spoke out against the principal during the regular educational inspector's visit. This resulted in the principal being warned about keeping the staff in line so no such insubordination may eventuate in future. Thus whenever a teacher tries to

suggest improvements or corrections to any policy, norm or action that was endorsed by the principal, he takes it personally and ensures that steps are taken to ‘silence and discipline’ such teachers. He wholeheartedly believes that this is being done in the best interest of the students.

The second fixed mind-set example came in the form of the Urdu teacher, Mr Rustam. The nature of his fixed mind-set was less administrative and more pedagogical. He is 47 years old and has been teaching Urdu language for approximately 20 years. During these two decades of teaching practice he has formulated his own teaching style and he religiously adheres to that style. According to him, ‘these new people coming from the District Educational Offices have no idea how sacred Urdu is to me. Urdu needs to be taught in the way that I use. Otherwise you are not doing justice to the language’ (Rustam, 2016). He clearly depicts the fourth point of fixed mind-set; ignores useful criticism. In his opinion technology wastes valuable time. He sees Urdu language as a subject that cannot benefit in any way from the use of technology to improve his teaching and students’ learning.

Third example of a fixed mind-set was presented by the science teacher, Mr. Ikram. He is not in favour of in-service teacher training. He believes teachers should be hired based on their educational qualification and that is a sufficient enough criteria to ensure good teaching practice from that teacher. He stated that he has successfully completed his Master’s degree and that is ‘more than enough to teach these kids’ (Ikram, 2016).

One of the fixed mind-set attributes state that the person with a fixed mind-set gives up easily. This giving up attitude was stated by two participants when asked about their attempts at trying to improve their use of technology in their teaching practice. Mathematics teacher tried to find useful educational videos for his classes but all of them were in English and he deemed them useless for his students. When asked about continuous search for more resources he stated that it was not worth it because it took too much time and did not yield any results so he gave up (Faisal, 2016). Similarly, the social studies teacher wanted to use Google Earth and other online resources to discuss certain content

from the syllabus. Poor Internet connection and electricity outages dissuaded him from trying it ever again and he gave up (Javed, 2016).

Fixed mind-set was not just a one school problem. Each of the three participant schools had some participants that depicted fixed mind-set in one form or another. While establishing correlation between older age and fixed mind-set is not within the scope of this study, one cannot help but notice that all of the participants who showed signs of a fixed mind-set were above 30 years of age.

4.4.2.1.2 Self-esteem Issues

Participants expressed their hesitancy when it came to engaging with concepts that may result in failure. ‘Apni izzat apnay haath main hoti hai’ (Gohar, 2016). This expression can roughly be translated as each individual is in control of their own esteem and pride. Upon probing further the Urdu teacher from The Partnership School, explained that he does not take part in any activities that result in failure; for example, technology related activities. He mentioned that failing in such activities becomes school gossip and adversely affects his control on his students. Two participants stated that help is available in their school but they do not ask their colleagues for help as this would make them appear weak (Aisha, 2016) or even unprofessional (Seemeen, 2016). These self-esteem issues were also hinted upon when the ICT teacher talked about teachers’ inability and unwillingness to learn about word processing software and spreadsheet software (Sohaib, 2016).

4.4.2.1.3 Behind the Curve

‘We are so far behind the curve that we spend all our time and energy in catching up and it is not working.’ (Zareen, 2016). This concept of being behind the curve was not just mentioned by the Principal of The Private School it was also stated by several participants from all three schools. Zareen (2016) explained what she meant by being behind the curve. According to her, teachers and students alike, were trained in using MS Office 98. By the time they attained a certain level of expertise in that Microsoft has released MS Office XP. This new version had different features and that rendered all the printed manuals, guides and books obsolete. Similarly, new versions of this software kept coming and resources

kept getting outdated. It resulted in a lot of wasted money, time, and energy. Thus, she expressed her discontentment at always being behind the curve.

One solution was proposed by Shazia (2016), to get ahead of the curve. She suggests that ICT should not be taught using books. Books take long time to write, edit, approve, publish, print, pack and arrive. During this time a newer version of technology has arrived and the content printed in books becomes obsolete. She proposed that technology should be taught by experiencing it in various contexts and not by memorising the definitions and descriptions of various jargon (Shazia, 2016). This can be a sustainable solution to cure the problem of being behind the curve. However, it does require trained professionals to execute. Given the current level of pedagogical, content, and technological training of participants, it does not appear to be a feasible solution for present or even for near future. Table 4.52 shows the participants' formal qualifications when it comes to content knowledge, pedagogical knowledge, and technological knowledge.

Table 4.15 Participants' TPACK Qualifications and Certifications

Code	Designation/ Subject Taught	Content Knowledge Training	Pedagogical Knowledge Training	Technological Knowledge Training
The Public School				
S1H	Principal	Double Master's (Mathematics and Statistics)	School Head training by the government	Two day workshop on meaningful use of technology
S1T1	English	Masters of Arts (English Literature)	None	Two day workshop on meaningful use of technology
S1T2	Urdu	Masters of Arts	Urdu teachers' workshop based training by Punjab Government	None

S1T3	Islamiat	Masters of Arts	None	None
S1T4	Science	MSc. Physics and Chemistry	None	Two day workshop on meaningful use of technology
S1T5	Math	MSc. Mathematics	None	Two day workshop on meaningful use of technology
S1T6	History / Geography	Masters of Arts (History)	None	None
S1T7	ICT	Intermediate of Computer Science	None	Intermediate of Computer Science
The Private School				
S2H	Principal	Master's in Education, and Masters of Arts in Educational Leadership and Management	Master's in Education, and Masters of Arts in Educational Leadership and Management	School based certificate courses and diplomas
S2T1	Urdu / Islamiat	Masters of Arts in Urdu Literature	School based certificate course	Two day workshop on meaningful use of technology
S2T2	ICT	BSc Computer Science	School based certificate course	ICT Workshop coordinator / Facilitator
S2T3	English	Masters of Arts in English Language	Certified Teacher of English as a secondary language (British Council)	Two day workshop on meaningful use of technology

S2T4	Math	Double Masters in Mathematics and Statistics	School based certificate course	Selected as a regional teacher trainer for IT skills
S2T5	History / Geography	Masters of Arts in History	None	Two day workshop on meaningful use of technology
S2T6	Science	MSc. Botany	school based certificate and diploma course	Regional Teacher facilitator for use of technology in teaching Science
The Partnership School				
S3H	Principal	Masters of Arts in English Literature	School Head's training by Government of Punjab	None
S3T1	English	MA. English Language	None	None
S3T2	ICT	BSc. Computer Science	None	BSc. Computer Science
S3T3	Science	BSc. General Science	None	None
S3T5	Urdu	Masters of Arts in Urdu Literature	None	None
S3T4	Math	BSc. Mathematics	None	None
S3T6	History / Geography	MSc. Geography	None	None

S3T7	Islamiat	Bachelors of Arts in Arabic and Islamiat	None	None
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As noticeable in the Table 4.52, The Private School’s research participants are far more qualified when it comes to a comparison of all three domains. This lead is also noticeable in the way they use technology for personal and professional use. However, they still believe technology is advancing at a much faster pace than their curriculum. Consequently, they are finding it hard to keep their technological use up-to-date with the current versions of technology easily available to their students.

4.4.2.1.4 ‘Why bother?’ attitude

Several participants revealed that their attitude towards innovation in teaching has changed from excitement to disillusionment and disappointment and eventually dismay. Qurat has been teaching social studies, geography and history to some grades in The Partnership School, for approximately ten years. During this tenure, she has repeatedly experienced incidents where she felt she was the only one working hard to help her students, whereas everyone else was getting away with doing far less. Initially, during her career with this school, she tried to motivate her colleagues to come up with innovative ways of teaching their subjects. After repeated failure in trying to motivate other teachers she felt like she was putting extra stress of herself and that too for no positive outcomes (Qurat, 2016). Nowadays she believes she is better off by doing what everyone else is doing. Her focus has shifted from meaningful use of technology to ensuring that all the topics in the syllabus are covered before the final examination.

She is not the only participant with the ‘why bother’ attitude. Mr. Shoukat, the Islamiat teacher for The Public School, in his relatively short stint with his current place of employment has experienced his attitude change from experimentation with technology to absolute avoidance of any sources of content other than the textbook. During his first year he undertook a presentation based approach to empower students to do research about the topics being discussed in class. He asked the students to work in groups and create a presentation using a medium of their choice. During this presentation students were

required to explain a topic to the class while their peers would ask questions about it at the end of the presentation. This approach for teaching Islamiat was not only rejected by the parents it ended up offending many of the students as well as parents. The problem that broke the camel's back were topics that were controversial and not agreed upon among the various Islamic schools of thought. Shoukat (2016), explains that he started receiving threats from the parents as they believed he was trying to convert them to another sect of Islam. From those experiences, instead of modifying his approach to suit the needs of the students, he started playing it safe and totally avoided giving students any control to do research on any topic. From those days till today, he gives lectures and provides notes to students. Eventually, students memorise those notes and get good results in their examinations. When asked if he would ever try to use technology again to aid in his teaching practice, he replied, 'why bother!' (Shoukat, 2016).

In both these cases it seems like the system has failed the teacher and eventually had a strongly negative impact on their attitude towards making meaningful use of technology to improve their teaching practice and inculcate 21st century skill in their students. If the Islamiat teacher had proper guidance and training on digital citizenship he would have made his students more sensitive and amenable to differences in opinion. Proper guidelines and age appropriate research material would have also helped him avoid all the trouble he went through. Similarly, for Qurat, perhaps starting small would have helped her get more success. She started with a flash and seemed to have burnt out rather quickly when she did not find positive or desired outcomes for her effort.

4.4.2.1.5 Lack of immediate gratification

Learning to make meaningful use of technology and fostering 21st century skills in students are long term processes. Often it is seen that these concepts will not yield immediate results and may even cause frustration early on, only to bear fruit if they are persisted with.

However, this lack of immediate gratification can be frustrating for teachers, students and parents alike. Zahra (2016), explains her experiences of using technology as a 'tiresome and tedious process till you gain mastery in using technology'. She has been teaching English language at The Partnership School for five years now. Early on, she faced very

commonplace challenges of slow productivity when trying to use technology. This was worsened by the fact that students were not adept at using technology either. She struggled to complete her assigned content during the first academic year. This lack of positive results was especially frustrating for the students who were very excited to be working on computers for their English lessons. But when they did not see immediate positive outcomes for their efforts, they started to lose interest. This is where Zahra realised that she needed to come up with a different strategy. She coordinated her lessons with the ICT teacher and came up with combined lessons that taught students about English language as well as how to use technology. Even now, sometimes the lack of immediate gratification can dissuade her students from participating fully but she keeps reminding them about the eventual prize of ‘lifelong learning’ (Zahra, 2016).

4.4.2.1.6 Job security

The Public School and The Partnership School follow teacher recruitment protocol as detailed by the government of Pakistan. Therefore, once a teacher is hired through government’s official channels, their jobs cannot be easily terminated on the whims of school administration as in the case of The Private School. This sense of job security is considered a ‘rehmat’, which can be translated as a blessing (Rustam, 2016), ‘a big advantage’ (Shahida, 2016), and ‘one less thing to worry about’ (Najma, 2016). However, the same sense of job security seems to have contributed to some teachers’ sense of complacency. They are so satisfied with their teaching performance that they see no reason to ‘experiment with technology’ (Javed, 2016). Some even admitted that they just refuse to do any of ‘this computer stuff’ to avoid extra workload, since they believe that they are an irreplaceable asset to the school and they are ‘not going anywhere till retirement’ (Faisal, 2016).

4.4.2.1.7 Gender barriers

Gender is a complex issue and it is made even more complex in a patriarchal society like Pakistan’s. Some female participants expressed their belief that male staff is naturally better at using technology than female staff (Riffat, 2016). One participant even believed that God has made men smarter than women so it is only natural that they are better at using

technology (Seemeen, 2016). While there are several extrinsic gender related barriers and assumptions, these intrinsic beliefs of a certain gender being inferior may also impact a teacher's willingness and readiness to make meaningful use of technology for promoting 21st century skills in students. There was one peculiar example of a male ICT teacher who expressed his disregard for female colleagues based on their comparatively lesser ICT skills. According to him, it was his job to help the teachers who can't help themselves. During his long academic career and in particular during his association with his current employer, The Private School, he has devoted several hours' worth of mentoring and coaching time to help his fellow teachers; especially the female teachers. While his helpful attitude stems from disdain for ineptitude, somehow, the principal has managed to channel his negativity into productivity (Zareen, 2016).

4.4.2.2 Extrinsic

For the purpose of this study, extrinsic factors affecting participants' attitude towards technology are those factors that are not directly a result of participants' beliefs, thought processes, and behaviours. The following sub-sections talk about all the extrinsic factors that were identified from the participants' interview transcripts.

4.4.2.2.1 Excessive workload

Participants were very forthcoming about their teaching, co-curricular and sometimes non curricular workload assigned by their respective schools.

Table 4.16 shows the total number lessons being conducted by the participant teachers of all three schools. School head have been omitted from this table as they rarely take any lessons.

Table 4.16 Teachers' Lesson based workload per week

Code	Designation	Pseudonym	Age	Lessons per week
The Public School				
S1T1	English	Inayat	32	32
S1T2	Urdu	Rustam	47	27
S1T3	Islamiat	Shoukat	29	24

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S1T4	Science	Ikram	39	30
S1T5	Math	Faisal	42	30
S1T6	History	Javed	50	25 (in total)
	Geography			
S1T7	ICT	Bilal	20	30
The Private School				
S2T1	Urdu	Uzma	42	32
	Islamiat			
S2T2	ICT	Sohaib	48	32
S2T3	English	Seemeen	35	30
S2T4	Math	Saadia	45	30
S2T5	History	Nosheen	27	24 (in total)
	Geography			
S2T6	Science	Aisha	36	27
The Partnership School				
S3T1	English	Zahra	33	25
S3T2	ICT	Shazia	29	24
S3T3	Science	Shahida	44	32
S3T4	Math	Riffat	26	30
S3T5	Urdu	Gohar	47	25
S3T6	History	Qurat	38	24 (in total)
	Geography			
S3T7	Islamiat	Najma	45	21

It is important to note that The Public School observes a six-day work week with Sunday as the only off day. Whereas, both the other schools observe a five-day work week with Saturday and Sunday as the off days.

All three schools observe Friday as a shorter working day due to the special mid-day prayers on every Friday.

Any workload of between 25 to 27 lessons is considered fairly average in The Private School (Zareen, 2016). To put this number in perspective, in The Private School and The Partnership School, students of each class undergo 36 total lessons per week. In The Public School this number rises due to an extra academic day; 45 lessons.

Interestingly, one can empathise with the teachers who expressed their discontentment over excessive workload as shown in the Table 4.53. All of those teachers who expressed

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unhappiness of lesson workload are taking 30 or more lessons per week. In a 36 lesson week that leaves them with only 6 lessons or less in total during which they have to plan their next week's lessons and check students' homework. Needless to say when these teachers are asked about their attitude towards any pedagogical innovation their immediate replies point towards the dearth of free time during a school day. 'When should I learn about technology?' (Seemeen, 2016) is a pertinent question asked by one participant. Another teacher got a bit more specific and expressed her desire to have more time so she can practice her typing skills (Uzma, 2016). ICT teacher went on to clarify that officially he is taking 32 lessons per week, however, unofficially he is taking all 36 possible lesson slots. This includes substitution lessons and drill and practice workshops and other such activities assigned by the school administration (Sohaib, 2016).

All participant schools engaged in a practice that assigned extra workload to teachers who were not already taking 30 lessons per week. These extra duties include assembly time management duty, uniform cleanliness checking, Break time discipline management, School events' management, off time discipline management duties (Zareen, 2016).

The Public School engaged in a rather unique activity that neither of the other two schools were doing. At any time during the academic year, The District Educational Officer can call upon the school's ICT teacher and any other technologically proficient teachers to their office to do computer data entry tasks. These clerical tasks are considered a part of these teachers' job description (Zahid, 2016). Sometimes, extra workload can last for weeks and results in teachers missing out on their primary responsibility of teaching their students. To make up for these missed lessons, students from two or more classes are made to sit together in one class to take their lesson together; 50 or more students in one class, learning about varying difficulty of a similar concept (Faisal, 2016).

4.4.2.2.2 Lack of mentoring

Teachers from public schools lamented the fact that there is a severe lack of mentoring when a new teacher joins the school. New teachers and even some seasoned teachers face a lot of difficulty in adjusting to the system and trying to make meaningful use of technology. Without proper mentoring these teachers end up getting dissuaded and stop using

technology. Most of them go back to the tried and tested way of lecturing and testing, thus completely forgoing creativity and innovation.

4.4.2.2.3 Bullying and harassment

Three participants mentioned how their interest in learning about technology changed from positive enthusiasm to dreadful memories. Some time ago the private school hired a new ICT teacher and it was his job to facilitate all teachers to make use of technology. That teacher was overly friendly with young female teachers and at times his actions would be reproachable to the extent that these days he would be sued for sexual harassment. This continued for a while till one of the teachers reported him to the principal. He was immediately fired, but damage was done. All of his harassment victims developed a distrust of male ICT teachers and still hesitate to ask for help from their male peers.

This should have resulted in these teachers lack of use of technology in their teaching practice. However, the principal intervened and mentored two female teachers to become school's technology leaders. These teachers now encourage all other teachers to come up with TIM based lesson plans. They help with planning, execution, evaluation, and improvement of TIM based meaningful use of technology.

4.4.2.2.4 Job insecurity

Almost all of the private school teachers mentioned a lack of employment contract when they were hired. This lack of safety net means that their employments can be terminated by the school's principal at any time. Normally, in Pakistan companies ask their employees to give a two weeks' notice before resigning and the companies provide such notices too before terminating a job contract. However, all of the private school teachers and some of the partnership school teachers do not have a job contract with their employer. This creates a sense of insecurity in the teacher. Such insecurity can demotivate the teacher from being innovative and taking risks. It can also motivate a teacher to perform better than their peers so when it comes to job termination, their performance can vouch for them. Even this outperforming attitude can lead to a mental and physical burn out.

4.4.2.2.5 Gender related issues

One glaring example of gender discrimination and patriarchy was shared by several female teachers of The Partnership School. These teachers come from families where access to technology is a right that is only provided to male members of the family. Any female who wants to use any technological tool, whether it is a desktop computer, a cell phone, or even television, she has to ask a male member of the family to grant her permission to use it. She cannot own any technological device nor can she use it in private (Shahida, 2016). This situation was corroborated by the Mathematics teacher who explained her difficulty of accessibility even when she needed to use the laptop computer for her studies (Riffat, 2016). Growing up in this exceedingly backward environment made some of the females more determined to study and learn about technology (Shazia, 2016). While it made the others more timid and shy and prone to depend on others when it came to tasks involving technology (Najma, 2016).

4.4.2.2.6 Demographical factors

Participant schools face a peculiar problem of female teachers leaving the school due to familial reasons. The Private School has had several female teachers leave the job because they were married to personnel from the armed forces; thus the family had to move to the city where the armed forces personnel was being posted. Over the years this phenomenon has led the school principal to subconsciously marginalise any female teachers who are married to an armed forces personnel. Zareen (2016), explains the situation by stressing on the fact that she wants to train and retain her teachers. She expended ample time resources on training female teachers that would eventually just follow their husbands to another city and find another job there. This repeated phenomenon led her to be more selective in choosing female teachers for ICT and leadership training (Zareen, 2016).

The Public School had a different version of this problem. Since the school's teachers are hired for the government of Punjab, the job assignments are based on merit. The higher marks you get in your exam the better are your chances of being placed in the city of your choosing. However, many teachers end up with job placements that they do not like. One year later these teachers can then opt to appear for an examination to upgrade their pay

scale. This examination's merit allows them the option to choose another city for their job. Thus being a public school in a relatively smaller town, The Public School has seen a lot of teacher turnover. Especially, the better qualified teachers tend to spend one year and then move on to another city of their liking. This repeated change of teaching personnel has dissuaded the school leadership from investing much training time into new and non-local teachers (Zahid, 2016).

The Partnership School hires a lot of young female teachers who have recently finished their studies and are looking for a teaching job. School trains them in Content knowledge, Pedagogical knowledge, as well as Technological knowledge. However, a lot of these newly hired female teachers end up getting married soon after they start their job. This changed in civil status often results in a change of city of residence. Thus these teachers have to leave the school and move to the place where their husband is settled. Sometimes, the husband is settled locally but the in-laws do not allow the female teachers to continue their jobs as they do not deem it as an appropriate activity for their daughter-in-law (Sajida, 2016).

4.4.2.2.7 Linguistic barriers

Pakistan is a country of many regional, provincial, and international languages. Total number of languages that are spoken in Pakistan is stated to be 74 (Eberhard, et al., 2019). Urdu is the national language yet it is the mother tongue for only 10% of the total population, and only 10% are able to speak English (Tayyab, 2019). Yet English is the language of instruction for all of the top rated schools in Pakistan. Those school which do not use English as a medium of instruction, they opt for Urdu instead. For this research, The Public School uses Urdu as its medium of instruction. The Private School and the Partnership School use English language instead; with the exception being Urdu as a subject.

Participants expressed their discontent at one language or the other being imposed upon teachers as a medium of instruction. Participants' English language proficiency becomes a vital factor in determining their productivity and efficacy when using technology. This is a

result of the fact that most of the resources that are freely available to them on the Internet are in English language. In recent times due to proliferation of web based media channels in Pakistan, more and more Urdu language resources are becoming available as well. However, resources in Punjabi are still scarce even though 48% of the population speaks this language (Tayyab, 2019).

Urdu and Islamiyat teachers from all three schools faced significant difficulty in coming up with the correct keywords to browse the Internet through the use of a search engine (Uzma, 2016). Establishing that resource's authenticity and correctness was another challenge that teachers repeatedly encountered (Najma, 2016).

Browsing was not the only issue pertaining to the language barriers; typing was a significant concern too (Riffat, 2016). Teachers were far more comfortable with pen and paper, rather than keyboard and mouse (Zahid, 2016). This hesitation to type in English or even in Urdu was noticed by the ICT teacher of The Private School as well. He tried to demonstrate the ease of use of various typing software to inculcate a sense of confidence in his fellow teachers, however, this only resulted in teachers coming to him for all of their typing requests; for example, composing worksheets and examination papers in MS Word software (Sohaib, 2016).

Participants' digital as well as non-digital proficiency in Urdu or English helped them become far more effective at making meaningful use of technology. Whereas, those participants who were not quite proficient in English or even Urdu, struggled to make effective progress towards making meaningful use of technology.

4.4.2.2.8 Availability and accessibility of resources

For the purpose of this research, resources refers to human resource, infrastructure, hardware, and software. Availability is the presence of that resource under the ownership of the school. Accessibility however, deals with the concept of open access to the said resource. Having a computer lab in a school checks the availability box but if teachers are not given ease of access to the lab then it is still not accessible. This subsection will

describe how each of the three school's resources affect their respective research participants' attitude towards meaningful use of technology.

The Public School has been provided with a computer lab. This lab comes equipped with seventeen fully functional desktop computers. The lab is fitted with its own air-conditioning system as well. However, all of this is rendered useless if there is no electricity to run the computers. Power outages are a nationwide problem and The Public School suffers from it just as much as any other part of Pakistan. With a small back power source the lab attendant is able to shut down the computers if a power outage happens during a computer usage session. However this backup power source does not last more than five to ten minutes; depending on how many computers are actively being used on the backup power. The School has requested the government to provide them with solar panels and battery storage so they can carry out uninterrupted computer based lessons. The request has not yet been approved (Zahid, 2016). The Public School has also applied to fill the vacant seat of a qualified ICT teacher. Meanwhile, they have recruited a part time local college student to teach ICT till there is an official appointment by the Punjab Government.

The Public School has been provided with an Interactive Whiteboard for its computer lab. This whiteboard is a very recent allotment by the government and they are yet to provide the school with the essential training and personnel to make use of this whiteboard. Ever since its acquisition in December 2015 till the time of this interview with the ICT teacher in October 2016 the white board has been turned on only twice to see if it was still functional after thunderstorms had caused electrical surges and outage (Bilal, 2016).

This school only has one computer lab. This lab is used by students from grade 1 till grade 10. Providing the appropriate furniture to cater to this diverse age range of lab's users, was a difficult challenge to overcome. The school's solution was to acquire chairs with adjustable seat height. This hydraulic pressure based seat adjustment works in theory. In reality the smaller children can raise the height by pulling on the lever but they cannot lower it as they lack the arm strength and the body weight to do so (Bilal, 2016).

English teacher for The Public School is an avid advocate for the meaningful use of technology to promote 21st Century Skills in students. In his experience, taking the students from the classroom, in a line, to the lab takes around five minutes. Then students settling down and getting ready to use the computers takes another five minutes. In a 35 minutes long lesson, losing ten minutes severely hampers the flow of the lesson (Inayat, 2016). He is a strong proponent for using tablet computers like iPads or other such brands to integrate technology in his teaching practice. According to him this will alleviate the pressure on the ICT teacher, the lab in-charge, and the subject teachers as well since they would not have to coordinate with the lab in-charge to check for availability of the computer lab (Inayat, 2016). The principal wants to use such devices in classrooms but his hands are tied by the governmental ban on such devices in public schools due to security concerns. He expressed his disappointment at the school's policy for banning the use of smart phones, tablet computers, or any other handheld device that could be misused for terrorist activities (Zahid, 2016).

The Private School is significantly blessed when it comes to availability of resources. It has three computer labs with 15 to 20 desktop computers in each lab. One lab is for primary and early years' section. Second lab caters to middle school from grade 5 till 8. Third lab is for senior students from grades 9 till 12. There is also a multimedia room with a multimedia projector and a retractable white screen. This multimedia room is equipped with a comprehensive audio unit as well that can be attached to the projector or any other device or simply a microphone (Zareen, 2016).

The power outage problem is equally significant for The Private School as it is for The Public School. However, The Private School has acquired two diesel-operated generators that can be turned on whenever there is a power outage in the middle of a lesson or a presentation. All labs are equipped with a small scale backup power supply as well that automatically gets turned on whenever a power surge or outage happens. This provides the computers with essential power for up to 15 minutes; sufficient enough margin to allow the generators to come on (Sohaib, 2016).

The computer labs are not only available to students, they are also open to teachers as long as teachers can find a vacant slot in the labs' timetable. Teachers make ample use of the available lab slot as well as the multimedia room. Sometimes these resources are used to show and discuss and video about the blood circulation in a human body (Aisha, 2016), or a presentation about landforms (Nosheen, 2016), or even a BLOSSOMS (Massachusetts Institute of Technology, 2014) lesson plan about probability (Saadia, 2016). Teachers are regularly making meaningful use of these resources to impart 21st century skills and foster meaningful learning in their students.

Usage of cell phones, or any other handheld devices is strictly forbidden in The Private School as well. This policy can be frustrating for teachers who are trying to maximize their instructional efficiency by not wasting any time by walking students up three flights of stairs and then bringing them back before lesson ends (Seemeen, 2016). However, given the country's struggle with terrorism and frequency of suicide and other bomb attacks in the region, the school strictly adheres to 'better safe than sorry' policy (Zareen, 2016).

The specific location of labs is problematic for older teachers as they have to go up to the third floor of the building to access the lab or even the multimedia room. While this is generally not an issue for students, teachers with medical conditions like obesity, osteoporosis, joint's pain or arthritis, find it a significantly difficult challenge to take their class to the computer lab (Saadia, 2016).

Accessibility concerns have made the school install some ramps next to the steps on the ground floor. However, a lot more work needs to be done to make all technological resources accessible to all teachers and students. The principal is aware of the challenge and has kept accessibility as one of her major objectives in the upcoming school improvement plan (Zareen, 2016). She is hopeful that one day when the country is at peace from the war on terror, students will be able to freely use handheld devices like smart phones and iPads to make meaningful use of technology.

The Partnership School is similar to The Public School in some ways and is comparable to The Private School in other ways. For example, the school has two computer labs. Both

labs are equipped with seventeen desktop computers. Of these fifteen computers are used by students. One is used by the ICT teacher and one computer is kept as a backup, in case one of the other sixteen computers go out of service.

Unexpected power outage is as big a menace for this school as it is for the other two schools. However, this school's partnership with the private sector has resulted in a gift of a solar panel system that can keep the two computer labs running for one hour during a power outage. The name of the private sector benefactor cannot be stated to protect the anonymity of the schools as well as of the participants.

This school also has an auditorium like room that is used for a multitude of activities. Due to its audio-visual equipment, teachers use this room for showing interactive videos, students' presentations, theatrical performances, music competitions, debates, and various other co-curricular activities. However, this room is in very high demand and teachers have to plan and book a slot weeks in advance otherwise it gets taken by someone else for some other activity (Shazia, 2016). This multipurpose room and one of the labs are situated on the ground floor. This makes these resources far more accessible than those of The Private School.

As is the case with many schools in Pakistan, this school does not allow its students to bring or use any mobile phones inside the school premises. Any and all emergency calls are made and received from the principal's office.

Overall, all three participant schools are being hamstrung in their stride of progress by the political instability and security threats prevalent in the country. However, despite this unfavourable dark cloud of terrorism and sectarian violence threats, teachers and school heads are still soldiering on to make the most out of the available resources. Some are doing a better job than others but with proper training and facilitation, there is no reason that all three types of schools cannot keep on improving.

4.4.2.2.9 Parental feedback and pressure

Participants expressed strong concerns about parental backlash and pressure whenever the teachers or school heads tried something innovative. Parents are so used to receiving

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homework in students' homework diaries that if they are told about observational and reflective practiced based homework, they panic and start calling the school heads or the teachers (Zareen, 2016). This attitude from the parents makes some teachers sway away from meaningful use of technology and they tend to adhere to the standard teaching practice that parents are comfortable with. However, this was only noticeable in The Private School. The other two schools' participants did not divulge any parental concerns; which can be deemed concerning in itself.

4.4.2.2.10 Teacher training and professional development

There were mixed feelings among participants when they talked about training and professional development. It appears that participants with extensive exposure to technology did not see much benefit in beginner and intermediate level training sessions. They deemed it either a 'waste of time' (Sohaib, 2016), or they expressed their lack of satisfaction with the basic level content (Aisha, 2016). However, this was not the case with all participants.

Some participants could be categorised as novices when talking about their experience with using technology. Many of these participants expressed the need for more frequent training sessions (Zahra, 2016) and increased opportunities for continuous professional development (Riffat, 2016).

4.4.3 Strategies for personnel training

School leaders and teachers suggested several ideas regarding professional development. While a lot of the ideas were similar in nature, two of the following ones were mentioned by almost all participants.

4.4.3.1 Self-Reliance

Teachers and school leaders need to start relying on themselves to learn and improve. Plethora of online content is available these days to learn about most of the relevant concepts. The culture of ICT teachers teaching everyone about technology is obsolete and ineffective. Teachers should take a leaf out of young adults' books and start learning about technology by trial and error method. However, this should not be the only approach.

YouTube videos can be an excellent source of learning. MOOCs like Coursera, provide a wide range of courses to help with teachers' professional development.

4.4.3.2 Feasible, affordable, reputable training for all

It is time for Pakistani schools to develop their own resource so they don't have to hire foreign trainers to conduct professional development training sessions. There several local entities that provide similar training to teachers and schools. Unfortunately, even those entities can be unaffordable for many teachers and schools. Schools can use the cascade model for information dissemination. Cascade model suggests that one person gets trained and they go back to their school and train everyone else. This is a cost effective method of dispersing professional knowledge

CHAPTER 5: DISCUSSION OF FINDINGS

5.1 Potential Benefits of using technology in school education

Technology can be used in many forms in school education; therefore the potential benefits are plentiful. It is not feasible to write a comprehensive list of possible benefits of using technology for teaching and learning in a school setting. However, some of the salient benefits are particularly relevant for Pakistani students. These are as follows:

1. Technology and particularly social networking enables students to augment the country's social capital (Ellison, et al., 2007)
2. It allows "... learning across time and space, stimulates not only formal but also informal education, and facilitate self and group learning (Tim, et al., 2004)
3. Technologies like Web 2.0 enable education to move from pedagogy (teacher centred) towards heutagogy (learner led) (Blaschke, 2012)
4. Provides a platform for students to develop important 21st Century Skills like
 - i. Creativity and innovation
 - ii. Communication and collaboration
 - iii. Digital Citizenship
 - iv. Critical Thinking, Problem Solving and Decision Making
 - v. Research and Information Fluency
 - vi. Technology Operations and Concepts (ISTE, 2015)

Pakistan is a country fraught with troubles like poverty, illiteracy, corruption, terrorism, sectarian and ethnic violence, famine and drought, and war on terror. It is no surprise that education does not fall in the top priority of Pakistan's government. Therefore, the above mentioned benefits albeit only a few, are extremely important for Pakistan's school going students.

1. Through the use of social media, students can portray themselves in a positive light and get to understand other students' opinions without having to see them through the censored lens of nationalistic media.

2. Learning is not limited to a classroom anymore, MOOCs and other resources have enabled students to learn from anyone and everyone. Due to poverty or other economic constraints, many Pakistani children do not get formal education. Technology enables education to become informal if needed. This way students can manage their daily schedule in a manner that does not affect their livelihood while still enabling them to learn.
3. Even though literature harps on about the student led classrooms, this phenomenon is yet to become common practice in many schools. Most of Pakistan's schools practice a teacher centred classroom learning setup. Lectures are prepared by teachers and delivered in classrooms. Technology can enable the students to break this status quo and move from pedagogy to andragogy and hopefully eventually "heutagogy".
4. 21st century skills is a name given to a set of skills that, many believe, are essential for everyone in today's world. School education can help the students in acquiring these skills. Meaningful use of technology can enable the students to acquire these skills while learning the subject matter.

5.2 Four ways of making meaningful use of technology to promote 21st century skills

As hardware and software continue to improve with the passing time, more and more schools in developed countries seek to adopt the latest technology. These technological advancements have enabled researchers and educators to come up some very interesting teaching and learning methods as well.

5.2.1 Blended Learning

Innovative approaches like BLOSSOMS (Blended Learning Open Source Science Or Math Studies), from Massachusetts Institute of Technology in the USA, have empowered the teachers to use technology in a non-traditional way to augment and polish students' critical thinking and problem solving skills. BLOSSOMS uses a duet pedagogical approach to teach students. This approach means that the teacher as well as the technological tool, help the students in their learning process. Students normally start watching a video and then there is a pause in the video. This is where the teacher steps in to evoke the thinking process and encourage students to come up with answers to the questions posed in the

video. Then the video resumes with a discussion of the possible answers and continues to develop the concept it was focusing on (Massachusetts Institute of Technology, 2014).

BLOSSOMS is not a very common practice in Pakistan's schools. Provincial government of the Punjab province has been trying to innovate the current outdated educational system. Punjab Information Technology Board (PITB) launched a 'Blended Learning' module development for the school teachers of Punjab. This competition was well publicized and launched at the public venue of the grand youth festival in 2012. PITB works closely with MIT's Learning International Network Consortium (LINC). LINC believes in non-discriminatory proliferation of education through technology and government of Pakistan seems to share this vision (Farooq, 2015). However, approaches like BLOSSOMS need technological infrastructure and trained personnel before they can be executed.

Most private as well as public schools lack such infrastructure. Low cost private schools are rapidly emerging in smaller towns and villages of Pakistan and with this escalated increase in numbers, equipping these schools with physical and human resources is a mammoth task (Andrabi, et al., 2010). Even the schools which are equipped with ample technological resources may not have trained teachers to develop video modules based on BLOSSOMS.

Nevertheless, it is a valid field to research because no matter which technology based initiative is launched in any school, teachers' preparedness and willingness to carry out that project are key variables in determining how successful it will be. Therefore, either the schools need to be provided with the technical equipment as well as personnel to operate it, or the Blended Learning model needs to be made partially independent of school's available technology.

Interview data showed that the private school principal is very keen on using this technique to not only buttress learning for slow learners but to also provide a different learning environment for students who do not learn well in the traditional class room setup. Moreover, she argued that this technique can also be used to cover and makeup for any deficits in the learning process due to illness or unforeseen interruptions in the school calendar.

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5.2.2 Flipped Classrooms

A flipped classroom can be seen as an opposite of a traditional classroom. In a regular traditional classroom lecture takes place in the class and then students go home to do homework. A flipped classroom approach provides students videos and other material to get acquainted with a new concept and then they come to the class to do exercises, discussions and collaborative, to get a deeper understanding of the concept (Baker, 2000). Sometimes this technique can create a chaos in the class but Andrew P. Martin, a University of Colorado teacher, loves this chaos and is excited about the prospect of students effectively teaching each other while engaging in lively discussions with their peers (Berrett, 2012).

Language and literature teachers have been using a form of this technique for a long time now. Many teachers would ask the students to read a chapter or a part of a text at home and then that section of the text would be thoroughly discussed in the class. However, flipping is not only applicable to language and literature classrooms; it can work for any classroom. Houston and Lin quote Salman Khan (founder of khanacademy.org) from a TED talk, that ‘flipping’ results in humanizing the classroom; students start learning like active participants rather than passive recipients of information. Moreover, it increases the student-teacher one-on-one interaction time as compared to a traditional lecture (Houston & Lin, 2012).

The effectiveness of this approach in Pakistan’s schools is yet to be measured and tested. Therefore, one cannot draw any general conclusion right now about how beneficial “Flipped Classrooms” can be for Pakistani school students and teachers. Just like any other teaching and learning method, “Flipped Classrooms” has its limitations as well. In order for this approach to be successful the teachers needs to be in command of the proceedings while allowing the students to lead their own learning. Flipped classroom approach requires teachers to be adept at choosing the right material for students (Schiller & Herreid, 2013). Choosing the right material is especially important for Pakistani teachers as parents tend to be sensitive about ideas that differ from their own ideology. Punjab government was forced to take action against a private school (Usman, 2013) after parents complained that their

children were being brainwashed against Islam in their school. This private school replaced the traditional subject “Islamic Studies” with a contemporary subject called “Comparative Religions” (Gilani, 2013). The parental backlash did not stick to this subject only; there were serious concerns about teaching the concept of sexual intercourse and abortion to students of sixth grade (John, 2013).

Secondly, Teachers should be skilled in monitoring the in-class discussions. They should be able to ensure that the classroom interactions are leading to students’ learning. Classroom management can be “harder than making everyone be quiet during a lecture. Thinking and learning can be quite noisy” (Fulton, 2012). Moreover, the success of this approach depends on the underlying assumption that whatever tasks are assigned to be done at home, students will be able to do them before coming to the classroom for the in depth discussion and activities related to the concept being studied. In Pakistan’s context this may prove to be difficult to assume. If the home tasks involve the use of computers or other multimedia, students without easy access to such resources will not be able to do the prerequisite homework before coming to class. Pakistan’s power crisis is another variable that may affect students’ ability to undergo technology dependent homework tasks. Some cities and many towns in Pakistan suffer from long hours of power outages during the whole year (Khan, 2014). Since this approach might be new to some students, they may find it difficult to break out of the habit of getting introduced to the concept in the class and then doing the homework related to it (Schiller & Herreid, 2013).

Despite these limitations, the following, possible benefits of flipped classrooms are important to mention (Schiller & Herreid, 2013):

1. Students pace their work at a speed which suits them.
2. Working in front of the teachers allows teachers the opportunity to assess students’ work with greater depth and insight.
3. Use of technology is flexible and appropriate to support the students’ ‘21st century learning needs’.

4. Students get more time working with scientific equipment that is only available in school.
5. Students are actively involved in the learning process.
6. Students enjoy their learning.

Surprisingly, the partnership school has expressed more interest in utilising this technique rather than the public or the private school. However, they have made a minor modification to the technique. Instead of giving students tasks to do at home, they are keeping the school open for extended hours so students can make use of the library, the computer laboratories, and the multimedia room to watch content related videos and lectures. These were then discussed in the next class. Most of these video lessons are watched in groups under the supervision of at least the subject teacher. Sometimes school leaders from the school or the management office also join the students in watching the video and engaging the students in a discussion, during or at the end of the video.

This interruption based execution has made this approach a blend of Flipped Classrooms and Blended Learning.

5.2.3 Social Networking

With the proliferation of social media applications and their integration in the smartphones, Pakistan's private schools are beginning to engage students through social media to enhance learning or to improve their academic performance. In Pakistan, one such extensively used social media website is Facebook.com. In 2013, Facebook had over one million users in the age bracket of 13-17 years old (Aftab, 2013). Several schools in Pakistan have their official pages on Facebook. Beaconhouse School System and The City School are by far the largest private school systems in Pakistan with over 200 and 150 schools respectively. Both these systems as well as many other private schools regularly use Facebook groups to engage teachers with each other as well as with schools' head offices. Additionally, within these schools, various classes make their own groups to stay in touch with each other.

However, it is possible that much Facebook activity may not have a significant impact on the learning and academic performance of students. Hew (2011) conducted a research on published content about the use of Facebook by students and teacher; Hew suggests that the use of Facebook by students was mostly for social interaction purposes and had little or no educational use. Only two out of nine motivations, for using Facebook, were related to students; only one of those related to learning (Hew, 2011). A study by Kirschner & Karpinski (2010) did not show any positive relationship between Facebook use and academic performance. In fact, they claim that Facebook users performed poorly as compared to non-users (Kirschner & Karpinski, 2010). Junco (2011) found that some Facebook activities affected the students' engagement and time spent preparing for the class, positively, while other activities affected them negatively (Junco, 2011). However, Junco did not find any strong correlation to establish whether social networking is generally useful for student engagement or not.

The private school makes extensive use of social networking to facilitate its teachers. Teachers from one school group form a Facebook page where they share their activities, ideas, and lesson plans. This alleviates the school leaders' burden to guide each and every teacher and makes teachers more reliant on self-sufficiency and peers' advice.

5.2.4 Gamification

It can be said that games have been part of mankind's history. They have taken various manifestations across centuries. It is only in recent times, that an attempt has been made to understand games through a systematic and logical lens. Ludwig Wittgenstein used games as an example to portray the ineffectiveness of language in illustrating abstract concepts (Wittgenstein, 1958).

The term gamification refers to the incorporation of gaming elements in non-gaming settings in order to understand and influence human behaviour. Recently gamification is mostly used by corporate companies as a marketing tool in order to promote a specific product and service. However, it has been realized that the approach of gamification could yield positive benefits in other domains such as education, health and

other government policies. An advantage of gamification is that the idea of games, children are exposed to it at a very young age. For example in the United States, 97% of teenagers play some kind of digital game on a regular basis (Lenhart, et al., 2008). People are so accustomed to the rules and interfaces of video games that they adopt a game-like mindset to various everyday situations and “see the world through the lattice of games” (Gordon, 2013). Designing systems that resonate with these principles will be instrumental in engaging young people in school and, later on, in the workplace.

In the context of education, it can be said that the school environment is similar to that of a game in the sense that there consists various levels, there exists a reward system as well as a leaderboard. Games require a level of ‘grinding’ by the player which relates to how much effort is made by the player in order to achieve a certain target. Schools similarly wish to illicit similar behavior amongst their students which is a commitment towards certain goals and targets. While the school environment typically fails to take this into account, games are able to counter the short-term bias by breaking down the path to the final objective into smaller tasks and offering intermediary rewards all along the way (Gee, 2008).

During the interviews with the participants, it was noted that if a participant had access to a phone then they had spent at least some time playing games on the phone. While it is noted that gamification is not the same and gaming, one cannot ignore the opportunity that gamification techniques can be used to motivate all mobile phone using teachers to come up with meaningful ways of using technology in their teaching practice.

5.3 Pakistan’s technological initiatives in educational institutions

Government of Pakistan states that it believes in empowering the youth of the country to develop marketable skills in them and to promote a culture of research activities.

5.3.1 Prime Minister’s Laptop Scheme

To further this agenda, The Higher Education Commission, upon the order of the Prime Minister of Pakistan, distributed 100,000 laptops to students enrolled in several higher education institutions across Pakistan (Amjad, 2014). These laptops were only given

to students who fulfilled a selection criteria. It is noticeable that only those students were awarded these laptops who were enrolled in a university which was run by the government of Pakistan; private universities were not eligible for this award. Moreover, several other categories of students are deemed ineligible for this award. It is important to note that the laptops do not come equipped with any specific licensed software that can help students.

All useful software has to be purchased according to the needs of the students' educational program. One criticism on this scheme is that without proper training and planning, this scheme will not be able to yield the desired results of improving education to strengthen economy to relieve poverty; instead laptops may end up primarily being used for leisurely activities, for example, casual text or video chatting, surfing and gaming (Hoodbhoy, 2012). Daniel (2010) presents a Uruguay's case study to depict that not all hardware led approaches end up failing. The potential to achieve desired results diminishes if the approach does not have a clear vision and action plan.

Such criticism has not deterred the government from continuing laptop distribution. The scheme has extended into the next phase and is now distributing laptops to students who secured over 78 percent marks in the final exam of the 10th year; also known as matriculation exam in Pakistan. The government of Pakistan has sandblasted the laptop scheme's logo on all laptops so that they cannot be sold off and are only used for educational needs of the students. Shortly after the launch of the scheme for the university students, the following video was uploaded on YouTube.com

<https://www.youtube.com/watch?v=-AnTZU2w1WU>

This video shows the complete process of how to remove the logo from these laptops. It is alleged that many such laptops were sold off for money after the logo was removed. However, there is no official statement about this from the government or any other independent researcher.

5.3.2 Computer on Wheels in Daanish Schools

Daanish schools is another project that aims to use technology to improve education in Pakistan, specifically in the Punjab province. Daanish school system was developed to

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educate the underprivileged children of Punjab province. The admission criteria states that these schools prioritize admission for those students who cannot afford education expenses. Daanish Schools are located in the smaller towns of Punjab rather than big cities like Lahore, Multan, and Faisalabad. Each school has a computer laboratory with 30 desktop computers. Moreover, two classrooms in the school are provided with interactive whiteboards. The school also has the facility of Computer-ON-Wheels to provide in-class technological access to teachers and students.

However, this information is solely taken from the schools' website (<http://daanishschools.edu.pk/>). The school was sent emails to verify the information but there was no response. It would be interesting to visit these sites and observe how they are incorporating the technology in their teaching and learning practices. While Computer-on-Wheels is a step in the right direction, whether it is being used meaningfully or not remains to be seen.

5.3.3 Handheld devices for school to digitise education

Punjab government among many of its technology based initiatives has also launched a program to provide handheld devices to public schools in Punjab. This has been done in an attempt to digitise the public school education and to potentially improve the quality of said education. More and more experts and education professionals are calling out for an increased use of technology to bolster the quality of education in schools. Dr. Yasira Waqar mentions the immense potential of mobile phone learning in Pakistan's public school education sector (Waqar, 2014). According to a report, by the end of September 2013, the number of mobile phone users in Pakistan had exceeded 129 million (News, 2013).

Such proliferation of technology makes an even stronger case of technology to be included in school education. Keeping in line with the theme of digitising public school education Dr. Umar Saif stated that 50,000 students in 12,000 classrooms will be provided with handheld devices called "tablets" which will contain e-learning curriculum (Sheikh, 2015). According to that statement each of the 12,000 classroom will have at least four

tablets available for use by the students. Three years later the reality seems to be different from the initial claim. While the schools were provided with handheld devices, the number of devices seems to be vastly different from what was stated by Dr. Umar Saif in his interview. According to three research participants only one tablet is given to the school and that tablet too is only accessible to the teacher for the most part of the year. Students are given access to the tablet when district education officer's visit is nearby. This is when students are asked to memorise the content in the tablet for the eventual examination by the government official. This is not the only example of a mismatch between words and actions by the government of Punjab. On paper things look far more promising than what the reality of visiting a school uncovers.

5.4 Importance of Using Appropriate Technological Tools

As previously discussed there is a huge disparity when it comes to the quality or even quantity of trained teachers in Pakistan compared with a developed country like Finland. Keeping this fact in mind there is a high likelihood that many teachers in public, private, and PPP schools will not be adept at handling technological tools let alone making meaningful use of technology for teaching and learning purposes. This puts extra pressure on education leaders and policy makers to deploy the type of technology that is fit for purpose; fitness in monetary terms as well as in feasibility of meaningful use by teachers and students. Studies like Maddux & Johnson (2005) and Gibbons & Fairweather (2000) depict that technology usage is more meaningful and cost effective when it gels well with the curriculum and is targeted at applications that enhance student interaction with the technology and puts student in charge rather than the software developer or teacher. Technology has improved immensely since year 2000 when this study asserted the aforementioned conditions. Nowadays, with the proliferation of smart phones and other personal handheld gadgets, not only has technology become more affordable it also allows a 'pocket option' for on demand interactivity and student led learning.

Researchers have also noticed the potential of these personal gadgets and their possible role in teaching and learning (Domitrek & Raby , 2008) vouch for increased autonomy and liberty for teachers as well as students to use technological tools to ensure

meaningful learning. They claim this independence and encouragement to use technology would open more learning avenues for both teachers and students. A rather primitive example of beneficial use of technology for teaching and learning is to use mobile phones for accessing online content or to interact with other students or teachers or other relevant personnel via texting applications (Rau, Gao & Wu, 2008). Phones can also be used to conduct quick assessments like multiple-choice question assessments or other forms of quizzes and exams (Waqar, 2014).

5.5 How do teachers interact with technology in school?

One of the stronger themes to emerge from the literature review and data analysis is that meaningful use of technology is not a trivial process that can be accomplished by merely providing the school with technological tools. It is a rather intricate and complex process which is affected by a bevy of varying factors and actors including teachers and their perceptions and attitudes towards using technology meaningfully. The complexity of this process is compounded by factors like teachers' communication skills, languages skills, supports system, training and the infrastructure which is available to them.

Even trained teachers are struggling to make meaningful use of technology (Slay, et al., 2008). Studies like this makes the reader wonder whether the problem lies with the teacher or the technology or somewhere else. Using appropriate technological tools is paramount to ensuring the success of meaningful use of technology. But that is only the start, appropriate teacher expertise is needed to ensure a meaningful use of technology.

5.6 Potential Drawbacks and Stresses Related to Technology Usage

When considering the implications of ICT usage by teachers it is important to understand the risks and prospects attached to effective utilization of ICT (Staples et al, 2005). For example weak implementation due to inadequate training of teachers with regards to ICT which would result in a loss of expensive ICT equipment procured in the process. The use of ICT could backfire and lead to ineffective as well as inefficient lessons (Staples et al, 2005).

Furthermore there need to be six characteristics which need to be assessed when evaluating the extent of innovation amongst teachers based on the innovation dissemination theory (Fullan, 2001). Many models fail to realize that before upscaling an ICT intervention it is important to gradually proceed the intervention in phases and small increments, such a method will help in reducing risks (Mueller et al., 2008). At the same time costs are a significant factor which determines whether ICT interventions can be supported in the long run especially when recurring costs are difficult to justify. It is then difficult to determine if teachers and school management are pressurized to ensure a return on investment with regards to ICT infrastructure which includes computer terminals and software and hence the opinion of teachers with regards to such high capital investment should be considered. An expensive investment in ICT would indicate that there is no room for any sort of trial and error and failure will not be considered as a viable option which means that accountability and effectiveness as well as implementation of the ICT program would fall on the teacher which why it is important to consider trial and error scenarios similar to the innovation dissemination theory (Fullan, 2001) in order to monitor effective ICT implementation in schools.

Other risks associated with ICT provision is the way in which such interventions are implemented. A top-down approach where only direction, command and instruction is issued to the teachers will be an ineffective method for an effective ICT based intervention in schools. Forceful persuasion for instructors and teachers to use ICT to teach new instructional strategies is not only expensive but the top down approach will limit its ineffectiveness (Chapman et al, 2004). Furthermore not only will the approach increase stress and aversion level for teachers but it also devoid the teachers any sort of autonomy or agency to be flexible with regards to the usage of ICT intervention (Chapman & Mahick, 2004). Thus in this context is important for the school management to ensure that ICT interventions are carried by offering adequate and satisfactory support to the main focal persons who are in charge of implementing the intervention which are the teachers.

5.7 Constructing a Technology based School Improvement Plan

In order to effectively utilize technology based interventions it is imperative to establish a clear, concise and articulate Technology Plan in order to integrate different tactics, policies and strategies (Baylor & Ritchie, 2002). An effective technology plan should encompass a central vision that the proposed intervention seeks to establish. The proposed vision then needs to be drilled within the teachers and all their queries and concerns need to be addressed. If such steps are not taken then the results of an ICT based intervention will have no impact on improving student learning outcomes nor will ICT play any significant role in transformation of education (Conlon & Simpson, 2003). Various case studies illustrate that technology impacts the medium of instruction and learning and hence the type and form of technology that is used will have an impact upon the quality of learning in the classroom (Gulbahar, 2007). Old models proposed in studies such as Rogers (1995) and Schussler (2007) are inadequate as they do not consist of a comprehensive technology plan as these models lack a basic implementation framework to incorporate ICT based interventions. The models proposed in studies (Sandholtz, 1997) also fail to have a tailor made solution for schools with varying context and background nor does it include a need analysis of each specific school which requires intervention.

Furthermore if we examine the context of the United Kingdom then it can be said that at least 831 schools in the UK, out of these at least 9 out of 10 schools have a comprehensive ICT strategy program (Becta Survey, 2009). These plans include indicators such as the replacement of equipment which has been quoted by most senior leaders as well as indicators of continuous professional development of teachers, investment in ICT provision, use of learning platform and an acceptable use of policy. At the same time, these indicators still fall short of a comprehensive technology plan based on the literature reviewed (Gipson, 2003; Barnes et. Al., 2009). It can be said the reasons for this is pedagogical as it needs to be understood that school management and individuals in leadership positions need to dive deeper into the plan rather than merely providing resources such as ICT equipment or its replacement. Management needs to understand the intricacies of incorporating technology and ICT in curriculum and a curriculum reform based approach should be followed. Most models which have a technology plan fail to

mention the integration of curriculum through ICT which in turn reduces the effectiveness of such interventions.

According to various studies (Popisil & Willcoxson, 1998) a comprehensive technology plan should consist of 3 core priorities such as anarchic development, negotiated development and controlled development. Anarchic development refers to a development program for online teaching where the institute gives complete autonomy to the individual based on their interest and capacity with regards to educational technology in order to ascertain what sort of intervention needs to happen and does not consist of an outlined or articulate priority that has been identified. Secondly, negotiated development refers to when priorities and interests related to ICT are identified by the individual or a small group and controlled development refers to the control over resources by the institution on decision making processes at the highest level in the institution.

Furthermore, according to the study (Popisil & Willcoxson, 1998) the cost effective model is that of negotiated development since it seeks to align various stakeholders and their demands and streamlines them into a set priority. The centralized nature of this model could possibly lead to investment of resources in areas that may not give long term advantages for the institution. With regards to 'Controlled Development', by the time a decision is made the said technology may already have become obsolete at that time. Schools are increasingly pressurized in decisions whether to delay technology changes as they wait for the technology to get cheaper. This technological deflation is counterbalanced by the increasing exertion and pressure to utilize technology for advancement of the learning process at a given time. In East Asian Countries such as Singapore, negotiation development seems to take precedence however at the same time the conclusion set out by the study (Popisil & Willcoxson, 1998) needs to be examined and questioned in today's world whose technology is accelerating at an exponential rate.

In lieu of above, the this research provides or a basic roadmap towards possible terms of references for public, private or public-private-partnership schools to adopt efficient and meaningful use of technology in their respective schools. It is easy to diagnose that an efficient and beneficial approach towards ICT implementation can be clearly established then an effective and sustainable transformation will be possible.

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It is thus essential to interact with each teacher and school leader as a long term engagement in order to withdraw internal cognitive and psychological procedures to better understand and encapsulate the intricate and diverse relationship that each teacher and school exhibits in relation to its use of ICT. As mentioned before, the positivist epistemology associates better towards the data oriented, quantitative heavy focused methodology where gathering information, figures and data forms an integral part of the approach. In contrast, interpretivism is an epistemology that reflects the subjective differences between the social (human) and natural worlds (Guba, 1990) in a relatively limited context. It can be said that interpretivism's emphasis on subjectivities allows it to capture the subliminal differences when understanding human cognition and perceptions of the private school teachers in school in contrast to the approach followed by the positivist school of thought.

Due to the importance of social and cultural elements of a particular environment, for the sake of this study the interpretivist paradigm was utilized as it's more aligned towards the objective of this study. The study analysed perspectives of participants and their attitudes which form a vital part of the research which why such a perspective was difficult to attain without the interpretivist paradigm. This paradigm quintessentially analyses interactions between actors in a specific environment and setting. Through this approach the study is able to explore topics such as the personal process of teachers, their way of thinking, belief systems and experiences and what makes these individuals different and what commonalities can be addressed through policy actions. It is important to note that this study did not intend to come up for highly generalizable findings. This is a comparative case study and findings of this study are very specific to the three participant schools.

CHAPTER 6: CONCLUSION

6.1 Main conclusions and their link to research questions

The main conclusions of this study are a result of analysing the collected data in the light of the five research questions that guided this study:

1. How are public, private, and partnership schools using technology for teaching purposes?
2. What is teachers' and school administrators' attitude towards the use of technology for teaching and learning?
3. What factors influence their attitude?
4. How is their attitude affecting the schools' teaching and students' learning?
5. What can be done to effectively train the stakeholders in using technology meaningfully for the teaching and learning process?

Conclusions will be presented for each of the research question separately.

6.1.1 Research Question 1

How are public, private, and partnership schools using technology for teaching purposes?

Conclusions for Public School:

- a) Most of the use is formal and planned. Other than ICT lessons that are part of the timetable, teachers have to seek permission from the principal if they have to make use of the computers in the computer laboratory.
- b) Technology is being used mostly for printing out worksheets and examination papers.
- c) Every year the school conducts one technology based project for Science for Grade 6, 7 and 8. This is reported to the District's Education Assistant as part of school's technology integration plan.
- d) Any innovative ideas for meaningful use of technology are faced with resistance from the principal. If teachers utilise their own financial resources to fund these

innovative interventions then the principal not only allows it but also owns the credit for its success.

- e) Teachers are were lacking a framework to guide their use of technology. With the introduction of TIM in the information dissemination workshop that I conducted teachers have started improving their lessons plans to move from entry level of technology integration towards higher levels.
- f) Most of the technology usage was done to increase the students' interest in education and in that topic in particular.

Conclusions for Partnership School:

- a) The partnership school has one more computer lab as compared to the public school therefore, their timetable has more available slots for teachers to utilise.
- b) Most of those slots were being used lesson planning, worksheet designing, and examination paper making.
- c) After the information dissemination workshop teachers began to use more and more of that computer time in coming up with lessons and projects that made use of TIM at Adoption levels and higher.
- d) This school's privately hired teaching staff makes more meaningful use of technology. Whereas, the teachers that are hired through the government's recruitment system are more reluctant to change the traditional way of teaching.
- e) The education foundation that is this school's private partner is making use of computer labs and specifically the resource room to train all teachers in TIM and meaningful learning with technology.

Conclusions for Private School:

- a) Generally teachers make regular use of technology for the following purposes:
 - i. Word processing for worksheets, assessment tests, date sheets, notices for parents etc.
 - ii. spreadsheets for results and tabulation of data
 - iii. presentation software to make informative presentation for students

- iv. gaming software to engage students in fun activities
 - v. Paint software for illustration and drawing
 - vi. animation software to learn logic and patterns
 - vii. mind mapping software to make mind maps or flow charts to show processes
 - viii. Internet for communication, collaboration, and research
- b) Before the information dissemination workshop the main focus of technology usage was on keeping the lessons fun and engaging for students. After the workshop on meaningful learning and TIM, teachers have begun to focus on achieving higher levels of technology integration. The aim has shifted from fun with technology, to deeper learning with technology.
- c) Initially the culture was to ask male colleagues for help with task pertaining to technology. Slowly, this culture is changing to one of self-help and taking charge of one's own learning.
- d) More and more teachers are now using technology for not just their own lessons but also to collaborate with teachers of other subjects, and to teacher other teachers as well
- e) Teachers are watching videos of lessons conducted by local as well as international teachers. Then they use the key learning points from those lessons in their own teaching practice

6.1.2 Research Question 2

What is teachers' and school administrators' attitude towards the use of technology for teaching and learning?

Public:

- a) Initially the attitude depicted their discomfort, distrust, and in some case disdain for the idea of making meaningful use of technology.

- b) This kind of attitude was primarily a results of trickle-down effect. Since the leadership was not supportive of increased use of technology in teaching, the teachers were reluctant to be creative as well.
- c) After the information dissemination workshop a few teachers found motivation to try and incorporate meaningful use of technology in their teaching.
- d) A few more joined them and it created a healthy competition among the teachers.
- e) Seeing how it affected students' involvement in lessons, how it improved their attendance, more teachers started learning about TIM.

Partnership:

- a) The partner education foundation is adamant in improving the quality of technological use in this school. So they keep motivating and training teachers in the field of meaningful use of technology.
- b) They cannot change the textbooks as they are prescribed by the Punjab government, but the school leadership encourages and at times enforces the use of Internet to research additional materials to bolster students' learning. Sometimes, this results in an attitude of resentment and frustration. But most of the times when students give positive feedback, teachers forget about the frustration and rejoice their success.
- c) There is a divide when it comes to attitude towards this technological intervention. The privately hired teachers are far more enthusiastic in experimenting with it as compared to their government hired counterparts. Privately hired teachers are less likely to be dissuaded by failure as they treat this as a learning and growth opportunity. Thus, depicting the very definition of a growth mind-set.

Private:

- a) The private school generally had two kinds of attitudes, overwhelming acceptance or staunch resistance
- b) Most of the younger teachers or those who were more exposed to the use of technology rapidly jumped aboard the TIM excitement train.

- c) Those teachers who do not have much experience with technology showed strong resistance towards embracing this technological intervention.
- d) The school's principal is an astute advocate of meaningful learning with technology and she was thrilled to learn about TIM and all of its free to use resources.
- e) One stakeholder that falls outside the domain of this study's scope is parents. The principal has conducted several training sessions for parents to educate them about meaningful use of technology so they can encourage students to partake in more meaningful technological activities at home as well.

6.1.3 Research Question 3

What factors influence their attitude?

Section 4.4.3 gives a detailed account of all the factors identified as a result of interview data analysis.

Analysis of textbooks revealed that a well-designed and well written book allows teachers to become far more comfortable with accepting and implementing meaningful use of technology.

A detailed look at policy documents suggested that raising the social status of the profession of teaching will attract more qualified personnel to join this field. That will in turn develop a sense of pride in teachers. This can motivate them to undertake all contemporary technological innovation and interventions to improve their teaching and students' learning

6.1.4 Research Question 4

How is their attitude affecting the schools' teaching and students' learning?

In various subsections of section 4.4 (Analysis of Data from Interviews) it is depicted that teachers' attitude towards the use of technology significantly affects the overall teaching practice, this in turn ends up affecting students' learning.

When teachers were forced to use technology it resulted in time wasted in developing hollow lessons that used technology for the sake of ticking the checkbox that yes I have

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used technology. On the contrary when teachers were motivated and inspired to come up with suitable ways of making meaningful use of technology they produced transformation level projects. Following are three examples of how previously uninspired teachers found inspiration and led their students to develop Active, Collaborative, Authentic and Constructive projects at Transformation level of technology integration.

Example 1:

The partnership school had been struggling to broach the topic of feminine hygiene and the use of feminine hygiene products to Grade 7 girls. More and cases were happening each day where girls started bleeding during classes and had to be sent home due to visible stains that soiled their school uniform.

School administration tried talking to parents but it became abundantly clear that parents felt extremely uncomfortable talking about it and at times they got agitated at the fact that school was noticing their daughters' private bodily phenomena.

This is where the school decided to make use of technology to convey the message of hygiene to both parents and students alike. Female teachers were trained to make use of technology to create a video that would explain the concept of female sanitary products and convince the parents to buy these products for their daughters. This stop motion animated video was extremely effective in delivering the message. It was praised by the parents and they encouraged the school to come up with more educational content like that.

Since the success of that video in 2015, the partnership school has created 11 more educational videos on various issues ranging from, cleanliness, rights and responsibilities, safety and protection, sexual harassment and abuse, right and responsibility of voting, and a few more.

Most important impact of these teachers' positive attitude has been on students' confidence. More and more students are now approaching teachers with ideas for the next video.

Example 2:

The most surprising but refreshingly positive transformation level project was conducted by the public school. The school is situated in an area where sewage at times seeps into the underground water table and people end up pumping that water out for drinking and cooking purposes. The school identified this as a life threatening problem and students wanted to do something about it. They wrote letters to various science and technology universities in the city and explained the problem to them.

Eventually, one of the renowned local university's biology and chemistry departments wrote back that they would be interested in a collaborative project with the students to test water and air quality of their neighbourhood. Just getting this acceptance message was considered a huge success by the principal. But the teachers wanted more; they wanted a long term collaborative project that would eventually enable, educate, and empower the local residents to improve their own locality.

Since 2018, every summer vacation a team of undergraduate students collaborates with these school students to survey water and air samples and disseminate the survey results to the local populace. Not only that, the students, design and execute campaigns to clean up the locality, as well as educate all residents on how to own the neighbourhood and keep it as clean as if it was their own house. Students and teachers have invited non-governmental organisations and private sector philanthropists to donate money to build and improved sewerage system so that sewage can be kept separate from the drinking water.

Example 3:

The private school is prolific in its meaningful use of technology and comes up with several projects each year. One of these projects seems inspired from a video on the TIM website, called, Dollars for Darfur. In this video students collaborate to raise funds for those in need. Similarly, these Grade 7 students identified that every year Pakistan faces one or more crises. So far we have had devastating earthquakes, ferocious floods, famines and droughts, terrorist attacks and bomb blasts, school shootings and much more. All of these tragedies and disasters leave a lot of people in need of help. Especially, in need for money.

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Therefore, these students decided to conduct a fund raising program every year during summer vacation. Students wrote to many philanthropists, celebrities, businessmen and influencers and informed them about their ambitions.

They did not receive any positive reply from anyone until a local event management and fund raising company wrote back to the school. They suggested conducting a proposal writing workshop for these students and offered to help train them in the field of fund raising.

Students learnt the jargon and technicalities of effective proposal writing and soon they were hearing from a few interested parties who wanted to get on board for this annual fund raising campaign called 'Main hi Pakistan hoon' which means I indeed, am Pakistan. This name is a take on a famous national song called 'Main bhi Pakistan hoon', which means I too, am Pakistan.

This campaign lasted for two years before it fell victim to corruption and fraud by one of the interested sponsors. Students shut it down before things got worse for everyone.

6.1.5 Research Question 5

What can be done to effectively train the stakeholders in using technology meaningfully for the teaching and learning process?

- a) Improve teacher training programs at university level
- b) Strengthen teacher recruitment criteria
- c) Improve teaching as a profession so it gets its reputation revived
- d) Provide affordable continuous professional development opportunities for teachers and school leaders
- e) Equip all schools with reliable and fast internet connections so stakeholders can learn about TIM and its support materials
- f) Motivate teachers to spread their knowledge about TIM and collaborate with others
- g) Promote global citizenship to learn from not just local peers but from international teachers as well

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6.2 Suggestions for policy makers and practitioners

6.2.1 Adjust and adapt policies for current context

Policy documents generally address an overarching situation. However, execution of such policies is rendered ineffective in the policy is phrased and worded in a vague manner. Rewrite the National Education Policy document to clearly state what level of technology integration is demanded from school. This is the only way government can enforce a culture that promotes meaningful learning with technology.

National Professional Standards should not just be listed in a government document, they should also be taught to the teachers. Before inspecting teachers government should ensure that teachers are provided with enough assistance and resources to implement those standards in a classroom setting.

Move education outside the boundaries of a classroom. Many schools are situated in areas where there are plenty of learning opportunities in things present in their surroundings. Allow, enable and encourage teachers to take students outside the class and engage with the world.

6.2.2 Inculcate ownership through involving relevant stakeholders in policy making

During interviews many teachers expressed their feeling of helplessness at the current state of policy making. When asked about national educational policy, some of them stated that they do not really care about since they were never asked before this policy was made. It turns out teachers have a feeling of disconnect from the educational reality. Many teachers have grown comfortable with the status quo where they come to school, teach, go back home. This status quo can only be broken by involving trained, experienced, and exceptional teachers in policy making to develop a sense of ownership of the current educational system.

6.2.3 Promote collaboration among different types of schools

The gulf of quality of education provided by various schools is widening day by day. Top quality education comes at a steep cost. Some schools are charging over 90,000 Pakistani rupees (around 560 US dollars) as tuition fee for a month. The Supreme Court of Pakistan

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saw this trend and issued a junction that all private schools will reduce their tuition fee by 25%. Instead of bridging the gap of educational quality between public and private school, this injunction started resulting in schools laying off staff that they could no longer afford.

A better way of bridging this ever widening divide is by promoting a culture of peer mentoring and collaboration between top quality schools and other schools. If schools teachers are given a government funded online platform to share their successful lessons with everyone in the country then more and more teachers could improve their own teaching practice without having to worry about training sessions, workshops, online courses et cetera.

6.2.5 CPD and lifelong learning opportunities

While Allama Iqbal Open University and Virtual University provide teachers with various professional development programmes, these are either not well reputed or are difficult to complete due to logistical problems.

Teachers and school leaders should be able to go online and take courses from existing MOOCs. If they show enough promise then the government should pay for their course completion certificates so more and more teachers are motivated to continue developing professionally. This will cure the ailment of stagnation that many teachers are facing in Pakistan. This stagnation leads to the kind of statistics presented in section 2.15 where a significant number of teachers did not have sufficient content knowledge.

6.2.6 Plan based on available technologies

On TIM website it is repeatedly stated that the objective of TIM in particular and meaningful learning in general, was never to push the schools to use latest technological tools. The idea is simply to make meaningful use of any existing tools. Now it is up to the schools to plan their use of technology based on whatever tools are available to them.

6.3 Future study

This study's main contribution was to aid in filling the gaps in the literature in field of meaningful use of technology, through TIM framework, by trained, in-training and untrained teachers of three different types of schools; public, private, and partnership. Some

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of the potential considerations for future research include stakeholders who were excluded from this research due to logistical or ethical reasons.

- a) future studies can include parents as a research participant to get their input on the use of technology
- b) They can include students as research participants, this study did not include students as Grade 7 students would be legally considered as minors and would require parental consent to participate in any research. Gaining parental consent as well as students' consent is a time consuming task which is why students were not included in this time bound research.
- c) policy makers can be included in future research to pique their minds about the field of technology integration
- d) curriculum designer can become important participants in future research in order to get an insight into the process of designing a curriculum document
- e) teacher training, teacher trainers, and teacher education programs can be studied too in order to ascertain what variables and factors affect a teacher's preparedness and willingness to make meaningful use of technology

Some of the questions that may be answered by future studies may include the following:

- a) How is meaningful use of technology affecting students' learning?
- b) What is the impact of collaborative learning of students' and teachers' personality development?
- c) Which technological tools are more effective at improving student learning?
- d) What motivates teachers to push themselves to perform better?

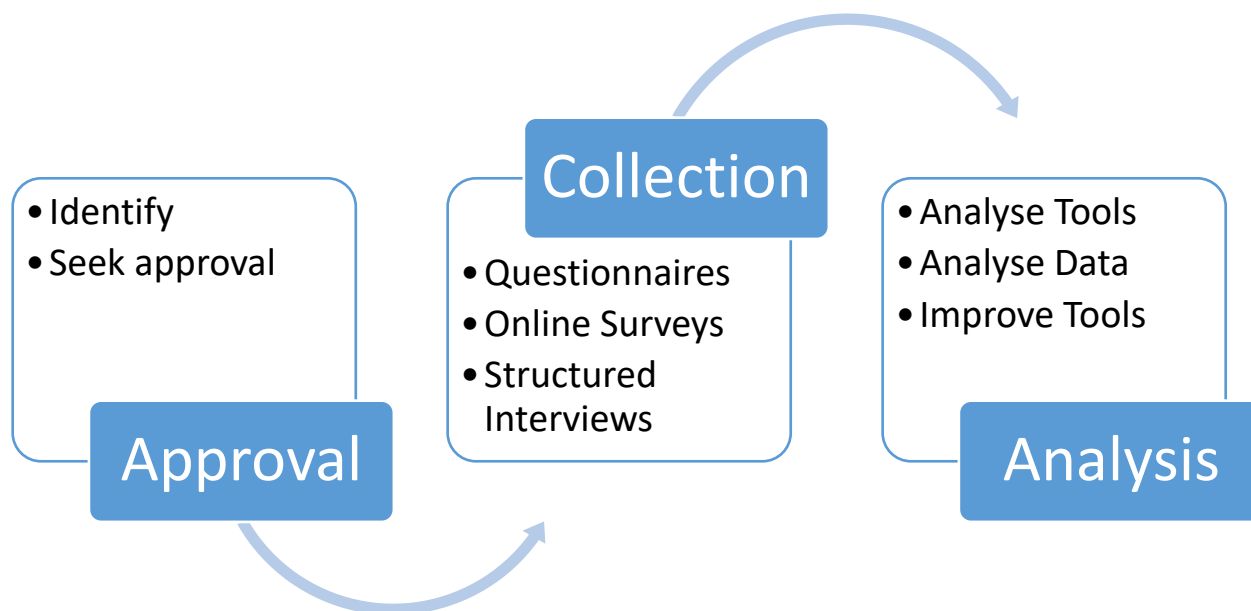
Future research should consider studying the impact of being a multilingual teacher as opposed to mono or bilingual only. It can focus on doing a nationwide quantitative study to gauge how many teachers speak which languages. Future studies can hypothesize about teacher's effectiveness and its relationship to the medium of instruction. Future studies can then advise the national educational policy makers about which languages should they

prioritise in their teacher training, curriculum design and medium of instruction related policies.

Future research can expand on this comparative case study and include more varieties of these cases for example, a full time boarding school, a day boarding school, a day school, or an evening school. Pakistan is a country where a lot of school going students also have to work in order to survive. Therefore, impact of evening schools can be a relevant study for future.

APPENDIX A

Pilot Study Plan



Pilot Study Progress

		Timeline	Progress
Approval	Identify schools from the population that can be a participant in the research	December 2014 to-date	Schools have been shortlisted and emails have been sent informing them of the research.
	Seek Approval from school heads and get consent forms signed by all participants to ensure informed consent.	10 th March 2015 – 15 th March 2015	None of contacted eight schools have responded as yet. This is normal behaviour from Pakistani schools. Therefore I will have to visit them in March 2015 and seek approval in person

Collection	Questionnaires	15 th March to 25 th March 2015	All three types of data collection will be employed simultaneously to save time and to improve them on the go
	Online Surveys		
	Structured Interviews		
Analysis	Analyse Tools	15 th March to 15 th April 2015	This phase will begin as soon as data collection starts. Tools will be improved as and when needed so that they are in prime shape for the main data collection phase of research later this year.
	Analyse Data		
	Improve Tools		

APPENDIX B

Studies that Incorporate the TIM & TIM Tools

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