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FACTORS THAT FACILITATE THE USE OF TECHNOLOGY AMONG SECONDARY TEACHERS IN MALDIVES

by

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Abstract

Technology have brought significant impact in all the sectors of economic, academic and as well as to the social life positively in all the parts of the world (Assar, Amrani & Watson, 2010; Elwood & MacLean, 2009; Erdogan et al., 2010). Use of technology in education context empowers learners and teachers as it cultivates the development and promotes change. It leads to transformation of learning and teaching practices from teacher subjugated to student centered approach (Condie & Livingston, 2007). Certainly, teacher plays an important role in creating an interactive learning environment. The use of technology in instructional practice totally lies with teachers as they have the control over the teaching strategies employed in the classroom.

This ex-post-facto quantitative research study was conducted because of the lack of information regarding the use of technology among teachers in Maldives. This study explores the factors that facilitate the use of technology in teaching practice among lower secondary teachers of Maldives. It is hoped that this study would assist in designing pre-service and in-service training programs particularly focused on technology use for students learning. In addition, this study would assist in developing policies and plans in the area of technology use in teaching and learning context.

Data was collected through a self-reporting research questionnaire from the lower secondary teachers working in the schools located in the capital city, Male'. A total of 373 questionnaires were returned which was about 68 percent of the total. To reduce the biases that was observed during the analysis process, ipsatizative scores were computed.

The results revealed that there is a gender disparity in the use of technology in teaching practice. Female tend to use technology in traditional context while the male participants' shows constructivist use technology. This disparity could have a relation to Maldives tradition and culture. Regarding the pedagogical belief, overall the participants inclined to have a traditional pedagogical belief. Looking at teacher training programs, teachers trained in local institutes tend to use technology more traditionally compared to teachers trained from overseas. Professional development programs (PDP) need to be formulated according to the needs of the teachers and there is a need for continuous PDP in all schools. The study also revealed that teachers above 40 years tend to use technology for students learning compared younger teachers. More emphasis need to be placed to retain teachers in this field for a longer period.

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I am forever indebted to the Ministry of Education of Maldives for giving me consent in conducting the research at the lower secondary schools. I do appreciate the support provided from the school management in facilitating to carry out this study in the schools. I wish to express my sincere thanks to teachers who so graciously agreed to participate in this study.

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TABLE OF CONTENTS

CHAPTER 8

CHAPTER 9

List of Tables

List of Figures

CHAPTER 1

Introduction

CHAPTER 1

INTRODUCTION

1.01 Introduction

"The future development path of the world will inevitably and increasingly be carved by information and communication technologies (ICT) as they are providing countries around the globe with opportunities to reinvent themselves and aspire higher level of sustainable growth" (Mohee, 2001, p.6). Indeed, ICT have brought a significant impact in all the sectors of economic, academic, and as well as to the social life positively in all parts of the world (Assar, Amrani & Watson, 2010; Elwood & MacLean, 2009; Erdoğan, Kursun, TanSisman, Saltan & Yildiz, 2010). The rapid development in ICT has brought a lot of benefits to the society at large, because it has facilitated easier delivery of services, easier communication, social networking, and many more. Students nowadays are able to learn on a global scale without leaving the classroom environment and making the learning personalized. Agricultural areas have now being automated due to advance technology making it to more cost-efficiency for farmers. Business companies have become more profitable and grown widely with the help of various advanced machines and equipment. In reality, it is now easier to establish global collaborations and to sustain partnerships in the international business arena. Furthermore, in the medical field, research processes occurs in a much more rapid rate and with recent and advanced machines and computers can do intense research to overcome many medical conditions. It is possible for people to pay their bills while sitting at home or at their working places. The use of cell phones in business transactions has been adopted in almost all countries. People can send and receive money through their phones instead of lining up in banks. In connection to this, the rapid development in ICT has also led to the invention of Automated Teller Machines which enables people to handle banking transactions at almost every bank without physically going there. In the past when ICT was not developed, people used to stay in queues for hours to get a transaction done.

In commercial sectors, things have been made much easier where people no longer required to travel other countries for business or to purchase things, because ICT has made possible for people to buy and sell products electronically. People currently use wire transfer to send and receive money from one country to the other. Variation and fluctuation in currency index can be immediately detected making it easier for people to know the right timing to do the transactions. In general, every sector of every country has received a significant evolution as a result of improved ICT technology. All these sectors have recorded increased productivity and development leading to a tremendous growth of the economy.

Likewise the increase use of computers and other forms of ICT in virtually all the sectors, the education docket too, has embraced these emerging trends (Almekhlafi & Almeqdadi, 2010; Condie & Livingston, 2007). In fact, studies have proven that ICT has had a profound impact on the education system, and the trend is bound to improve immensely (Almekhlafi & Almeqdadi, 2010; Jung, 2005). Ghafar, Hamdhan, Sihes and Harun (2011) stressed the importance of integrating ICT in education by stating as “[i]t is fundamental the aspirations of the country, stability and purity of the nations is realized through the education system” (p.208). Recent scenarios shows that we now have enthusiastic and interactive learners with the teachers acting as facilitators to an interactive student body (Bransford, Brown & Cocking, 2000; Hayden, 2006; Jung, 2005). Many authors are in agreement that the integration of ICT into classrooms is “an important aspect of successful teaching” (Almekhlafi & Almeqdadi, 2010, p.165) as it bound to strengthen the problem solving, synthesis, analysis, and evaluation skills of the participants (Loveless, Burton & Turvey, 2006; McAllister & Deaver, 2006). On the other hand, Nkansah and Unwin (2010) argued the role of ICT is crucial in assisting students with disabilities such as physical disability students able to participate in fieldwork with the help of assistive technologies or blind students able to hear what others read with text to speech software (Nkansah & Unwin, 2010).

With the inclusion of ICT in the learning curriculum, students are self-directed, and work both independently as well as interdependently to enhance their intellectual development (Ghafar et al., 2011). Transforming pedagogy is something all schools are attempting to do in virtually all countries globally. Providing the best educational opportunities for students is critical because achieving career dreams would become impossible without a good education.

For a long time, schools have been remarkably traditional, and this has reduced the level of technological innovation. The way schools were organized is decidedly different from today. The delivery of the curriculum and the school almanac were exceedingly traditional and this is the reason why the students’ needs were not fully met (Ghafar et al., 2011). In historical days, schools were replicated on the theory of scientific management which showed the assemblage line production method. The teacher would teach the same things in all subsequent classes that passed through him/her, without a consideration of change in technology and life situations. This made the whole stream of classes passing through the same teachers to have the same perspective of handling things and valuing life.

There are two main reasons why ICT should be introduced into the education system. First, considering the changes ICT has had on the various sectors of the world, economically, socially and politically, over the past twenty years, today's children need to grow the skills and knowledge that will ensure that they will be able to cope with the dynamic changes of the 21st century. Secondly, by making use of the new and advanced technologies, schools can offer an enhanced and personalized education established to the needs of the individual learner (Schols & Bottema, 2014). Some researchers have pointed out that there is no significant difference between traditional teaching methods, and the use of ICT for teaching and learning. Both cases highlight the significance of interaction. President of America, Obama (2014) stated "[t]echnology is not a silver bullet. It's only as good as the teachers … using it as one more tool to help inspire, and teach, and work through problems". ICT harmonizes other teaching methods, and should be seen as an addition to, rather than a substitute for, traditional methods, and thus gives students a combined learning environment (Conole, Dyke, Oliver & Seale, 2004). Alshahrani and Ward (2014) posited Blended Learning Approach (BLA) as one of the famous teaching techniques that uses online resources in the face to face traditional teaching approach. Alebaikan (2010) investigated the benefits of BLA and found that the high level of enthusiasm among high school students. Even though this approach is successful with high school children, he noted that with the younger children this could be risky and discomfited (Alebaikan, 2010). Hamari and Nousiainen (2015) addressed the values and use of Game Based Learning (GBL). Integrating innovative and creative games into teaching creates an "engaging and immersive learning experiences" for students (Hamari & Nousiainen, p.1, 2015). Furthermore, Hamari and Nousiainen (2015) posited that integrating games in education requires willingness to explore and experiment in addition to the engagement and motivation. This is because games are constantly changing and further making use of the latest technological advancements. Sharples et al. (2014) pointed the use of technology in flipped learning approach. Flipped learning approach consists of two elements; the face-to-face component in the classroom and home based component. According the authors "the classroom becomes a space for dynamic, interactive learning where the teacher guides students to apply concepts they have learned online" (Sharples et al., 2014, p.18). In this learning approach, students are encouraged to engage in online discussions and share their personal experiences on variety of online learning resources.

Although many countries have adopted the use of ICT in all areas, there are challenges that are hindering its adoption. Some countries may lack the required knowledge to impact a change in the ICT and the use of technology effectively in the educational environment. This tendency may be due to lack of competent personnel to teach with the use of the latest technology effectively in order to create an interactive learning environment (Gülbahar & Güven, 2008). Countries which do not have the habit of sending their students to other developed countries for further education are much affected by lack of technological advancement. Another crucial problem is the unacceptable attitude towards the use of the latest ICT technology (Deaney, Ruthven & Hennessy, 2006; Elwood & McLean, 2009; Ghafar et al., 2011). Many people feel that adopting this technology will lead to erosion of their culture and customs. This makes them concentrate less on the use of ICT in some sectors of the economy and more on their culture.

There are a number of factors that affect the successful use of ICT by teachers to teach. One of them is the lack of confidence among teachers. This is a contextual factor which acts as a barrier. According to Pernia (2005) a teacher's fear of failure is a likely to cause lack of confidence to teach. Another reason related to a teacher's lack of confidence in teaching is the lack of competence to incorporate ICT into pedagogical application. Numerous findings have identified lack of technology skills as being a major contributor towards the teachers' lack of ICT use in schools (Hanewald, 2014; Liu & Pange, 2014; Stratton, 2014). Many teachers prefer not to use ICT in teaching or due to lack of pedagogical competence in the use of ICT for teaching and learning.

1.02 Background of the study

The use of technology in the educational sector has grown exponentially over the past years. Today, technology is seen everywhere; home, workplace and in schools, making life easier and better (Oldenziel, 2006). The revolution of the technology is turning the real world into a huge information system which is also referred to as "industrial revolution and industry 4.0" (p.7). Industry 4.0 refers to the consistent digitalization and connection of all the productive units in an economy. For instance, development of smart robots and machines where robots and human will be working together interlinking tasks widening the production. Not only in the economic sector, but in educational sector these changes will obviously be seen. In early days, the most commonly used technology tool was "calculators" to computer numbers (Nolte, 2001).

Looking back at the computer use in the education sector, the first operational computer called Harvard Mark 1 was completed in 1944 at Harvard. This was a room-sized, relaybased calculator consisting of fifty foot long camshaft. Even though initially this was used to calculate mathematical tables, was later taken the place of storing computer programs. In 1946, ENIAC was developed at the University of Pennsylvania. Taking 1000 square feet of floor area, ENIAC had an improved speed of 5000 operations per second. During that time, these computers were mainly utilized for calculating numbers in the field of mathematics, science and engineering. Slowly more computers were developed with improved speed and started using in other sectors

After thirteen long years, Donald Bitier from the University of Illinois in 1959, started the first large scale project called PLATO, which was focused to the use of computers in education. Consisting of thousand-terminal system assisted undergraduate education, elementary school reading, colleges in Urbana and in Chicago. This was the beginning of computers in education however, it was used primarily for research activity.

In 1963, number of people initiated to bring a change in the way computer was used in the education. Kemeny and Kurtz introduced a new computer language called BASIC, which was easy-to-use compared to previous computer language FORTRAN. With this change, more computer-based instructional materials was developed for specific subject areas in all the educational levels. Suppes and Atkinson developed a program on computer-assisted instruction in mathematics and reading. These programs were focused to individualize learning and to move according to the students own pace by providing feedback to correct his or her responses. The computer revolution has brought many changes to the education. The following section will focus on some of those major changes.

Even though computer was introduced to the instructional setting, this was formally documented in the National Standards in Education in 1970, as a component of industrial arts program (Drugger, 2002). The purpose was to prepare students to the industry after their completion of high school. However, other areas of the national standards were unchanged even though at some instances science and technology were connected (Drugger, 2002). In 1985, major changes were brought to the local and state education system with the inclusion of use of technology in the National Standards of the education. Latter the document was entitled as Standards for Technology Education Program. According to Philips (2002), later many changes were instituted to the education system such as developing new curricula to prepare students for 21st century educational system.

During the reform process of technology inclusion in the education, drawbacks were also encountered at times. For instance, in 1990 the mismatch of the developed software to the curriculum has failed the effective use of technology. According to Means and Oslon (2002) the software developed was basically on drilling and practices rather than for a collaborative learning interface. Similarly, introducing stand-alone technology courses in the schools was not successful plan. Educational professionals later recognized that these stand-alone courses does not provide the required technology experiences needed (Pearson and Young, 2002). Therefore, emphasize should be given in implementing technology in all the subjects.

During this long period, there has been lot of transformation of learning and teaching practices from teacher subjugated to student approach and are expected to include some technology in the teaching (digedu, 2014; Condie & Livingston, 2007). Changes such as classroom looks and operations were seen. Technology is believed to be a crucial component that would prepare students as a productive knowledge workers (Pelgrum, 2001). Countries are increasing investments in technology, however, the research has revealed that many of the schools, technology has not been effectively implemented (Trucano, 2005; Russell, 2003). This is substantial in the developing countries and Small Island States. In Small Island States such as Maldives this problem is more significant because the population is scattered to numerous remote islands making it difficult to provide an equal and quality educational services to all the scattered island population.

Many of previous studies have pointed out that the “full integration of computers into the educational system is a distant goal unless there is reconciliation between teacher and computers. To understand how to achieve a sufficient level of ICT integration, we need to study teachers and what makes them use computers (Marinkiewicz, 1993, p.1993). Ertmer (2005) and Condie and Livington (2007) contended that the decision on whether the use of technology in the professional practice relies of teachers. Several studies have identified various factors that influence the utilization of technology for instructional purposes (Gotkas, Yildirim & Yildirim, 2009; Afshari et al., 2009; Ertmer, Addison, Lane, Ross & Woods, 1999). Gotkas, Yildirim and Yildirim (2009) stated that even though many teachers believe that technology can facilitate their work and help them accomplish such tasks efficiently; some teachers are not willing to use technology in their classroom for different reasons. Some researchers have noted that such reasons differ, but they include lack of knowledge, low self-efficacy, and existing belief systems (Teo, 2009a; Pelgrum 2001); teachers’ attitudes toward the use of technology (Galanouli, Murphy, & Gardner, 2004; Mumtaz 2000). Selwyn (2010) contend that teachers resistance to change, contextual factors within the school may also create favourable or unfavourable conditions for adoption of technology. Lumpe and Chamber (2001, cited in Ertmer 2005) research study determined the contextual factors in their research. They are resources, professional development, mobile devices, software and application, classroom structure, class size, administrative and technical support, allocated teaching time, internet access and connectivity (Ertmer 2005).

Understanding and recognizing the factors that facilitate the use of technology among teachers in their professional practice is vital. It also provides a gateway to efficiently utilize technology in the educational context and to be part of this global change and to prepare students for 21st century requirements.

1.03 Statement of the problem

Growth and development of any country in the 21st century finds its basis in the inclusion of current technology. ICT has brought considerable growth in the field of development. Thereby, embracing ICT in schools at an early age will foster a society that is ICT oriented and, thus, inculcate the conceptual nature of it in every sector of development in the future. This will see the eventual growth of the economy in the developing countries, thus, reducing the discrepancies between the under-developed and developed countries. Furthermore, it will also establish development footage for the third world countries and Small Island Developing States as they will start the noble journey towards developing.

"The Government of Maldives (GoM) appreciates the potential benefits of Information and Communication Technology to a rapidly growing country" (Reddi & Sinha, 2005, p.254). This is in their quest to expand the present level of ICT to create awareness among people and eventually achieve the requirements of ICT policies. (Reddi & Sinha, 2005). According to the Seventh National Development Plan (NDP) which is the latest available government plan, has stressed on expanding existing ICT levels throughout the country (Department of National Planning, 2007). In addition, NDP also accented a number of major ICT policies related to education (Department of National Planning, 2007). The Strategic Action Plan (2009-2013) developed by the Government of Maldives also focuses on the intensification of the ICT industry (Presidents Office, 2009). In addition, the document highlights on policies and plans necessary to develop the ICT infrastructure, and guarantee affordability of ICT services to all citizens. Trucano (2005) accentuated the importance of research in assessing the technology use in the education context. Touwen (2001) emphasized the importance of the policies by stating that policy should be formulated on the exact condition under consideration may encounter implementation hitches. However, according to the UNESCO report, Wallet (2014) stated that Maldives like some other Asian countries "have yet to develop policy specifically on ICT in education" (p.10).

Adam and Urquhart (2007) contended that the lack of competent individual as one of the main barriers in successfully adoption of technology. Reddi and Sinha (2005) posited that lack of actualizing ICT policies in the education sector has been mainly attributed to the lack of ICT knowledge and skills by the teachers in Maldives. Without a good understanding of the teachers' literacy level, it will be somehow difficult to formulate the strategies of improving their ICT skills and knowledge. Further, inadequate studies have been carried out in this area of the education sector in Maldives which has left the exact situation of the education sector with regard to ICT not particularly clear.

The government of Maldives has also taken number of initiatives to develop the existing level of ICT access and consciousness. Despite a huge amount of money being invested in

ICT projects, reports still indicate a lack of ICT integration and no studies related to this concept have been conducted in the country (Pernia, 2005). This is calling for a thorough study so that adequate strategies can be enacted in an attempt to create clear cut guidelines which help to improve ICT technology in schools. Therefore, for better, efficient and successful projects in the education sector, it is imperative that the whole situation be clearly understood.

Of course, there is a growing number of researches in the area of technology use in education sector. However, little research exists in developing countries and moreover, Small Island Developing State. Small Island Developing States like Maldives, tend to experience numerous challenges such as limited resources, dispersed small population (Atchoarena, Garaca & Marquez, 2008). Thus, this research would be an addition to the growing scholarly works in the area of technology use in education, and positively contribute to shed more lights to determine current situation, its importance and usefulness especially in Small Island Developing States such as Maldives.

1.04 Purpose of the study

The researcher has employment background of teaching secondary schools and training secondary teachers. During the visits to some of the schools and from the conversation had with the student teachers, it was found that ICT was not integrated effectively into the instructional practice. However, as there is not any research conducted in this area in Maldives, the influential factors to effectively integrate ICT in teaching and learning is unknown. This research attempt to explore some factors that influence the use of ICT in the educational setting.

In particularly the research study attempted to:

- Describe the pedagogical beliefs (constructivists' and traditional) of the lower secondary schools in Maldives. The main purpose of this question was to explore the relationship between teachers' pedagogical beliefs and the technology use in instructional practice.
- Explore teachers' attitudes (affiliation) towards the use of technology in the educational setting. In addition the relationship between attitudes towards the use of technology and the use of technology in teaching practice will be investigated.
- Investigate the external (training programs, technical support, resources) and internal (age, gender, educational background etc.) factors that facilitate teachers' use of technology in their instructional practice.

1.05 Objectives of the study

The main objective of the research is to investigate the situation of ICT usage among teachers at the lower secondary schools in Male', Maldives. The researcher believes the study will provide adequate information needed to successfully use of ICT in teaching and learning by teachers in the schools of Maldives. The outcomes of the results of this study will be able to identify the influential factors that contribute to effectively use ICT in teaching and learning. It is hoped that this research would contribute immensely for teachers in the Maldives towards the use of appropriate Information and Communication Technology efficiently in classrooms especially in designing and formulating training programs.

1.06 Research Questions

The study sought to answer the following research questions

1. How teachers' pedagogical belief is related to the use of technology in instructional practice?
2. Do teachers' attitudes (affiliation) towards the use of technology, perceived use and perceived ease of use affect technology use in instructional practice?
3. Is there any effect of the training programs (initial teacher training and in-service professional development programs) to the use of technology in instructional practice?
4. Do the selected internal and external factors have an influence to the use of technology? Internal factors explored in this study were age, gender, teaching experience, computer literacy and competence. External factors were training programs, availability and accessibility of resources and technical support.

1.07 Significance of the study

Teacher plays an important role in creating an interactive learning environment (Papanastasiou & Angeli, 2008). As Vighnarajah, Luan and Baker (2008) stated "the teacher alone is able to flourish or crush the outcome of students' participation in the teaching and learning process" (p.37). Therefore, it is crucial to conduct a study to reflect on how teachers infuse ICT in their teaching in order to enhance students learning.

Significance of knowledge: Findings of this study are essential in the sense that teachers in lower secondary schools will find an additional research paper on ICT that critically analyses the factors that prevent teachers in integrating technology effectively in the educational environment. Furthermore, it will act as a guideline for educational policy makers to formulate policies that are viable and essential to institutionalize in the contemporary 21st century classrooms and schools. Trucano (2005) posited the importance of research studies in evaluating the use of ICT in education highlighting the limited number of quality studies conducted in the lower developing countries (LDC) in this area. On the other hand, Touwen, (2001) stressed on the policies developed without a clear understanding of the exact condition under consideration may encounter implementation hitches. Wallet (2014) indicated that Maldives does not have any published ICT plans in education. Therefore, this research paper will be particularly critical to the policymakers in their quest for proper and viable policies for the development ICT in the education system of Maldives.

Significance for Practical Solutions: Outcomes of this study will benefit to teachers, school management and policymakers. By knowing and understanding the factors that facilitates the use of technology for teaching practice, teachers can work to overcome the difficulties to successfully implement technology in teaching and learning. Similarly, by understanding factors that impede the use of technology in teaching practice, school management can facilitate in formulating professional development programs.

Significance for Action: In fact, with clear and feasible policies being laid down, this study will pave the way for designing of professional development programs for teachers and heads of schools. Furthermore there is no doubt that this will be useful in formulating teacher training programs. The essence and professionalism of the designs of such programs will be established for the fact that they are based on findings from the research study.

CHAPTER 2

Context of the study

CHAPTER 2

CONTEXT OF THE STUDY

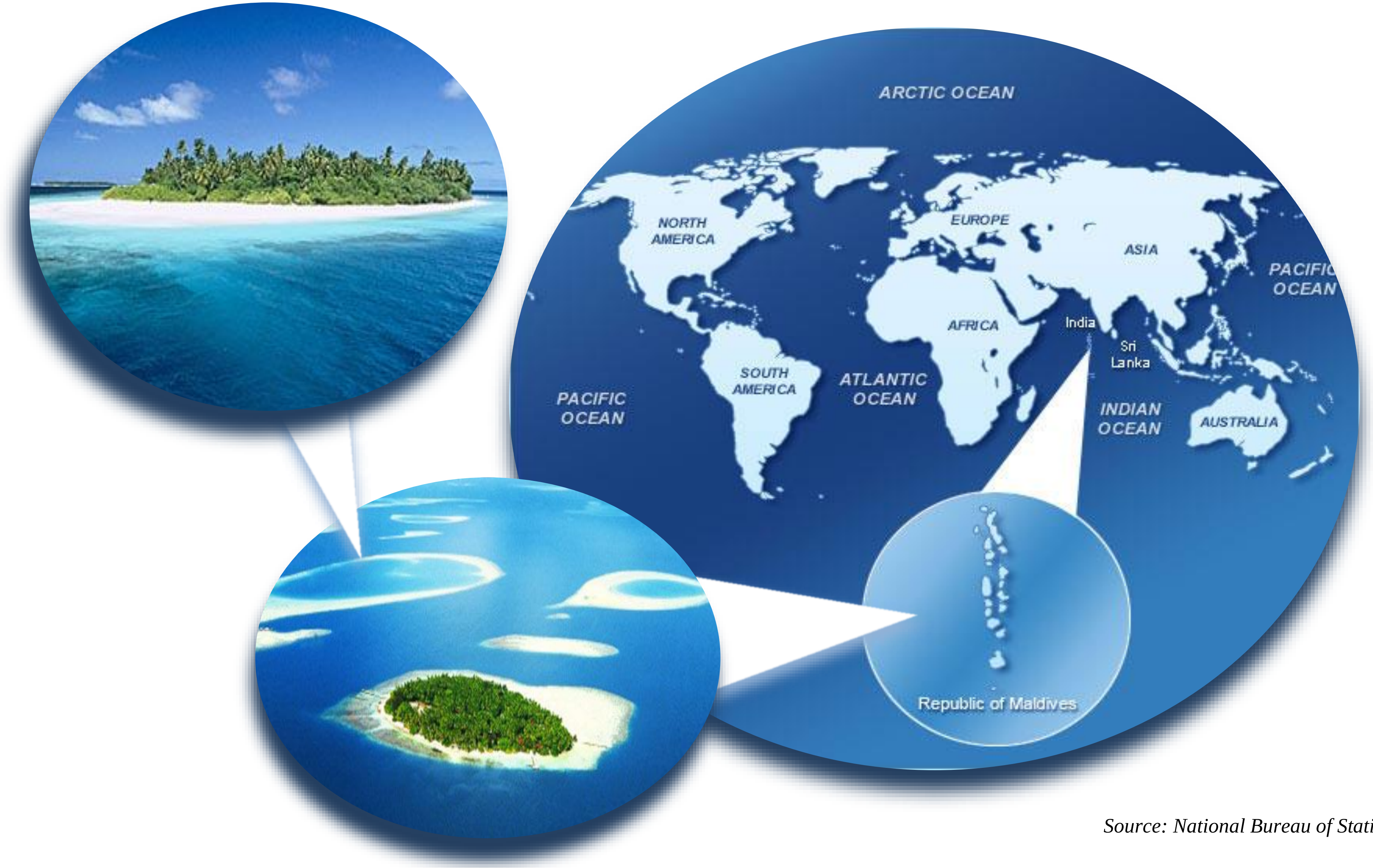
2.01 Background of the Maldives

The focus of this study is to explore the factors that facilitate the use of technology in teaching and learning among teachers in Maldives. This section presents the country's background discussing the general features of the country followed by a discussion of the educational system, ICT projects in education and some challenges in establishing ICT in the schools.

2.01.01 Country Background

The Republic of Maldives is an archipelago of approximately 1,196 tiny coral islands of which 194 of the islands are inhabited (Maldives-Country Implementation Profile, 2012). It is located in the south-west of about 700 kilometres of Sri Lanka and 400 kilometres of the Indian sub-continent. The islands form twenty-six double chains of natural atolls, which are grouped into twenty atolls for easy administrative purposes. The total area is about 900 square kilometers in which about 298 square kilometers consists of land and 644 is the ocean (Das, 2010). More than 80 percent of these low lying fragile islands are less than 1 meter above sea level. Below (Figure 01) is the map of Maldives showing the dispersion of the islands.

Figure 01: Map of the Republic of Maldives



Source: National Bureau of Statistics

According to the latest statistics from the Department of National Planning, the population of Maldives is around 336000 (Maldives at a Glance, 2013). The population is distributed to 194 inhabited islands, with 131 islands having a population of less than 1000 and 47 islands of population less than 2000 (Maldives at a Glance, 2013). Maldives share the same religion (Islam), unique language (Dhivehi) and culture." Dhivehi" is the official language of the country however, English is widely spoken and also used as the medium of instruction in schools. The economy of the country strongly depends on tourism and fishing, which yields approximately 33 percent and 6 percent of the GDP respectively (Analytical Report 2006, 2006).

The capital city of Maldives is Male' located at the southern edge of North Male' Atoll consists an area of about 5.798 square kilometers (2.239 square miles). This is the most populated island in the Maldives, having about 35 percent of the population (103693 people) and which is also the only urban island in the country (Maldives at a Glance, 2013). In addition, there is a large population of expatriate workforce residing in Male' (Faisal, 2008). This is the main focal point of all economic, social and political activities. In fact, the migration, population growth and urbanization has made it as the world's most densely populated cities (Faisal, 2008). The neighboring two islands, Villingilli and Hulhumale' are now considered as two constituencies of Male'. Hulhumale' is located about 4 km of Male', which is an artificially reclaimed island targeted to a population of 100000. Figure 02 shows an aerial view of the capital city Male'.

Figure 02: Aerial view of the capital city Male' of Maldives

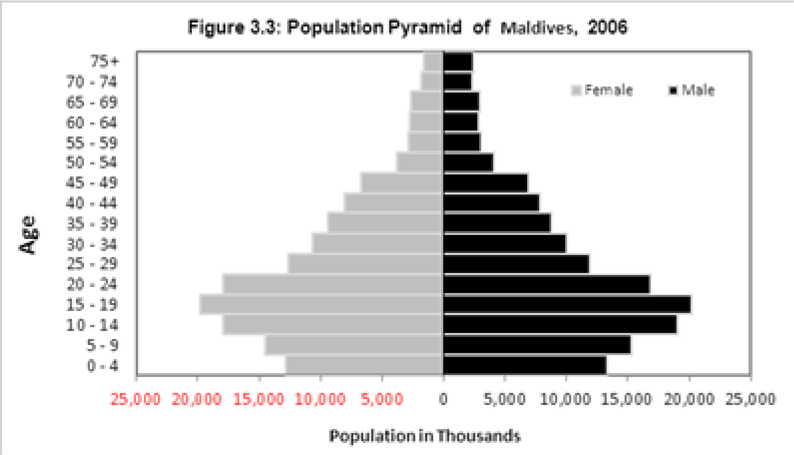
Source: Male', Wikipedia, the free encyclopedia
http://en.wikipedia.org/wiki/Mal%C3%A9

2.02 Maldives Education system

This section reviews the education system of Maldives both the traditional and the present. This is followed by the work of the Ministry of Education and the educational policies.

Maldives has a high proportion of young people, of about one-third is below 20 years (Figure 03). According to the Ministry of Education (School Statistics, 2013) about 86198 children are enrolled in schools of which 27204 are from different schools located in Male and 58974 are enrolled in the atolls.

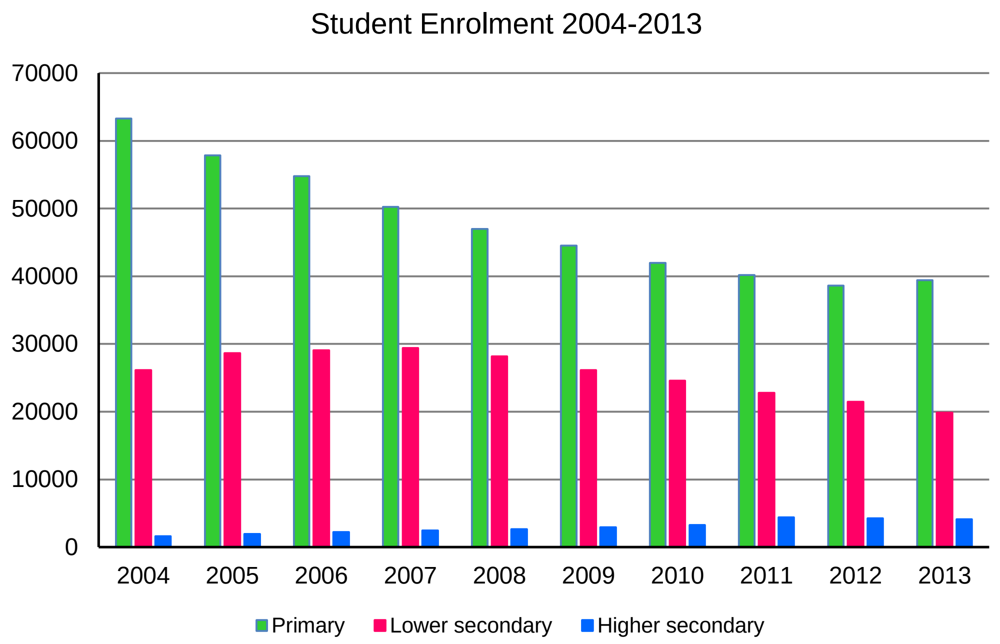
Figure 03: Population Pyramid of Maldives (2006)



Source: Yearbook 2013, National Bureau of Statistics

According to the Seventh National Development Plan (2007), primary education (i.e. grade 1 to 7) net enrolment ratio has been 100 percent since 2002. Accessibility to primary education is available in all the islands, however, the quality of education and resources are in need to be developed (Seventh National Development Plan, 2007). Accessibility to secondary education is not yet available in all the islands however, the Ministry of Education is working towards it. The education sector of Maldives "is challenged to be creative in finding cost effective ways to cater for the education needs of the smaller islands" (Seventh National Development Plan, 2007, p.126). School Statistics (2013) reported that are 204 primary schools in the country of which 12 are located in Male'. There is a total of 187 lower secondary schools in the country of which 12 are located in Male' (School Statistics, 2013). A total of 33 schools offer higher secondary education of which 3 are located in Male' (School Statistics, 2013). Due to limited schools offering higher secondary schools "there still exists a significant loss of students between the "O" and "A" levels" (Pressnell, 2011, p. 5).

Figure 04: Student Enrolment from 2001-2013



Source: School Statistics 2013, Ministry of Education

The above graph (Figure 04) shows the student enrolment from 2004 to 2013. According to the graph, even though there is an increase in higher secondary education enrolment, the percentage of students getting the opportunity to complete higher secondary education is still very limited (School Statistics, 2013). Since 2002, Maldives has 100 percent net enrolment in primary level Grades 1 to 7 (Country Report, 2007). However, in order to increase the education attainment of the country, it is vital to increase the opportunity for higher secondary education as well as to provide equal and quality education in all the islands.

2.02.01 Overview of the Education System

Maldivians have always given a high priority to education. In the past, children were provided education from three different type of schooling; known as “edhuruge”, “makthab” and “madharusaa” (see Figure 05). Children at a very young age were sent to private homes in the neighborhood called “edhuruge” or “kiyavaage” mainly to learn rudimentary knowledge of arithmetic, recite Quran and read and write Dhivehi (Mohamed & Ahmed, 1989). These institutions are still seen in the country (Azza, 2008). In contrast, “makthab” and “madharusaa” provided more formal education in a separate building. However, in “makthab” followed almost same curriculum as “edhuruge” while “madharusaa” has a wider curriculum with additional subjects. In fact, these schools have vastly contributed in accomplishing the high literacy rate and conservation of culture and tradition of the country (Mohamed & Ahmed, 1989).

Figure 05: "Edhuruge"- children learn Quran and Dhivehi

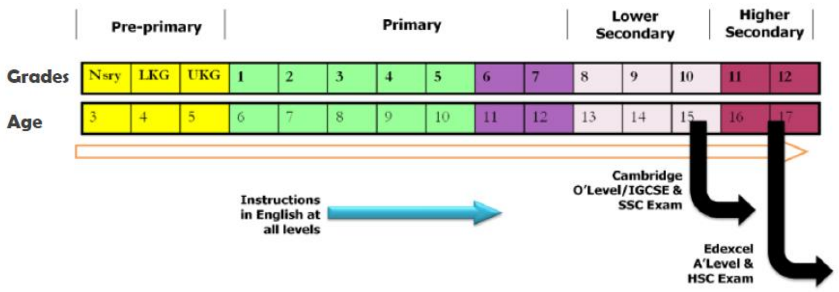
Source: Education in the Maldives (http://maldivianislands.blogspot.com.es/2011/12/education-in-maldives.html)
Maldives Education (http://maldives-visit.blogspot.com.es/2008/10/maldives-education.html)
Dhivehi Bavana (http://dhivehi.tumblr.com/post/34135976438/the-system-of-education-prevailing-in-the)

The first government school was instituted in 1927 in Male', which was targeted only for boys. However, in the year 1944, girls and young women were given the opportunity to study in this school. By the initiation of the government in providing education for all children, each inhabited island had a "makuthab" that provides primary education (Education for All, 2000). The education system was reconstructed in 1950 in order to educate citizens required for the development of the country (Azza, 2008). As part of this continuous development of education, English medium schools were introduced in the two schools located in Male' in 1960. This education system was based on Western system of schooling following British curriculum and methods of instruction. Later, schools in the islands upgraded to English medium following the same curriculum. Even at present, the secondary schools follow British curriculum. In 1978, a major development was made in education by the government initiation in unifying the national education system. With this change, the schooling was restructured to 5-2-3-2 cycle; five years of primary and two years of middle schooling of education followed by three years of lower secondary and two years of higher secondary education (Mohamed & Ahmed, 2006).

2.02.02 Present Education System

In 1999, a major curriculum exercise was undertaken (World Data on Education 2010/2011, 2011). The schooling structure was changed to 7-3-2 cycle (see Figure 06); 7 years of primary schooling followed by three years of lower secondary and two years of higher secondary.

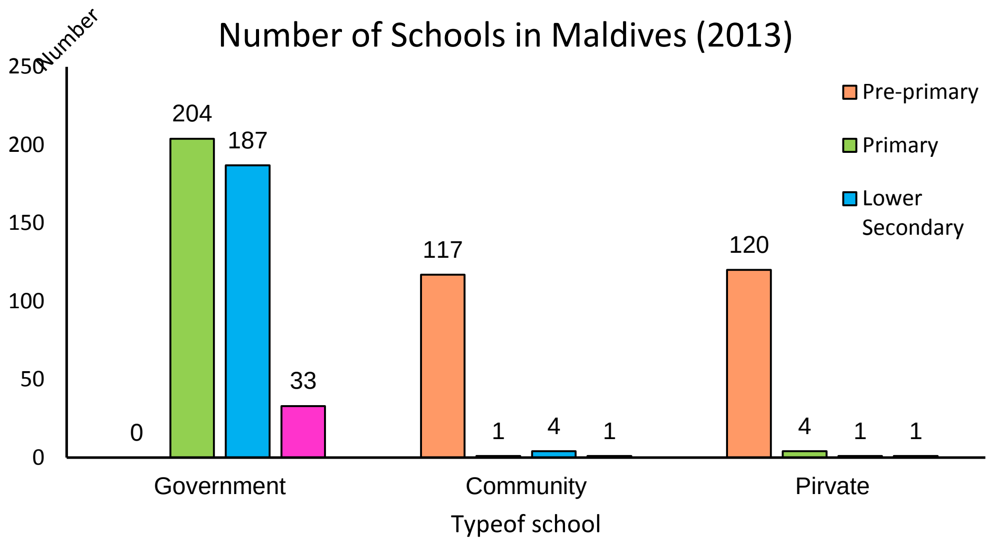
Figure 06: Schooling Structure



Source: World Data on Education 2010/2011

At the end of three years of lower secondary and two years of higher secondary, students are expected to sit for London Examinations and Edexcel International Examinations respectively. Even though primary education is offered by all inhabited islands, lower and higher secondary education are still limited in many parts of the country (Azza, 2008). The ministry of education is working towards in providing a quality and accessible secondary education to all children in the country.

Figure 07: Number of schools in Maldives-2013



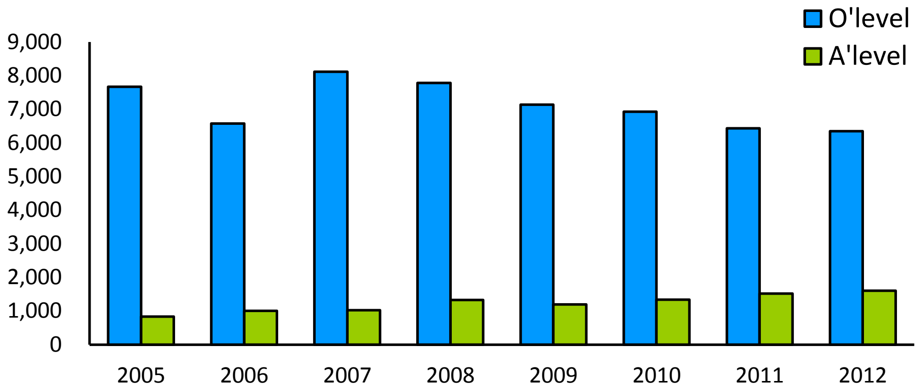
Source: School Statistics 2013,
Ministry of Education
www.moe.gov.mv/wp-content/uploads/2013/08/STAT-BOOK-2013.pdf

As seen in the above (Figure 07) schooling is provided by the government, the community and the private sector (School Statistics 2013, 2013). 63 percent of the schools are government schools. These schools are free of charge while community (18.3 percent) and private schools (18.7 percent) are charged a monthly fee. However, until recently parents had to pay the cost of textbooks, stationaries and examination fees. Most of the community and private schools (35 percent) only offer pre-school education.

Community schools are established by the community or ward members while private schools are individuals financed schools. The government supports both community and private schools by providing financial subsidies as well as supplying resources and infrastructure and providing teachers depending on student enrolment (Analytical Report 2006, 2006). According to Zahira (2005), compared to private and community schools, the government schools are “better off” and “prestigious”.

According to the Analytical Report 2006 (2006) the education attainment of Maldivian population is not high. Even though the country has 100 percent net enrollment of primary education, only 12 percent and 2 percent of the population completed lower secondary and higher secondary education respectively (Analytical Report 2006, 2006). Moreover, only one percent has achieved university education.

Figure 08: Candidates sat in O'level and A'level examination, 2005-2012



Source: Statistical Yearbook of Maldives 2013, National Bureau of Statistics

In fact, many of the children who complete lower secondary education do not continue higher education because of the limited schools offering higher secondary and also due to limited seats and the high academic requirements (see Figure 08).

2.02.03 Ministry of Education

The main responsibility of the ministry of education (MoE) is primarily for administering the education sector of the country. MoE's objective is to provide all Maldivian children to an accessible and a quality education in both primary and secondary. Furthermore, MoE aim to support an education to achieve the maximum potential of the individual student, at the same time inculcating religious and cultural values to enable them to become responsible individuals in the society. Among the responsibilities of education ministry includes "[…] policy, curriculum, teacher recruitment, in-service development, preparation of textbooks for primary level, school infrastructure, school and teacher supervision, school governance, public examinations, academic accreditation, etc." (Mohamed, 2006, p. 9).

According to Ministry of Education's Statistics Book (School Statistics, 2013), there are 187 government schools providing lower secondary education while 33 schools provide higher secondary education. Four community schools all located in Male' provide lower secondary education and one community school offered higher secondary education. There are five private schools located in Male', out of which three schools offers lower secondary education and two schools provide higher secondary education. The medium of instruction of all the school subjects are in English except for the local language (Dhivehi) and religion (Islam). The Ministry of Education is working towards in providing lower secondary education for all students regardless of the location and furthermore to increase the students O'level and A'level results at least to ensure that students achieve the minimum entrance requirement of for tertiary education (Seventh National Development Plan 2006-2010, 2007).

2.02.04 Educational policies

According to the present governments manifesto regarding the mandate of the Ministry of Education is "formulation of an educational policy, identification of the knowledge, skills, discipline, well-being and academic standards that student should realize through an education system ("Aneh Dhivehi Rajje", 2009, p. 60). In addition the ministry has to provide technical assistance and other facilities to the schools to ensure the above mandate is implemented ("Aneh Dhivehi Rajje", 2009, p. 60).

The Seventh National Development Plan (2007) highlights twelve educational policies and the strategies. They are:

- Ensure that all children have access to 10 years of basic education
- Increase quality, and effectiveness in the provision of basic education
- Increase efficiency and effectiveness of the supervision system
- Improve organizational productivity and strengthen organization and management of the Ministry of Education and its departments
- Review the national curriculum to meet national needs and improve the implementation of the national curriculum in schools
- Increase relevance of education to the local environment
- Promote health, nutrition, safety and life skills among school children
- Ensuring equitable access to basic education for all young people and continuing education for adults
- Expand and improve comprehensive early childhood care development
- Develop infrastructural support in line with the expansion of services provided by the sector
- Increase trained manpower through education and training for sector development

(Seventh National Development Plan, 2007, p.127)

One of the targets highlighted in the Seventh National Development Plan is to improve the physical facilities of the schools stressing the ICT in the schools. Moreover the Information Communication Technology policy addresses in expanding and strengthening the existing ICT levels in all the sectors including education (Seventh National Development Plan, 2007). Some of the fundamental ICT policies related to the education are:

- Accessibility to computers: in order for all students to become familiar with computers regardless of the location and to employ it in their studies, government is working on to make it easily available in all schools
- ICT professionals: in order to meet the demands for ICT, government need to educate more ICT professionals in all areas.

2.02.05 Teacher Training in Maldives

There is a great demand for trained teachers at all levels, especially at the secondary level. Until very recently a lot of this demand is met by expatriate teachers, especially for subjects like English, Science and Social Studies. Teachers are specially required on small islands. Due to lack of options, even those who have passed O'levels (lower secondary school) start to teach. The government's policy is to focus on teacher education to meet the need for trained local teachers. According to Ministry of Education, Maldives, the single most important factor affecting student achievement and overall quality of education is the quality of the teachers. Teacher education has not been able to keep pace with the rapid expansion of the education sector. As a result, local teachers, with lower or higher secondary level qualifications are employed in almost all schools in place of trained teachers.

According to Ministry of Education, at present there are more than 1250 unqualified teachers working in 212 schools (Ministry of Education, 2015). "To complicate matters further, there is an inequitable distribution of under-qualified teachers" (Ministry of Education, 2015, p.1). For instance, according to statistics of 2014, the unqualified teachers working in the atolls was 28 percent while in Male' was only 8 percent (Ministry of Education, 2015). As a result of this unequal distribution of qualified teachers and lack of unqualified local teachers have called to employ expatriate teachers especially to secondary level.

With the expansion of tertiary education in the Maldives, a number of institutes have embarked on training teachers for the local need. The two major institutes which have teacher training in their education programs are Maldives National University, and Villa College.

Maldives National University

The Faculty of Education of Maldives National University (MNU) is by far the largest and oldest institution where teachers training programs conducts. It was established in 1984 as Institute for Teacher Education and is currently the largest faculty of the Maldives National University.

As the Maldives' leading and most diverse teacher training institution, MNU offers courses at Bachelor of Teaching, Advanced Diploma, Diploma levels in different areas including Primary School Teaching, Middle School Teaching and Secondary School Teaching. In 2013, the faculty of education started Master of Education and PhD programs. Two students were enrolled to PhD program and 42 to Masters' program (Annual Report, 2013).

One of the aims and commitments of the Faculty of Education is to provide quality teacher training programs that will meet the standards of the education sector in Maldives and beyond.

Villa College

Villa College is a tertiary education and training institute established by the Chairman of Villa Group, Hon. Qasim Ibrahim to offer educational opportunities to Maldivians. It is relative a young institute with its establishment in 2007 only. One of the primary objectives of Villa College is to provide education at an affordable price, in the country. It is also worthy to note that Villa College is the first Private College established in the Maldives by the Department of Higher Education, and today it is the second largest institute in terms of teacher education and training.

In 2011, Villa Collage introduced degree courses aimed at working primary and secondary teachers in collaboration with Malaysia Open University. And they are internationally approved programs. One of the main purposes of aiming the courses at primary and secondary teachers is to provide Maldivians with an opportunity to achieve higher education and teacher education without going abroad. This was the beginning of teacher training at Villa Collage, and today they offer number of course from certificate level to Masters' degree level. Some of the programs offered are affiliated with Open University of Malaysia.

2.03 Information Communication Technology

According to Analytical Report 2006 (2006) shows that the use of information communication technologies among people has increased tremendously. The percentage of accessibility to computers in households is 67.2 percent (Country Profile 2012, 2012). Similarly, the Communication Authority of Maldives statistics indicates that there are 626814 mobile users and of which about 17 percent of them have mobile broadband connection (Telecom Statistics, 2013). There are 20531fixed broadband subscribers (Telecom Statistics, 2013).

According to the International Telecommunication Union report, Maldives is ranked as 72nd position globally in the ICT Development Index (IDI) which represents the growth of ICT uptake with a score of 4.30 (Measuring the Information Society, 2012). When comparing to the Asia and Pacific region, Maldives is ranked as 10th among 30 countries in the region. In fact Maldives ranks as number one among South Asian nations and second among the Lowest Developed Countries (Ahmed, 2004).

This section presents ICT in education followed by the ICT projects conducted in the education sector. Furthermore, some challenges faced to establish ICT in the schools will be also be highlighted.

2.03.01 ICT and Education

To implement the ICT policies, the government has taken number of initiatives to develop the existing level of ICT access and consciousness. In order to make the ICTs more affordable the government of Maldives reduced import taxes imposed on computer equipment (Ahmed, 2004). Moreover, the government liberalizes the market for Internet service providers (Ahmed, 2004). Indeed, these initiatives are vital for improvement of ICT infrastructure within the country (Ahmed, 2004). In order to increase the PC literacy of students, the government provided computers to schools that are located in various regions of the country.

Currently, the Maldives government attempts to improve IT infrastructure in the educational sector. One of the intentions is to ensure that computers are present in all secondary schools (Seventh National Development Plan, 2006). In addition, developing a national curriculum for primary and secondary education by infusing ICT skills and usage. In 2015, the new curriculum have been introduced for grade 1 to 3 (National Curriculum Foundation Stage, 2015). Furthermore, the National Institute of Education is conducting workshops to prepare teachers to implement the new curriculum (National Institute of Education, 2015). However, for the policymakers emphasized the ability of teachers to incorporate ICTs into their lessons.

2.03.02 ICT projects in the education sector

In recent years, the government of Maldives with corporation of international organizations has initiated number of projects focused on education sector. The main purpose of these projects is to implement technology in the education sector throughout the country. Among them are:

Teacher Resource Center (TRC): One of the major initiatives was building twenty Teacher Resource Centers one in each atoll (PricewaterhouseCoopers, 2010). The capital investment of this project was approximately US$3.5 million with the corporation of Ministry of Education, Dhiraagu (Telecommunication Service provider) and UNICEF. These TRC's are equipped with the latest technology tools such as "interactive smart board" and computers. The computers and smart boards are connected to internet to enable students to interact other students and professionals in different TRC's and other schools. In addition, teachers can use these centers to browse and download materials for their teaching and moreover to expand their expertise by accessing to different online programs.

In addition, each center has a trained coordinator to assist teachers and also conduct workshops to ensure teachers are up-to-date.

Multipurpose Community Telecenter (MTC): MTC's would enable islanders to get the opportunity to get access to different technology tools such as telephone, fax, voice mail, Internet, TV and radio (PricewaterhouseCoopers, 2010). These telecenter's are open for the public as well as to students and teachers that are not available in their schools. Moreover teachers get the opportunity to participate online training programs to expand their expertise.

Virtual University for Small States: Virtual University for small states is another key initiative. The participants would be able to study for free on online courses offered by the Universities of the Commonwealth nations (PricewaterhouseCoopers, 2010). Virtual Universities give an equal opportunity for all students and adults to continue studies by staying in their own island.

A laptop for every teacher: A laptop for every teacher is also an initiative that is aimed at providing a chance and support to edify teachers. The initiative also instills coaching skills through the use of assets of modern technology (PricewaterhouseCoopers, 2010). A total of 500 laptops are to be supplied for teachers in each year. In this scheme teachers are provided with laptops for installments, where they have to cover the full cost within two years.

2.03.03 Challenges in establishing ICT in Maldivian schools

There are several obstacles that prevent the government of Maldives from establishing ICT in schools. Unlike majority of the South Asian countries, Maldives has electricity in all the inhabited islands, internet connectivity in all the islands except for few of the islands have difficulty regarding the speed of connection (Ahmed, 2013). The minister of education, Dr Asim Ahmed emphasized that government does not have the financial capacity to provide the modern technology tools to all the schools (Ahmed, 2013). However parents take the initiative in raising funds to purchase tools such as TV, Smart-boards and computers in the schools. Government ensures that schools are provided the basic facilities such as good infrastructure, quality teachers, text books, etc. (Ahmed, 2013). In addition, PricewaterhouseCoopers (2010) identified lack of competent teachers and high costs of internet access are barriers that need to be addressed to successfully implement ICT in education.

The level of technology integration in the schools or education is unknown. Unlike in other countries the research in Maldives in very limited. The availability of the information in relation to education context is mainly from international reports which only briefly summarizes it. However it does not give clear information about the situation or the outcome of certain projects. Regarding the ICT use in Maldives the most recent document available was UNESCO report on Information and Communication Technology (ICT) in Education in Asia released on 2014. According to this report, Maldives need to develop ICT policies related to education and at present does not have any specific plan on implementing ICT in education. In fact the report does not give a clear picture about the present status of the use of ICT in education.

2.04 Conclusion

The government of Maldives attaches importance to the role of information technologies and has initiated taken number of projects as it critical for human development of the country. Regarding the education sector several projects have been conducted to introduce ICT particularly focusing on teaching and learning. However, there are problems that cannot be overlooked and need to be investigated further in order to address it properly.

CHAPTER 3

Pedagogical belief and technology use in teaching practice

3.01 Pedagogical belief and technology use in teaching practice

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PEDAGOGICAL BELIEF AND TECHNOLOGY USE IN TEACHING PRACTICE

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On average students spend about 7½ hours per day with media and with multitasking activities it is estimated about more than 10 hours per day (Rideout, Foehr & Roberts, 2010, p. 2). On the other hand, OECD (2009) report has raised the issue about the present limited usage of technology in the teaching and learning environment in the school system. Due to this disconnection, the school environment may not be relevant to the young people's social life. Then again, research also has clearly proven that in most of the educational institutions, teacher use of technology has raised enormously. Some researchers referred introduction of technology in classrooms as a change agents to enhance constructivist teaching (Dexter, Anderson, & Becker, 1999). Thus, it is crucial for researchers to determine influential factors in the use of technology for teaching among teachers and furthermore to point out the key factors.

Several studies have identified various factors that influence the use of technology for instructional purposes. Generally, these factors include both internal (endogenous) and external (exogenous) factors (Drent & Meelissen, 2008). Pajares (1992) research contended that there was a "strong relationship between teachers' educational beliefs and their planning, instructional decisions and classroom practices" (p.326). Chai (2010) and Veen (1993) argued that teachers' pedagogical belief is crucial in determining on how technology is used in classrooms. Mumtaz (2000) and Veen (1993) further posited that teachers' beliefs is identified as one of the main influencing factors in the use of technology in teaching and learning. Ertmer (2005) argues that teachers' belief determines their behaviours then obviously teachers' pedagogical beliefs configure the teaching practice, instructional activities and the decisions made during the process. This is vital because teachers are the key player in designing the entire teaching and learning starting in the lesson planning phase to selection of instructional activities and delivering.

Ertmer and Ottenbriet_Leftwich (2010) stressed that currently the challenge involves how to address personal factors like "teachers' belief system and their impacts on adoption of technology". Al-Amoush, Markic, Abu-Hola & Eilks (2011) emphasized that "beliefs are context-bound" and its colligated to the individuals context such as educational and cultural context, the exposed educational system and the present working environment (p. 188). Therefore rather than making a generalization it is crucial to study the individual beliefs in each context separately.

By emphasizing the differences among the teachers belief in difference context, Liu (2011) argued that in many Asian countries "teachers are overly concerned with academic achievement and skill-based knowledge, and teach textbook content only, or identify with the examination-oriented education culture, technology integration would be insufficient and lack meaningful practices; this may be related to an inadequate understanding of technology integration" (p. 1020).

Constructivist teachers are recognized as those to create a learning environment by incorporating creative instructional activities, interconnecting different disciplines of the study by linking it to students' interests, and developing activities and projects that enhance students learning (Dexter, Anderson & Becker, 1999). In these scenarios, teachers act as facilitators guiding students in the right path by assisting students to access the information, processing and to convey it according to their understanding. Applefield, Huber and Moallem (cited Rakes, 2007) four characteristics constitute in a constructivist learning environment. They are;

1) Students construct their own learning
2) Learning is associated with new information and the existing knowledge or understandings
3) Social interaction is vital to the learning
4) Exposing students to real world context activities are crucial for learning (p.3)

On the other hand, traditional teaching is moreover one way communication as teacher being the main information transmitter. In a traditional teaching environment, teachers' role is mainly directing students to what teachers want the students to know and students' role is passive listeners, note taking and memorizing for examinations (Behar-Horenstein, Mitchell, Notzer, Penfield & Eli, 2006). Such teachers depend on the use of direct instruction most of the time, want students to focus on the textbook, act as a sole provider of knowledge, and discourage students' participation in the teaching process (Teo, 2009a).

Rakes, Fields and Cox (2006) argued that in a traditional classroom environment students are exposed to limited arbitrary activities rather than students getting opportunities to construct information based on their experiences in an active environment. Ertmer and Ottenbriet_Leftwich (2010) indicated that use of technology in teaching and learning promotes student learning through involving learners in “higher order thinking, self-regulated learning, and collaborative or cooperative learning”. Therefore teachers should embrace constructivist teaching method in order to foster effective learning among students (DiGironimo, 2011). Generally, teachers who hold traditional teaching belief tend to apply traditional approaches or low level of integration of technology in teaching and learning process. On the other hand, teachers with constructivist beliefs adopted high-level or student-centered technology use (Gurcay, Wong & Chai, 2012; Chai, Teo & Lee, 2010; Teo et al., 2008).

Gurcay et al. (2012) investigated a comparison study among Turkish and Singapore Pre-service teachers’ to explore the pedagogical belief and use of technology. Data was collected from a sample size of 115 Turkish and 90 Singaporean pre-service teachers by using a survey questionnaire. The results showed that both Turkish and Singaporean teachers inclined to constructivist teaching belief. Interestingly, the analysis revealed that there is a positive correlation with constructivist teaching belief and the use of technology as concorded by researchers (Becker, 2001; Sang, Valcke, Braak & Tondeur, 2010). Furthermore, the results indicates that teachers who have constructivist teaching beliefs tend to use technology for traditional teaching as well as agreed by many scholars (Teo et al, 2008, Chen, 2008, Ertmer, 2005). Studies have revealed that teachers incline to use technology nevertheless technology tools are used as a “teaching machine” simply to convey information, delivery of content material and to do administrative work such as preparing notes and students grading (Chai et al, 2010; Teo et al, 2008). In addition Sutton (2011) literature review indicated that teachers frequently use technology tools for communication, use of internet for research and for record keeping as well.

Goktas et al., (2009) explored the ICT usage among K-12 teachers. Data were collected via a survey questionnaire from 1429 Turkish teachers. The results showed that more than tierce of the participants do not use ICT laboratories for teaching and learning while one-fourth responded as they use the ICT labs. The remaining replied as they seldomly use the labs or the facility is not available in their respective school. The study shows the technology tools such as computers, printers and internet were basically used for lesson preparation. Similar researches have revealed teachers' technology use in instructional activities was found to be very low or it is used as a word processor or to search the internet rather than using it for developing students' problem-solving and critical thinking skills (Ertmer 2005; Fox & Henri 2005; Gao, Choy, Wang & Wu, 2009; Sang et al. 2010; Baser & Yildrim, 2007).

A similar study was conducted by researcher Liu (2011). His study was to investigate the factors related to pedagogical beliefs of teachers and technology integration. Questionnaire was used to collect data from a sample of 1139 Taiwanese elementary teachers. The research on pedagogical belief and use of teaching activities was focused mainly into two categories namely; teacher-centered belief and student centered belief. The chi-square findings revealed that majority of the teachers' concurred student-centered belief (78.9 percent). However, only few responses inclined constructivist teaching activities with technology (28.2 percent). Thus, the use of technology and constructivist teaching belief shows discrepant for majority of the participants. In fact, 80.2 percent of the participants who had traditional teaching belief employed lecture-based teaching approach (Liu, 2011). Liu (2011) concluded that regardless of the teachers' pedagogical belief, they tend to use lecture based teaching activities. Liu (2011) accentuated that this was because teachers were mainly focused on student achievement in test scores and believe that constructivist teaching with the use of technology will not improve nor enhance student achievement which is commonly seeing in the Asian countries. Similarly, Chen (2008) study revealed similar finding regarding the relation between pedagogical belief and use of technology. In his study he stressed to consider the interrelated factors when dealing with pedagogical beliefs.

In contrast, regarding the teachers' role, Gorlewski (2008) argue that "our role is to acculturate students so that they can be successful in society. School achievement is intended to reflect both current and potential achievement outside of school" (p. 27). Therefore rather than focusing on students examination results "[t]eachers must facilitate a learning environment that motivates students to reach high levels of academic achievement while ensuring that complex curricular materials are accessible to a broad range of students with diverse interests, prior experiences, and ability levels" (Messinger-Willman & Marino, 2010, p. 5).

Similar research was done by Sang et al. (2010) in China to explore the association between teaches' pedagogical belief and technology integration. This study was conducted to 727 student teachers from four different Universities. The results revealed that participants with stronger constructivist teaching belief are colligated to use technology in their teaching. A similar study was conducted in China to investigate the primary teachers' beliefs (Sang et al., 2009). Data was collected by a questionnaire from 820 primary teachers. The results showed that teachers had more constructivist beliefs (*m*=3.06) then to the traditional belief (*m*=2.17). Furthermore, the authors reported that there is a strong correlation between the constructivist teaching and the learning approaches used. The authors argued that this could be due to the traditional educational culture of the Chinese context which emphasizes “a group-based, teacher-dominated, and centrally organized pedagogical culture” (Sang et al., 2010, p. 1)

The socio-cultural aspect is considered as a vital factor in successful use of technology into teaching and learning (Myers & Tan, 2002). Adam (2015) research was focused on the relation between use of technology into teaching and traditional pedagogical practices. This ethnographic study was carried out among teachers in Maldives. The study revealed that regardless of the professional development programs, teachers tend to employ traditional use of technology. The author emphasized that teachers unconsciously use technology in traditional context and this could be due to the “influence of early established practices on teachers’ use of technology” (Adam, 2015, p.24). In fact, Maldives education system is focused to the rote learning and memorization (Adam, 2015). The pedagogical belief that is being formed from the past experiences has a huge influence to the teachers’ pedagogical orientation (Myers & Tan, 2002; Olutimayin, 2002).

Likewise, Becker and Ravitz (1999) study revealed the association between pedagogical belief and the use of technology in teaching and learning. However, Becker and Ravitz (1999) argue that use of technology in teaching and learning among high school teachers are more compared to elementary school teachers (1999). Authors emphasized that this is because with mature students it is easier to make connections between real world activities and the concepts. Furthermore, authors emphasized that the use of technology among teachers is not “the mere conjunction of innovative teachers” but is a true causal relationship between constructivist teaching belief and use of technology (Becker & Ravitz, 1999, p.381). On the other hand, Rakes et al. (2006) punctuated that the constructivist concept is nothing new to the educational context but how it is employed is still developing.

Dexter, Anderson and Becker (1999) research was to investigate the use of computers in the teaching practice. The study also focused on finding the teachers perception on effect of computers to their teaching. The research was conducted to 47, K-12 teachers selected from 20 schools in 3 different states. Mixed research method was used to collect data which were by questionnaire, interviews and classroom observations. The researcher classified the participants’ into three groups of pedagogical styles namely;

1) Non-constructivist: teachers believe that “learning is a mastery set of skills, the recall of important facts, and the learning of discipline-valued abstract concepts” (p.5). The mode of learning is mainly through direct listening, reading, note taking and practicing. In addition teachers believed that students are motivated to learning by giving grades, recognition and praising.
2) Weak constructivist: These teachers often incorporate discussion in their teaching. However, their discussions are mainly directed by the teacher and are conducted by recitation. Unlike non-constructivist, teachers incorporate interesting and easy to interpret activities. Nevertheless, students are motivated by giving grades and reinforcements.
3) Substantially constructivist: Unlike the above two categories, these group of teachers incorporate “creative instructional practices, innovative interdisciplinary themes, individual or group projects of some complexity and duration, and content

linked to student interests and/or personal concerns" (p.5). Students are cognitively engaged in the learning process.

Dexter, Anderson and Becker (1999) argued that by introducing computers to teachers don't automatically change their instructional approach to constructivist teaching or in other words computers are not "automatic catalysts" that turns towards constructivist teaching. The case study showed that majority of the teachers believed they have constructivist belief and computers will definitely facilitate to move towards a more constructivist teaching practice. Furthermore, authors ascertained that the "teachers' changed practices were insights about their own effectiveness, gained as a result of reflection" (p. 7).

Likewise, the research study conducted by Tondeur, van Braak and Valcke (2007) and van Braak, Tondeur and Valcke (2004) keyed out teachers' use of technology into two categories;

1) supportive ICT use defined as activities such as recordkeeping, preparing worksheets, and handouts, searching information and material from internet for preparing lesson.
2) classroom ICT use is specified as use of technological tools in teaching and learning which is focused on "pupils to train skills, instructing pupils in the possibilities of computers" (Tondeur, van Braak & Valcke, 2007, p.197).

Similarly, Hennessey's (2006) study on "Integrating technology into teaching and learning of school science: a situated perspective on pedagogical issues in research" conducted to

K-12 teachers, distinguished seven categories on teachers' ICT use. Those are 1) classroom preparation, 2) professional e-mail use, 3) delivering instructions, 4) accommodation, 5) student use, 6) student product, and 7) grading. Hennessy (2006) emphasized that to successfully employ technology for students learning depends on teachers' knowledge of the technology as well as on how technology tool can be applied to the specific use or purpose. For instance, use of multimedia software for simulation enable students to explore by interacting with the variables. As Hennessy (2006) pointed out that to successfully use simulation for students learning depends on how the tools are used. Thus, for an effective use of technology for students learning, teachers need to be provided adequate information on how to use it for instructional purposes (Hennessy, 2006).

Senapaty (undated) suggested a model focused on stages of adoption and ICT use in the educational system. This model was formulated based on previous studies on ICT development. The model was formed on the basis of; stages of ICT use and use of ICT for pedagogy. Stages of ICT use consists of four stages; emerging stage, applying stage, infusing stage and transforming stage. The emerging stage is the initial stage which is basically on understanding or learning the basic skills of technology such as use of basic office applications, use of e-mail. The second stage refers to applying stage relates on integrating specific technology tools into subjects. Teachers in the infusing stage employ technology across the curriculum and use technology in instructional practice as well as administrative purposes. Transforming stage which is the last stage; use technology considered as "part of everyday life" and teachers tend to seek new ways technology use in teaching and learning (Senapaty, undated, p5).

The second component is pedagogical use of technology which is categorised into four stages; supporting work performance, enhancing traditional teaching, facilitating learning and creating innovating learning environment.

1) Supporting work performance: relates to the use of productivity tools such office applications; word processor, spreadsheet (excel), email. This is mainly to support the teachers work performance such as writing lesson plans, worksheets etc.
2) Enhancing traditional teaching: teachers tend to employ computer-assisted learning software into their instructional practice, however, these applications are used in a traditional context. For instance, use of PowerPoint for instructional delivery.
3) Facilitating learning: in this stage teachers tend to use variety of technology tools to enhance students learning. In this stage teachers learn to know how to use different technology tools accordingly to their lesson or particular task.
4) Creating innovative learning environment: In this stage teachers use specialized software such as simulation and modelling, games in their instructional practice to enhance students learning.

Senapaty (undated) emphasized the need of professional development programs to maximise the use of technology effectively in teaching practice. In addition, the need of learning experience has been indicated as a vital component for successful use of technology.

Lin, Wang and Lin (2012) suggested a two-dimensional model for teachers ICT integration based on a study conducted in Taiwan. The two main components in this model were pedagogical competency and technical competency. There were four pedagogical competencies and eight levels of technical competency which were numbered from 0 to 7. This model analyses the level of technology use according to the four pedagogical levels.

For instance, a teacher of level 3 of technical competency (utilising internet applications) can employ at direct teaching in the pedagogical competency. The direct teaching refers to the traditional teaching methodology such as on lectures, note-taking etc.

The pedagogy levels depicted in the model were:

1) Direct teaching (level A): teachers tend to use traditional teaching methodology such as lectures, note taking etc. This is very teacher centred model where teacher takes control and give directions for students. Students act as passive listeners.
2) Cognitively active learning (level B): at this level teachers establish learning environment that students can actively participate. Teaching is designed for students understanding and application than on rote or memorizing.
3) Constructive learning (level C): in this level teachers encourage students to construct their own knowledge by facilitating an interactive learning environment.
4) Social learning (level D): teachers act as facilitators and provide learning opportunities where students get engaged in social activities.

These four levels of pedagogical competencies were mapped to the eight levels of technical competencies which are described below.

0) Non-use (level 0): teachers in this level have no interest and are incapable in use of technology.
1) Mundane (level 1): teachers tend to use technology but at a very basic level such as for students grading, communicating with parents, posting announcements.
2) Using off-the-shelf compact disc based educational software (level 2): teachers use software that are available in the school or supplied with the textbook.

3) Utilizing internet applications (level 3): teachers at this level use online tools such as mails, chatting, blogging etc. Teachers at this level have the basic knowledge to handle common internet problems such as virus.
4) Creating multimedia teaching materials (level 4): teachers have the capability to digitalize materials using word processor, presentation or spreadsheet. Teachers are familiar with the basic office applications.
5) Customizing multimedia resources (level 5): teachers able to make alterations to the self-made images, audio and video clips to accommodate for the lesson. In addition, with the use of specialized software, teachers can create animations necessary for online learning.
6) Producing simple instructional applications (level 6): at this stage teachers can develop simple instructional application such as class websites or platforms to post announcements etc.
7) Implementing sophisticated instructional system (level 7): teachers have the advanced knowledge of computer skills. For instance, creating websites with features such as discussion forums to facilitate student and teacher interactions.

To make the model more significant, the authors added a third dimension "to explore how different combinations or alignments of the current two dimensions impact student learning" (Lin et al., 2012, p.107). This model could be used as a guide to measure the quality or effectiveness of technology use in teaching and learning.

The use of technology in teaching and learning in the classroom totally lies with teachers as they have a control over the instructional practice and the teaching environment. Oncu, Delialioglu and Brown (2008) stated it is the teacher who decides the technological tools and the frequency of use on their teaching. Researchers have pointed out that the use of technology in teaching should complement constructivist teaching (Al-Zaidiyeen, Mei & Fook, 2010). Thus, exposure to student-centered teaching is necessary prior to adoption of technology. “Availability of computer technology alone will have little or no impact on the intellectual challenge of teachers’ lessons or the students’ styles of learning” (Valiente, 2010, p.8).

CHAPTER 4

Teachers' attitude towards the use of technology in teaching and learning

CHAPTER 4

TEACHERS' ATTITUDES TOWARDS THE USE OF TECHNOLOGY IN TEACHING AND LEARNING

4.01 Introduction

The availability of technology equipment in schools does not provide assurance that teachers will use them effectively. The teacher is critical in determining how technology is used in a classroom. As a result, teachers must possess the right attitude towards technology and its application in teaching and learning setting.

Numerous researches have proven that there are a number of factors that impede the successful use of technology in teaching and learning environment (Awan, 2009; Beacham & McIntosh, 2012; Becta, 2004; Chen, Tan & Lim, 2012; Drent & Meelison, 2008; Ertmer, 1999). Granger, Morbey, Lotherington, Owston and Wideman (2002) stressed that implementation of technology in the education setting is a complex process, influenced by a number of internal and external factors such as pedagogical beliefs, attitudes and infrastructure. Akbaba-Altun (2004) concurs with Granger et al. concluded that the task is not simple as the implementation depends on interconnected factors. However, among them many scholars agree that the teacher's attitude toward the technology is being considered as one of the main predictors in successfully utilizing technology in the teaching and learning (Albirini, 2006; Al-Zaidiyeen el al., 2010) because the teacher is the main player in the teaching environment (Newhouse, 2002; Teo, 2011). Sa'ari, Wong and Roslan (2005) suggested that to overcome the teachers disinclined to utilise technology in instructional practice is to look for ways in how to change their attitudes.

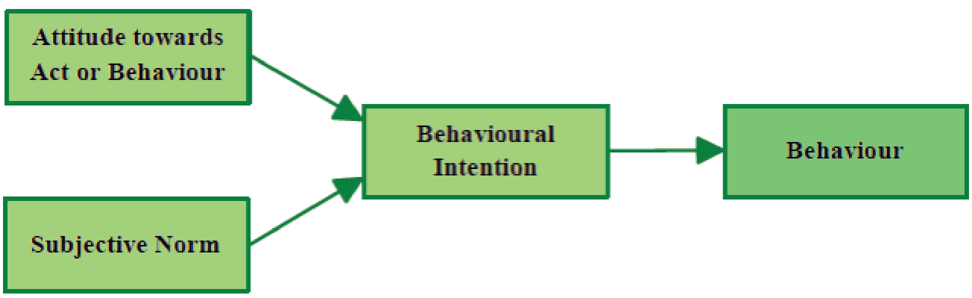
Attitude plays a major role in shaping up individuals behavior or their action. Pickens (2005) defined attitude as "a mental or neural state of readiness, organized through experience, exerting a directive or dynamic influence on the individual's response to all objects and situations to which it is related" (p.44). Yusuf and Balogun (2011) defined attitude as "one's positive or negative judgment about a concrete subject" (p. 19). In this context, scholars have noted that analysis of information concerning the effect of an action based on their negative or positive outcomes were responsible for determining one's attitude (Al-Gahtani & King, 1999). Ajzen and Fishbein (1977) posited that "most investigators would agree that a person's attitude represents his evaluation of the entity in question" (p.889). Galletta and Lederer (1989) suggested that attitudes, perception and satisfactions are interrelated even though it differs in meaning. He further explicated as "perceptions are beliefs about an object" while "attitudes result from evaluations of those beliefs" (Galletta & Lederer, 1989, p.420). Moreover, satisfaction is a combination of beliefs and attitudes. Mitra (2011) depicted that attitude is a complex factor which is basically shaped by learning and from the individual's belief, however it is changeable. Zimbardo et al. (cited in Albirini, 2006) argue that the individual's behavior can be changed once their attitudes are recognized and addressed to it.

Certainly a number of studies were carried out and have determined that teacher attitudes toward the use of technology is one of the main predictor to effectively use technology in teaching and learning environment (Albirini, 2006; Al-Zaidiyeen el al., 2010). In fact, attitude plays a crucial role in determining people action to certain situations. Therefore, it is important to look at some of the models that shows the association between attitude and other influencing factors to the actual use or individuals' behaviour.

4.02 Models

In the past years, researchers have been investigating the contributing factors colligating the adoption of technology in different fields (Nair & Das, 2011). The groundwork of Ajzen and Fishbein (1977) model on "The Theory of Reasoned Action" (TRA) is one of the most popular and successful theories in the field of attitude-behavior. This theory is mainly focused on the individuals' beliefs, attitudes, intentions and behaviours (Zint, 2002). Basically this theory establishes the association between attitude and behavior. Thus the individuals' behavior is determined by the behavioural intentional which is influenced by their own attitude towards the act/behavior and to the subjective norm (Montano & Kasprzyk, 2008).

Figure 09: The Theory of Reasoned Action (TRA)



Source: The Theory of Reasoned Action
(Hale, Household & Greene, 2002)
http://comminfo.rutgers.edu/~kgreene/research/pdf/TRAbkch-02.pdf

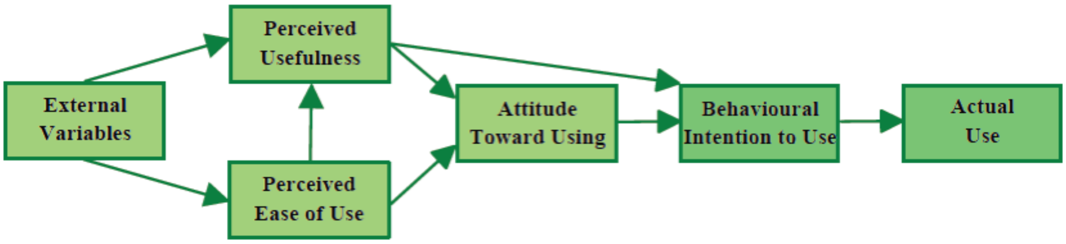
In model TRA (Figure 09):

> Attitude towards Act or behaviour: refers to the extent to the individuals' agreement towards the event (favourable or unfavourable)
>
> Subjective Norm: refers to the individual's perception regarding of what others in the surrounding picture believe that the individual should perform.

Ajzen and Fishbein TRA theory fundamentally demonstrates that the individual's behaviour is determined from his/hers behavioural intention. As behavioural intention is the main deciding factor for performing behaviour, which is associated to the individual's attitude and to the subjective norms. Thus "beliefs are influenced by attitudes, which lead to intention, to use and finally actual usage behaviour" (Tagoe, 2012, p.92). Hale, Household and Greene (2002) suggests that individuals' belief is generally linked to attitude or behaviour.

Later Davis in 1988 developed "Technology Acceptance Model" (TAM) which was focused on "the prospect that beliefs influence attitudes that indicate intentions and generate behaviors relative to technology acceptance" (Nair & Das, 2011, p.38). This model was designed by taking TRA as a basis. According to Davis et al. (cited in Al-Gahtani & King, 1999) "[t]he goal of TAM is to provide an explanation of the determinants of computer acceptance that is general, capable of explaining user behavior across broad range of end-user computing technologies and user population" (p.278). In fact, the main purpose is to key the external factors influencing the beliefs, attitudes and behavior (Al-Gahtani & King, 1999). The primary elements of the model are attitudes and behavior which is related to the perceived usefulness and ease of use. According to Al-Gahtani and King (1999) perceived usefulness and perceived ease of use are two particular beliefs which are relevant to computer acceptance behaviours. Even though TAM's main focus is on the actual usage, it also explicates on the acceptance of a particular technology (Tagoe, 2012).

Figure 10: Technology Acceptance Model (TAM)



Source: Attitudes, satisfaction and usage: factors contributing to each in the acceptance of information technology
(Al-Gahtani & King, 1999)

In TAM model (Figure 10), the perceived usefulness and perceived ease of use are considered as two particular beliefs. In this theory, the individuals' behaviour is determined by perceived usefulness and perceived ease of use. The perceived usefulness refers to the level of agreement that the individual believe in using the technology will improve the performance of the job. In other words, the person has a perception that by using the technology will enhance his/her job performance (Davis, 1989). On the other hand the perceived ease of use means that the user believes that use of "technology will be free of effort" (Nair & Das, 2011, p.39).

In TAM belief variables influence the actual usage or performing the activity "through their effect on attitude" (Al-Gahtani & King, 1999, p.279). Moreover, TAM also stresses on the external factors that facilitates the use of technology which will be focused in this research. In fact, the individual should have an understanding of the usefulness of technology and at the same time be able to use it without many difficulties which are the cognitive response of the individual.

Similarly, researchers have revealed that attitude is composed of three main elements; namely affective, cognitive and behaviour (Albirini, 2006). Here:

Affective: relates to the emotional feelings of the person about the object, for instance, liking of an object

Cognitive: relates to the individual's knowledge about the object

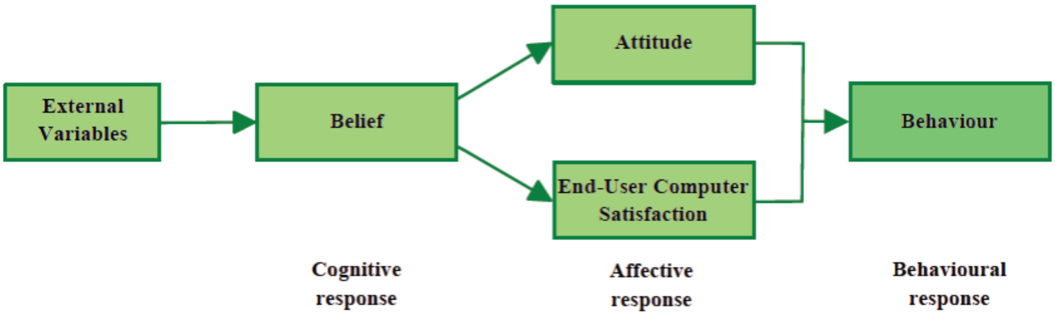
Behavioural: refers to the person's observable behaviour/reaction towards the object.

Then again, in Al-Gahtani and King, (1999) research study, the cognitive component is used as the individual's belief, affective as the person's attitude and end-user computer satisfaction (EUCS) and behavior actual as the use. In here, the attitude is about the individual's feeling about the object (positive or negative). The end-user computer satisfaction (EUCS) moreover relates to the output of the object. For instance, using technology will enhance students learning or use the internet for lesson preparation. He argued that all these three factors are connected and interrelated to each other and to external factors.

The TRA models discussed above suggests that attitudes and perception influence the actual use or performance of activity. However, TAM depicts that individuals' behavioral intention is affected by perceived usefulness and attitude.

The tri-component Model of Attitudes (Figure 11) stipulate that attitude consists of three major elements; which are affective (feelings), cognitive (beliefs) and behavioural (actions). In this model attitude is defined as a favourable or unfavourable tendency that directs the behaviour of individual toward certain objects (Makanyeza, 2014).

Figure 11: Tri-component Model of Attitudes



Source: Attitudes, satisfaction and usage: factors contributing to each in the acceptance of information technology (Al-Gahtani & King, 1999)

In support, Adlers (cited in Pickens, 2005) contended that interconnections of an individual's "thoughts, feelings, and behaviors were transactions of one's physical and social surroundings and the direction of influence flowed both ways" in his model on "Tri-component Model of Attitudes" (p.45). He further emphasized that attitudes are formed from individuals' interaction to the social environment and on the other hand, social environment is influenced by the person's attitudes.

4.03 Perceived usefulness and perceived ease of use

Perceived ease of use and perceived usefulness is considered as two particular beliefs affected to the individuals attitudes (Al-Gahtani & King, 1999). Perceived usefulness is the degree which the individual believes that by using specific technology will increase the job performance. Perceived ease of use is the degree on how the individual use of specific technology is free of effort or perceived difficulties (Holden & Rada; 2011). Many of the studies have indicated that perceived usefulness and perceived ease of use significantly influences attitudes towards the use of technology (Holden & Rada; 2011; Teo & van Schaik, 2009).

Teo and van Schaik (2009) conducted research study to investigate the technology acceptance among pre-service teachers in Singapore. 250 participants of which 175 were female and 75 males completed the online survey questionnaire. The study was mainly focused on perceived usefulness, perceived ease of use, attitude toward computer use and behavioural intention. The results revealed that there is a significant relation between attitude toward computer use and perceived usefulness and perceived ease of use. In addition, the study revealed that perceived usefulness is related to the behavioural intention to use. Moreover, the facilitating conditions such as perceived usefulness relates to perceived ease of use. However, no significant relation was revealed between attitude and behavioural intention. Teo and van Schaik (2009) emphasized the importance of accessibility to technology tools for teachers for instructional practice. In addition, importance of relevant training that facilitate the use of technology for professional practice was stressed for effective use of technology. The authors also stressed that during teacher training phase or through professional development programs if teachers were exposed to the effective use of technology certainly it would have a positive effect in use of technology in instructional practice. Understanding the usefulness of technology for teaching and learning and by seeing that use of technology does not require effort it is likely that they would use it in their professional practice. Teo (2011) indicated the importance of continuous training to address perceived usefulness and perceived ease of use as they were dynamic due to rapid technological advances. Smarkola (2007) study reported that both perceived usefulness and perceived ease of use contributes to attitudes, however, perceived usefulness have a stronger effect.

4.04 Attitudes towards the use of technology

Roger (2010) affirmed that attitude decides the individual's willingness in trying out the new innovation or not. Roger (2010) argued that depending on the characteristics of the innovation and how it is perceived by the individual will define the rate of adoption. Moreover, Roger (2010) contended that diffusion involves a number of processes "by which innovation is communicated through certain channels over time among the member" (p.10). Thus, the process of adopting and integrating technologies in teaching and learning is not an easy job, and according to Roger, the individual go through five processes in the diffusion procedure (Orr, 2003). They are;

Knowledge: the individual is cognizant of innovation and has some functional knowledge of it

Persuasion: an individual builds up an attitude toward innovation based on likeness or unlikeness of it

Decision: an individual employs innovative activities and makes up a choice whether to adopt or reject it.

Implementation: an individual starts to use the innovation

Confirmation: at this stage individual evaluate the activities involved innovation

Orr (2003) emphasised that "[p]eople will adopt an innovation if they believe that it will, all things considered, enhance their utility" (p.2). In fact, the individual knowledge and attitude towards the innovation are associated to the actual use of technology in future. Attitude can be a positive and negative feeling towards an object. Teo, Luan and Sing (2008) ascertained attitude as "how teachers respond to the technology" in teaching and learning environment (p. 268). Hence, in order to infuse technology in the teaching environment totally depends on the teacher's attitude towards technology regardless of its highly advanced development (Huang & Liaw, 2005). In support Yusuf, Ajidagba, Yusuf, Amali, Bello and Oniye (2012) posited that "if the attitude of a person is negative towards a thing, it is likely that the disposition will be negative and conversely" (p. 54).

Teo (2008) investigated the relationship between the attitudes toward the use of computers and behavioural intention of using it to the perception of use and control of the computers among pre-service teachers. Data was collected via a questionnaire from a total of 139 pre-service teachers. The questionnaire was composed of four main factors apart from demographic characteristics; affective (liking), perceived usefulness, perceived control and behavioural intention to the use of computer. The first factor (affective) was about the participants' feeling towards the use of computer such as how comfortable they are with the use of computers and they are not hesitant or scare to use it. The second factor on perceived usefulness was basically on the usefulness of computer to perform their job in this case its teaching and learning. Questions such as improvement and productivity as well as interesting and enhancing their work were inquired. The perceived control factor was to measure their comfortable level in using the computer. Question such been able to solve basic problems in computers or whether they need an experienced person nearby whenever they use computers. The last fact on behavioural intention was to enquire the participants' reactions to computer use. Participants were asked to whether they would avoid in using computers or are regular users of it in their teaching and learning processes. All these factors were assessed separately and later were computed together to evaluate the overall attitude. The results indicated that participants had a positive attitude towards the use of computers and it is related to the usage or the intention of using it in the future. In fact, Teo (2008) reported that the teachers' attitude towards use of technology and intention of use computers were more affirmative than the teachers' perception regarding the usefulness and control of the computer. Similar results have been emphasized in many other studies (Huang & Liaw, 2005; van Braak et al., 2004; Sang et al., 2010). For instance, van Braak et al. (2004) posited that teachers effectively employ technology in teaching and learning environment inclined to positive attitudes towards technology.

Regarding the attitudes towards computers in schools, Jumiaan, Ihmeideh and Al-Hassan (2012) study on "Using Computers in Jordanian Pre-School Settings: The Views of Pre-School Teachers" provided evidence to affirm the relationship and cruciality of attitude and use of computers in the education context. A sample of 113 pre-school teachers from 43 schools was selected for this study. A mixed method of using survey questionnaire and in-depth interview were used for data collection. The survey questionnaire consisting of five-point Likert-type scale was used to measure the teachers' attitudes towards computer use in the education setting. The question on teachers' positive attitudes such as computers should be used to support or enhance students learning, create an interactive and exciting learning environment, enable them to use concrete activities and help to improve teachers' professional development and assign with new and important roles were inquired. On the other hand, negative attitudes suchlike computers should be used when students feel bored, or only in instructional practice and by using computers does not encourage student's creativity or imagination. The results revealed that the majority of the teachers had a moderate agreement toward the use of computers with a mean score of 3.44. From the interview, about 86 percent of the teachers pointed "[c]omputers play a fundamental role in promoting children's development and learning, thus, should be employed in the classrooms" (Jumiaan, Ihmeideh & Al-Hassan, 2012, p.31). Moreover, they contended that computers without doubt should be employed in teaching and learning and it enhances student learning. On the other hand, teacher with a negative perspective towards use of computer posited that "[a]lthough our pre-schoolers are ready to learn from the computer, I personally find children get benefit from other learning areas more than computers" (Jumiaan, Ihmeideh & Al-Hassan, 2012, p.31). The study shows that teacher's actual use of computers in their teaching and learning environment is limited and authors indicated that this could be due to the teacher's moderate attitude towards use of computers in the classroom. In fact, teachers with positive attitude toward technology are considered to be a necessary condition in using it successfully in teaching and learning environment as agreed by numerous scholars (Albirini, 2006; Huang & Liaw, 2005; Sabzian & Gilakjani, 2013; Yusuf et al., 2012).

Then again, Al-Zaidiyeen el al. (2010) research study with 650 teachers randomly picked in Jordan in order to determine "the level of ICT usages among teachers and issues concerning teachers' attitude towards the use of ICT". A sample of 460 teachers returned to the questionnaire. The questionnaire was designed to obtain data on the level of ICT use, attitudes of teachers towards ICT use. The level of ICT use was five level likert type questions from never used to very often. The tools were simple devices from computers to simulations and games. Fifteen attitude questions were asked basically on their comfortableness, productivity of using technology for teaching and learning, advantages, time saving, interesting and as well as enhancing students' learning. The results revealed that the overall use of technology was low (m=2.52) among teachers. The use of the internet tends to be high, with a mean score of 3.34 and on the other hand, use of simulations and games were the lowest score of 2.03 in the category. The overall teachers' attitude toward the use of technology was positive with a score of 3.19. Interestingly 72.2 percent of the participants agreed or strongly agreed that using computers would help them to organize their work. Then again, 37.2 percent of the teachers disagree or strongly disagree that computers can enhance students' learning. The relationship between the teachers' attitude toward technology and actual use in the teaching environment indicates a positive correlation ($r= 0.50$, $p<0.05$). However, Al-Zaidiyeen el al. (2010) emphasized the use of technology for educational purposes among teachers are very low. In fact, "[t]his indicated that teachers holds negative attitudes towards the use of ICT, as a result they are less likely to contribute effectively to the utilization of ICT for educational purposes" (Al-Zaidiyeen el al., 2010, p.216). Thus, by having positive attitudes towards technology does not mean that technology will be used effectively in the educational setting to enhance students learning (Mumtaz, 2000). In contrast, Enayati, Modanloo and Kazemi (2012) have established in their study that positive attitude towards technology to high rates of usages in learning and teaching and argued that the teacher's attitude towards "the use of technology in education was positive" (p. 10958). On the other hand, poor attitudes towards technology among teachers led to low-levels of technology adoption in learning and teaching. In contrast, Megan-Nagar and Peled (undated) concluded in their study "that the influence of teachers' attitudes towards technology has an indirect effect on implementation of technology" (p. 20).

Williams, Coles, Wilson, Richardson and Tuson (2000) research on "Teachers and ICT: current use and future needs" shows the level attitude towards the use of technology and the actual use. Williams et al. (2000) reported the use of computers in three levels namely; low use, medium use and high use. The results revealed that there is a positive correlation between the levels of use and attitude towards the ICT use. Teachers who tend to hold positive benefits of using ICT to themselves and to the students learning, inclined to use more frequently. In contrast, teachers who are distressing and uncertain of the benefits of ICT in the educational environment tend to use technology occasionally or rarely. Thus

Capan (2012) contended that "[t]eacher attitudes towards computers then stand for teachers' evaluation and perceptions of self-regarding how they feel about utilizing computers in their own teaching practices" (p.248). Cakir and Yildirim (2009) posited that teachers' attitudes toward technology determines their use of technology in the teaching environment. In supporting, van Braak et al. (2004) accentuated that teachers who productively utilize technology in teaching and learning inclined to have a positive attitude towards ICT. Ocak and Akdemir (2008) reported the teachers with negative attitudes toward using computers in instructional activities tilted to the use of it and stressed it as a still continuing problem in many schools. For instance, Arishi (2011) study showed that teachers were uncertain about the validity or how to effectively use in teaching and hence "their reliance on the old-fashioned techniques of teaching" (p. 49).

Moseley and Higgins (cited Mumtaz, 2000) research study on teachers' attitudes revealed that there is a positive correlation of attitudes and the use of technology in the learning environment. Their study disclosed the use of ICT level and the attitudinal characteristics as follows:

Teachers with positive attitude toward technology inclined to use it in the learning environment.

Inclined to use it in a student centered teaching environment. On the other hand teachers with traditional teaching practice have low technology competency and unable to use technology without assistance.

Students are active in the learning environment rather than been as passive listeners.

Tailor made learning activities according to the student's ability level.

Nair et al. (2012) research study was focused on Malaysian English teachers ICT usage and attitudes. A sample of 60 teachers was selected and data were collected from a survey questionnaire. The results revealed that there is a strong positive relationship between teachers' attitude and actual level of ICT use. The authors claimed that the level of ICT is higher when teachers' attitude is more positive towards the use of ICT. van Braak concurs with Nair et al. (2011) stated that "favourable Attitudes toward Computing in Education enhance the degree of Technological Innovativeness, which appears to be the main predictor of computer use in the classroom" (p. 151). Demetriades et al. (2003) argue that teachers who conceive that computers are suitable and essential tools for enhancing students learning tend to infuse it in their teaching and further employ their students in the use of computers more than the contradicting teachers.

Attitude is defined as "one's positive or negative judgment about a concrete subject" (Yusuf & Balogun, 2011, p. 19). In other words, it is the affiliation or association toward the use of technology for teaching. Nair et al. (2012) claimed that the level of ICT use is higher when teachers' attitude is more positive towards the use of ICT. van Braak (2001) concurs with Nair et al. stated that "favourable attitudes toward computing in education enhance the degree of technological innovativeness, which appears to be the main predictor of computer use in the classroom" (p. 151). In fact, the effectiveness of technology used among teachers in order to enhance learning depends on the teachers' attitudes (Demetriades et al., 2003). Many researchers have emphasized that attitude as the main predictor for an effective use of technology in teaching and learning environment (Albirini, 2006; Al-Zaidiyeen el al., 2010). In order to overcome the teachers disinclined use of technology in instructional practice, Sa'ari et al.(2005) suggested to look for ways in how to change their attitudes, such as focusing on effective and focalised professional development programs, teacher education programs, improving school technical support system and availability of relevant resources. Gibbone, Rukavina and Silverman (2010) indicated that teachers even though they had a positive attitude toward the use technology could not use technology in professional practice. This may be due to challenges such as budget, class size or lack of suitable training. Thus, it is essential to look at other influencing factors that may affect to use technology effectively.

CHAPTER 5

Training programs

CHAPTER 5

TRAINING PROGRAMS

5.01 Teacher training programs

"21st Century classrooms require 21st century prepared teachers" (Slepkov, 2013, p. 120). In fact teachers need to know how to integrate technology in "the curriculum, classroom, school management, library, and any educational setting" (Goktas et al., 2009; Hammond et al., 2011). There is no doubt that this process improves the quality of education by facilitating the role of teachers in education as students learn effectively. Thus, roles of teachers are evolving in 21st century in order to "[m]eet the demands of the global economy by exemplifying, and embedding in instruction, the mastery of 21st century skills such as critical thinking, problem-solving, communication, collaboration and creativity and innovation" (Greenhill, 2010, p.6). In fact, these involve applications of technologies in learning and teaching procedures. Therefore, knowledge, levels of readiness, and skills of teachers are crucial factors in determining success of ICT integration in teaching.

Research have revealed numerous benefits of educational technology (Hamari & Nousiainen, 2015; digedu, 2014; Alebaikan, 2010). Among them were creating personalized learning platforms, instant feedback and assessment. Moreover teachers were able to identify and address students' needs and address it individually. Through ICT learning can be made available at anytime and anywhere. Learners can be actively involved in their own learning processes (Lu, Hou & Huang, 2010). There is no doubt that technology opens many educational affordances and possibilities and develops a creative and a collaborative learning environment. Regardless of all the advantages, research has also revealed that teachers do not use technology effectively in teaching and learning (Palak & Walls; 2009; Brush, Glazewski & Hew, 2008; Yildirim, 2007). Reed, Drijvers and Kirschner (2010) described despite to the advanced technological tools, it is used only for limited or repetitive activities in the traditional context rather than focusing in a constructivist teaching. Therefore, in order to use technology effectively to its maximum potential, teachers need to be provided with proper training.

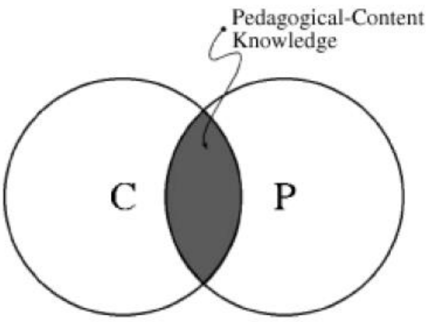
There is no doubt that training is critical to the successfully integrating technology by teachers, certainly only by furnishing facilities and resources let alone are not sufficient (Ajjan & Hartshorne, 2008). Thus, the role of teacher education is fundamental in creating readiness among teachers for future proficiency and integration of ICT into learning (Greenhill, 2010). Thus "[t]eacher education programs need to embrace educational technology and help prospective teachers use it effectively in the classroom" (NEA, 2013, p.1).

In fact, "[t]eacher education should be carried out in constructivist learning environment and provide teachers with a conducive and non-threatening environment to experience success in using the computers" (Sang, Valcke, Van Braak & Tondeur, 2009, p. 813). This indeed will ensure that teacher education programs help teachers realise how ICT can enhance teaching in meaningful ways and also "to gain competence and confidence in using computers for teaching and learning" (Teo, 2008, p.421). Ogunkola (2013) gibed by positing "[i]f technology is to be integrated into the classroom and play a significant role in educational reform, teachers need to be prepared to use emerging technological devices in ways that will facilitate teaching and learning" (p. 104). Thus, it is fundamental in training teachers to ensure that they have acquired necessary skills needed to apply technology when teaching students in 21st century classroom (Mason, Berson, Diem, Hicks, Lee & Dralle, 2000; Doolittle, 2001). Bhasin (2012) and UNESCO (2011) report discerns that teachers need to incorporate pedagogical skills of ICT in order to enhance teaching and learning or in other words to merge the modern technologies in the instructional practice to create an interactive learning environment.

"Over the past decade, the goal of preparing the citizenry for the global "knowledge economy," "information society" or to be a "workforce for the 21st century" has become increasingly prominent on public agendas throughout the world" (Maclay, Hawkins, & Kirkman, 2005, p.12). In order to successfully implement ICT in education, a number of models were developed as a guideline in integration of ICT such as the TPACK (Technological Pedagogical Content Knowledge) model and Pedagogical Content Knowledge (PCK) model (Wang, 2009).

The Pedagogical Content Knowledge (PCK) model was developed by Shulman's which was based on three components pedagogy, content and knowledge (PCK). As seen in Figure 12, the model basically was based on how teachers relate their pedagogical knowledge (knowledge about teaching) to the subject content knowledge (subject matter).

Figure 12: Pedagogical Content Knowledge (PCK) Model



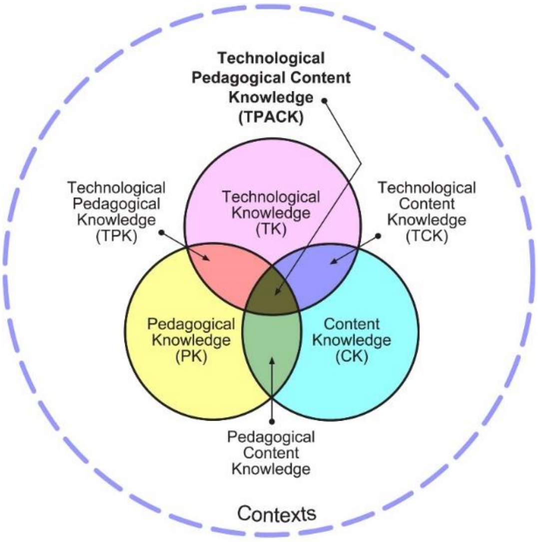
Source: Technological pedagogical content knowledge: A framework for teacher knowledge (Mishra & Koehler, 2006).

The pedagogical and content components are intersected to form the pedagogical content knowledge (Cochran, 1986). Mishra and Koehler (2006) argued that in PCK model "teacher interprets the subject matter and finds different ways to represent it and make it accessible to learners" (p.1021). Furthermore Mishra and Koehler (2006) indicated that technology and its relationship to pedagogy and content were not included in this model. They believed that at the time the model was developed technology was used in the teaching and learning but in a very traditional context (Mishra & Koehler, 2006).

At present, the most commonly used model is TPACK model which was developed based on PCK model. According to Harris, Mishra and Koehler (2009) "TPACK is not limited to a particular approach to teaching, learning, or even technology integration" (p.412). In fact, by using TPACK model teachers have the opportunity to intertwine factors "to accommodate the full range of teaching philosophies, styles, and approaches" (Harris, Mishra & Koehler, p.412, 2009).

TPACK model shown in Figure 13, is a framework with a combination of three knowledge areas; technological knowledge, content knowledge and pedagogical knowledge.

Figure 13: TPACK Model



Source: Using the TPACK Image
Koehler (2011)
http://mkoehler.educ.msu.edu/tpack/using-the-tpack-image/

According to Koehler (2011) TPACK seeks to identify the type of knowledge that teachers require in order to integrate technology in teaching. The three knowledge components (content, technology and pedagogy) are integrate or synthesised to form four intersected components. These are Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK), Pedagogical Content Knowledge (PCK) and Technological Pedagogical Content Knowledge (TPACK) as the central component of all three (Saengbanchong, Wiratchai & Bowarnkitiwong, 2014). Below describes each of the components as elaborated by Mishra and Koehler (2006).

Content Knowledge (CK): this is the knowledge about the subject matter that is to be taught or to be learnt. These includes facts, concepts and theories.

Pedagogical Knowledge (PK): These are the knowledge of teaching and learning methods and practices and how it relates to the educational purposes, values and aims. The "pedagogical knowledge requires an understanding of cognitive, social, and developmental theories of learning and how they apply to students in their classroom" (Mishra & Koehler, p.1027, 2006).

Technology knowledge (TK): This is the knowledge about the general technological tools. In addition, this involves the skills necessary to use hardware and software tools. This further includes the ability to learn and adapt to new technologies.

Pedagogical content knowledge (PCK): These are the knowledge of different teaching approaches that correspond to particular content. These includes different ways to representing and formulating concepts, pedagogical techniques, to present concepts according to the students level of understanding and to their prior knowledge. In addition teachers need to be able to address students learning difficulties, misconceptions and to facilitate a meaningful understanding.

Technological content knowledge (TCK): this refers on how to use technology (or integrate technology) effectively to present the content knowledge or the subject matter. For example, teachers can use certain software applications to teach mathematical abstract concepts or proof of constructions.

Technological pedagogical content (TPK): this refers to the integration of technology in teaching and learning environment, in other words teachers should have the ability to teach by using different technological tools. For example: creating online discussions forums.

Technological pedagogical content knowledge (TPCK): This refers to the basis of good teaching with technology. Furthermore teachers should be able to infuse technology into different pedagogical approaches in order to present different concepts. In addition teachers should be able to create a constructivist and collaborative environment with the use of technology to construct knowledge and addressing students' difficulties.

McKenzie (2001) reported that the disconnection of technology courses and the practical use of technology in instructional practice offered in the teacher education programs are one of the main reasons on why teachers are unable to integrate technology effectively in the classroom practice. Likewise, Hughes (2009) indicated that it is crucial "[…] to enhance the experience of student teachers by exposing them to both theoretical development and very real, structured, reflective, on-going field experiences" (p. 256). Mishra and Koehler (2006) argues that teacher training programs need to be focused to produce teachers "that can assist teachers in becoming intelligent users of technology for pedagogy" (p. 1031) rather than solely focusing on content courses and workshops. Koehler and Mishra (2006; 2009) emphasized that by implementing TPACK model in teacher training programs, teachers would enable to combine the three factors and use it effectively in teaching and learning accordingly. In fact, there isn't any single method or solution to integrate technology that applies for every teacher, every concept or every teaching approach. Therefore, it is crucial to understand how the three factors can be used interchangeably or interconnected accordingly that applies to the context of use to create a collaborative learning environment (Mishra & Koehler, 2006).

Lack of effective training for teachers has been considered as one of the main barriers in using technology in teaching and learning (Afshari, Bakar, Luan, Samah & Fooi, 2009; Albirini, 2006; Demetriadis et al., 2003; Pelgrum, 2001). Groce, Jenkins and Lumadue (2012) argued that the deficiency of technology in teacher training programs is one of the major barriers in impeding the use of technology among teachers. On the other hand, Veen

(1993) and Cox, Cox and Preston (2000) contend that the training programs for teachers are basically focused on technical skills rather than the use of technology in specific teaching practices. Yildirim (2000) indicated that the teacher education programs need to be designed in educating teachers in using technology effectively in their teaching. Zhao et al. (2002) posited that teachers need to have the capability to perform "[…] necessary to use a specific technology in teaching" (p. 486). Teo (2009b) stressed that teachers need to be trained to accommodate tools developed in future rather than simply being able to employ the present available technology. Goktas et al. (2009) pointed that many institutions have struggled in discerning and determining an effective standard or guideline on training teachers in using technology in teaching and learning environment. Doering, Hughes and Huffman (2003) concurred with other researches stating that novice teachers entering the teaching field are not fully trained or prepared in using technology in teaching. Santagata and Guarino (2012) stressed that "[i]f new teachers entered the teaching profession with knowledge and skills for systematically analyzing teaching, they would be on the right trajectory for playing an active role in this cultural shift" (p. 60). Messinger-Willman and Marino (2010) emphasized that teachers' not prepared to employ technology in their teacher training program tend to be disinclined in using technology as "[…] ICT skills forms the foundation of teacher use ICT in classrooms" (Chai, 2010, p.397). As a result, regardless of the technology available in the school environment teachers are not able to use it efficiently due to lack of appropriate training and skills.

Researchers have revealed that by employing miscellanea of technological tool and applications in teacher training programs could have a direct effect in pre-service teachers' use of technology in their future teaching (Alper, 2012; Kobak & Taşkın, 2013; Goktas & Demirel, 2012; Gotkas et al., 2009; Lim & Pannen, 2012; Park & Yang, 2013; Slepkov, 2013; Tondeur, van Braak, Sang, Voogt, Fisser & Ottenbreit-Leftwich, 2012). Robertson, Macvean and Howland (2013) contended that "[e]mpowering teachers to plan their own classes around the technology respects their academic freedom and professional judgment, thus increasing the chance that they will be able to embed the project [technology] in their everyday [teaching] practice" (p. 5). Tondeur et al. (2012) in their meta-ethnography study emphasized the importance of alignment of theory and practice. For instance, rather than explaining how to use a specific application or software, it need to be presented in how to use it in an actual situation to so that "pre-service teachers can understand the reasons behind using ICT" (Tondeur et al., 2012, p. 5).

Schneiter (2010) accentuated that participating in ICT courses will ameliorate student teachers attitudes towards ICT and its level of use. According to Chai (2010) in developed countries it is compulsory for pre-service teachers to attend at least one introductory course on educational technology. According to the author these courses present a variety of technological skills and constructivist teaching pedagogy. Chai, Koh and Tsai (2010) contend that the "failure to raise the teachers' competence during preservice education may result in the preservice teachers quickly forsaking the use of ICT in practice" (p. 70).

Anderson and Maninger (2007) conducted study to explore the changes in and factors related to technology related abilities, beliefs and intentions among student teachers. A sample of 76 pre-service teachers participated in this study and data were collected in two different phases; post and pre stage of the course. These courses were designed on learning how to use different education software's and completing number of assignment. In addition, students had to complete an electronic portfolio which consisted of part of their assignments, reflection of the application and how it could be used in their future teaching and other activities that they had learnt and could be used in future instructional practice. Moreover student teachers had to attend schools to observe and interact with teachers and students in a school setting to get experience on how to use and apply technology related activities in the classroom. The results revealed that student teachers attitudes, beliefs and intentions toward technology use after completion of technology course increased. Comparing the results of pre and post course survey shows that there is a significant increase in all the factors studied namely, abilities, self-efficacy, beliefs and intentions toward the use of technology.

In another study conducted by Thieman (2008) revealed that 85 percent of the pre-service teachers employed variety of technology in their instructional practice. She indicated that the high percentage of integration was because:

a) The support and encouragement given to pre-service teachers from their educators to integrate technology in teacher and learning
b) the required course integrated technology tools into instructional design and was taught prior to and concurrently with Student Teaching
c) the high level of technology skills of the students enrolled in the teacher education program.

The findings of the study conducted by Thieman (2008) shows how teacher education programs were utilizing technology tools for communication and working collaboratively to support their own and to fellow student teachers learning. In addition, student teachers have learnt to enhance student engagement and personalize their learning according to their needs. Certainly these student teachers would enable to use what they have learnt in their future teaching career.

On the other hand, Lambert, Gong and Cuper (2008) argue that technology training and integration need to be embedded in all the courses offered in the curriculum instead of just focusing only on one course. Authors indicated that by attending only one course may not be enough to bring a huge change in teachers' attitudes toward the technology and its use. Yusuf and Balogun (2011) stated that "need for more emphasis to be placed on exposing student-teachers to advanced courses in ICT" in their teacher training programs (p. 32). In agreeing, Groce et al. (2012) indicated that "[p]reservice teachers report feeling ill-prepared by their TEP [teacher education program] to effectively implement technology in the classroom" (p.1).

Foulger, Buss, Wetzel and Lindsey (2013) study on reforming teacher education programs highlighted three main benchmarks based on their findings that need to be emphasized. They are:

1. Technology skills: exposure to a variety of technological tools and "know-how to learn almost any tool to the basic operational level" (p. 53). Participants in the study agreed that if "they were adequately prepared with enough technology skills" they will be more confident in technology use and independent to learn more on using these tools in teaching.
2. Technology access in the field: student teachers who get the opportunity in using technology in teaching are more motivated to learn more of employing technology in teaching. One of the participant of the research indicated regarding her internship experience that "[My mentor teacher's] classroom is 95% paperless. It's been really interesting to see how she uses it throughout the day.... Pretty amazing stuff." (p. 53).

3. Orientation of class content and access to resources: participants stressed on moving away from standalone course to more hand on experience programs. Authors noted that standalone courses provide more general information which is not relevant for student teachers subject or their teaching grade. Therefore courses need to be designed and focused to provide student teachers with necessary content, accessibility and hands on experience that are relevant for their future teaching.

Authors concluded that by focusing on all of the above benchmarks in training teachers will assure that “candidates will learn to acclimate quickly to site cultures without jeopardizing their vision and interest in teaching with technology. Additionally, we expect candidates will continue to develop their teacher-leader qualities by seeking new and innovative methods, given the available resources in the field, and that they will become advocates of change by promoting the integration of technology by their peers” (Foulger et al., 2013, p. 56). In agreeing, Oberlander and Talbert-Johnson (2007) posited “teacher education must promote technology use in authentic contexts through curriculum-based, technology-enhanced field experiences” (p. 6).

Chesley and Jordan (2012) study was focused on finding how much teachers were prepared for their profession. Two groups of teachers were selected in which each group consists of about thirty teachers. Teachers with three months to three years of teaching experience were chose in the first group. Experienced teachers especially who were working as mentors for novice teachers were chose in the second group. Data were collected using focus group discussions. One of the focus questions in the discussion were on the integration of technology in teaching and learning. Both groups expressed that in the pre-service teacher training programs the use of technology in teaching and learning were limited. Teachers particularly indicated that use of technology in lesson planning did not exist at all. Authors argued that "[t]he teacher preparation programs and student-teaching experiences found in many universities are archaic vestiges that do not reflect the world of today's teacher and learner" (Chesley & Jordan, 2012, p. 45). Chesley and Jordan (2012) suggested that teacher education programs need to be redesigned in such a way that meets the expectation of today's education. Moreover, authors advocate that these training programs need to be conducted in collaboration with the schools and ascertain that pre-service teachers "have experiences and develop expertise" in areas such as "using technology to organize and present new learning, and engaging students through technology rich instruction" in order to meet the requirements of the schools so "that every classroom will have a teacher who possesses a clear understanding of excellent professional practice" (Chesley & Jordan, 2012, p. 45). Therefore as Yusuf and Balogun (2011) and Emhamed and Krishnan (2011) contended that teacher training programs need to be designed in such a way to provide adequate training for student teachers in order for them to use technology effectively and efficiently in teaching and learning environment. Slepkov (2013) contend that "when teachers saw the technology as good for students, they were willing to make changes to their classroom programming and learn how to integrate the new methodology into their ways of doing things" (p. 127). However as Adreas (2012) reported that "no matter how good the pre-service education for teachers is, it cannot be expected to prepare teachers for all the challenges they will face throughout their careers" (p. 77). In fact, incorporating ICT into teaching and research were major challenges to education systems (Bhasin, 2012) and need to be carefully looked upon and addressed to it.

Teacher education programs is indicated as one of the main factors in successfully implementing technology in teaching and learning and is hindered by number of issues. Among them were course content, methodology used in delivering the curriculum, infrastructure, and outdated tools could be some issues that hinder the use of technology among student teachers'.

Curriculum: Teacher training curriculum is designed on content oriented. Chai and Lim (2011) and Sutton (2011) indicated that some of teacher education programs have standalone technology courses and method or content courses. In fact, it is not easy to infuse technology into these rigid outdated curriculum for teacher educators or students. Hence, students do not get any opportunities to integrate technology and get hands on experience to practice the skills. Therefore, it is crucial to infuse technology into the method courses (Chai & Lim, 2011; Sutton, 2011). In addition the teacher educators need to trained and be able to make the changes to the curriculum (Collis, Nikolova & Martcheva, 1994).

Cost of IT training: some of the teacher education institutions are unable to carry out training programs as the cost of training is high. Even if the technology resources are available, lack of training may lead to abandoning the complex technology tools (Dyal, Carpenter & Wright, 2009).

Resources: Collis, Nikolova and Martcheva (1994) indicated poor quality of hardware and software was also an obstacle to effectively integrate it in teaching and learning. Chen (2010) noted that teachers need to be supplied with appropriate hardware and software that support teaching and learning.

Time constraint: lot of time is required for planning and preparing to the lesson. Swabey, Castleton and Penney (2010) emphasized that time was recognized by many of teachers as a problem for teacher education courses. Teaching full time courses educators were not motivate to put any effort to infuse technology in their teaching courses. In order to motivate educators, Engida (2014) suggest to provide appropriate incentives to motivate educators or “reduction of the teaching load despite of the fact that they spend more time for lesson preparation” (Collis, Nikolova & Martcheva, 1999, p.77).

To successfully integrate in teacher education programs it is crucial to address the issues faced in training teachers. Chai et al. (2010) argue that “failure to raise the teachers’ competence during pre-service education may result in the pre-service teachers quickly forsaking the use of ICT in practice” (p. 70). Without proper exposure and training on technology integration during the teacher education program it is unlikely to be able to utilize technology effectively in education setting. Goktas and Demirel (2012) affirmed the importance of engrafting ICT courses in teacher education programs moreover emphasized the importance of aligning theory and practice. West and Graham (2007) revealed that student teachers revealed that they find it easy to “apply what they learned in modeling sessions to their future teaching” (p.40). There is no doubt that this alignment will “provide opportunities for the participants to gain real experience and to practice using them as tools to support a classroom environment” (Goktas & Demirel 2012, p. 915).

5.02 Professional Development Programs on the use of ICT for teaching and learning

Research studies have emphasized that continuous professional development programs for teachers is a vital component in order to acquire and enhance the necessary skills and for effectively and efficiently use the technology in teaching and learning environment (Guskey, 2002). Guskey (2002) stated “[p]rofessional development programs are systematic efforts to bring about change in the classroom practices of teachers, in their attitudes and beliefs, and in the learning outcomes of students” (p. 381). Similarly, Darling-Hammond and McLaughlin (cited in Levin & Rock, 2003) posited that professional development programs need to cater “occasions for teachers to reflect critically on their practice and to fashion new knowledge and beliefs about content, pedagogy and learners” (p. 2). Likewise, emphasizing the importance of ongoing professional development programs NEA report on “NEA’s position on Technology and Education” (2013) indicated that “[a]t least a third of all tech budgets should be reserved for school staff to become proficient in using and integrating technology into their classrooms”. Guskey (2002) further highlighted three major goals of the professional development programs, which are mainly to bring about a change in the teachers instructional practice, their attitudes and beliefs and students learning outcomes.

According to Kraft and Blazar (2013) about 90 percent of the teachers working in the U.S are reported to participate in some kind of a professional development program. In some districts around US$ 2000 to US$ 8000 are invested annually on per teacher on job-training. In European countries participating in professional development programs is considered as a professional duty of teachers. For instance, Poland, Portugal, Spain participation in in-service training programs are optional, however, teachers tend to get career promotions and salary increase (Hendriks, Luyten, Scheerens, Sleegers & Steen, 2010). On the other hand, in Greece, Cyprus and Italy for novice teachers it is compulsory to attend these programs (Hendriks et al., 2010). However, Kraft and Blazar (2013) argue that "most professional development programs fail to produce systematic improvements in teacher effectiveness" (p. 4). Supovitz and Turner (2000) contend that effective professional development programs must give the opportunity for participants for "inquiry, questioning and experimentation" (p. 964). Guskey (2002) accentuated that these programs need to be designed in a pragmatic approach meaning that it must be "specific, concrete and practical ideas that directly relate to the day-to-day operations in their classroom" (p. 381). According to ESEA report (cited Kraft & Blazar, 2013) stressed that these programs need to be well designed and have to be "sustained, intensive, and classroom-focused…and are not one-day or short-term workshops or conferences" (p. 6). McGrail (2006) emphasised that professional development programs need to be designed in such a way to focus individual needs, subject oriented and on all throughout the program integration need to be incorporated. In support, Ranguelov, Horvath, Dalferth and Noorani (2011) and Hendriks et al., (2010) report emphasized the importance of professional development programs due to the rapid and constant change in the technology and stated that "regular support to keep up-to-date through relevant professional development programmes and materials" (p. 14). According to UNESCO report (Andreas, 2012) in some countries "teachers to keep up with the rapid changes occurring in the world and to be able to constantly improve their practice, they are entitled to 100 hours of professional development per year" (p. 60).

The type of professional development in the use of technology programs undertaken varies from country to country. The most common type of program among teachers reported in

Hendriks et al., (2010) research was “informal dialogue to improve teaching” of which 93 percent of the teachers surveyed have stated they have been involved (p. 62). The second most frequent type of professional development program are course works and workshops, which more than 80 percent of the teachers have reporting to have participated in this activity in the last 18 months, following “reading professional literature” with 78 percent (Hendriks et al.,, 2010). Among other activities were educational conferences and seminars, qualification programmes, observation visits to other schools, professional development network, individual collaborative research and mentoring and peer observation. According to Hendriks et al., (2010) report the participation number varies from country to country. For instance, in Austria 92 percent of the teachers participate in courses and seminars while 83 percent of the teachers in Iceland were engaged in professional development networks.

Kopcha (2012) and many other researchers (Mouza, 2011; Potter & Rockinson-Szapkiw, 2012; Ritzhaupt et al., 2012) indicated that one of the barriers that teachers prevent in using technology is lack of passable professional development programs. NEA (2013) reported that “[t]eachers and school staff must know how to do more with technology than simply automate practices and processes. They need to learn to use technology to transform the nature of teaching and learning” (p. 1). Mouza (2011) investigated the potential of professional development programmes and how they could assist teachers to integrate technology with content pedagogy and develop the required habits for practical learning. The author notes that professional development programmes were effective ways of understanding the relationship that exists among technology, pedagogy, and content. Thus, they are useful in developing reflections, which facilitate practical learning.

Kopcha (2012) conducted a study to find the common barriers associated in integration of technology focused in professional development programs. This study was conducted in an elementary school with a sample size of 30 teachers. The school selected in this study had recently upgraded the technology, and hired a mentor for a year to conduct professional development activities. Survey was completed by the teachers of year 2 based on the professional program activities they have participated in year 1. For instance, teachers were asked whether the training they had received could be applied in their classroom teaching or whether they had received adequate training necessary for them to use technology or they had enough opportunity to share their technology experiences with their fellow teachers with mean score of 3.32, 2.89 and 2.05 respectively. The author remarked a disconnection between the availability of technology and actual use of the corresponding technology in the instructional practice. In addition, the author noted that if the professional development program is not directly related to instructional practice then it acts as a barrier to the instructional practice. Kopcha (2012) suggested that the professional development program need to be tailor made according to the teachers' need for a desirable change to occur. Based on survey findings and interview results Kopcha (2012) emphasized the importance of mentors in designing and conducting an on-going professional development programs. These programs facilitate and assist teachers in adopting technology in their instructional practices. Participants stressed that it would be extremely difficult to integrate technology in teaching and learning or selecting appropriate resources without the help of the mentor. In addition, the results showed the positive relationship between professional development programs and teachers' attitude toward using technology. Regarding the successfulness of these programs, Kopcha (2012) indicated "… positive outcomes is that the communities of practice continued to provide teachers with the support and professional development needed to sustain their [teachers] attitudes toward and practices with technology overtime" (p. 1118).

Similar results were disclosed in the study carried by Cifuentes, Maxwell and Bulu (2011) in the two year START project. The results revealed that completion of the on-going two year professional development program helped teachers to boost their confidence and were more comfortable and enthusiastic in using technology in teaching and learning environment. Furthermore, authors stressed that for teachers it is not easy to get time from their regular work schedule to attend activities outside the school premises.

Potter and Rockinson-Szapkiw (2012) and Green and Cifuentes (2008) pointed out the most effective form of professional development activities are the on-going activities in the school context than the short term workshops. Furthermore, Potter and Rockinson-Szapkiw (2012) accentuated that professional development programs need to be furnished with a combination of both knowledge and practice that teachers need. For instance, without the knowledge of how to function an iPad, able to lookup or download educational application, teachers cannot use the tool effectively in instructional practice. Moreover, in designing of professional development programs a much consideration need to be given for teachers' attitudes and prior experience (Potter & Rockinson-Szapkiw, 2012).

Overbaugh and Lu (2008) study was to explore the impact of professional development activities to the participants' self-efficacy. Authors defined self-efficacy in this study as "a teacher's desire to implement the teaching strategies he/she believes to be appropriate and efficacious and, perhaps more importantly, the tenacity with which he/she will persist in trying to do so" (Overbaugh & Lu, 2008, p.45). A sample of 377 in-service teachers of K-

12 working in the Southeastern Virginia participated. Data were collected in three phases; before the course (pre-course survey), after the course (post-survey) and several months after completion of the course (follow-up survey). The courses were conducted for a period of six-weeks by online. The paired-sample t-test was carried out to explore the participants' self-efficacy in the three phases (pre, post and follow-up). The results revealed that there is a statistically significant difference in the means between pre and post survey, pre and follow-up survey, with mean score of >2.85 and >2.40 respectively. However between post and follow-up survey did not show any statistically significant differences <0.28. Thus, the result clearly shows that professional development can definitely change attitudes towards the use of technology and experiences in using technology. Adam (2002) study revealed similar results showing a positive correlation between the professional development programs undertaken and to the teachers' attitudes toward the use of technology.

Likewise, Hwu (2011) doctoral research revealed that the use of technology in teaching and learning was very much influenced by their participation of technology oriented professional development programs. The study was carried out at the University of Alaska Fairbanks at Alaska. The result showed that there was a significant relationship (p=0.020) between technology related professional development program and use of technology in teaching among the faculty staff. However, the author emphasized that there was a "tremendous need for professional development" which is vital in assisting staff, as most of the faculty members were unfamiliar in using technology in their teaching environment. Similarly, Hendriks et al., (2010) survey showed that fifty five percent of the participants stated that they need more professional development programs.

Conversely, some studies have indicated that professional development programmes have enhanced knowledge of teachers and increased the level of technology use in instructional practice (Uslu & Bümen, 2012) but does not show any change in the attitudes of teachers toward the use of technology. In addition, the study indicated that teachers who had a positive perspective to professional development program had an increase in student use of technology in classroom practice (Uslu & Bümen, 2012). Moreover, these teachers showed an increased use of technology in their instruction after the professional development was carried out (Uslu & Bümen, 2012). On the other hand, teacher who held negative attitude toward technology use did not show any change even after the professional development program. Uslu and Bümen (2012) suggested that professional development programs need to be repeated after six weeks in order to maintain the level of technology use.

Therefore, for positive attitudes toward the use of technology, and for effectively and efficiently use of technology in teaching and learning environment, a well-designed, organised and an effective on-going professional development programs is crucial (Uslu & Bümen, 2012; Mouza, 2011; Glazer, Hannafin & Song ,2005). Moreover, Glazer, Hannafin, Polly and Rich (2009) indicated that professional development activities should be conducted in the work site of the teachers. Andreas (2012) emphasized regarding the importance of professional development programs by stating "[h]igh quality professional continuing development is necessary to ensure that all teachers are able to meet the demands of diverse student populations, effectively use data to guide reform, engage parents, and become active agents of their own professional growth" (p. 77). Professional development program is considered as a key factor in infusing technology in teaching and learning, therefore it is important to provide training opportunities continuously to teachers.

CHAPTER 6

Other factors affecting teachers' use of technology in teaching and learning

CHAPTER 6

OTHER FACTORS AFFECTING TEACHERS' USE OF TECHNOLOGY IN TEACHING AND LEARNING

6.01 Introduction

Various research articles have proved that the introduction of ICT as a teaching and learning tool has been very instrumental in the effectiveness of the learning process (Almekhlafi & Almeqdadi, 2010). Studies have shown that schools are investing lot of money on latest technological tools without looking at the "target group's needs and interests" (Cavas, Cavas, Karaoglan & Kisla, 2009, p.29). Kozma (2003) in his meta-analysis study reasoned out that teachers in many parts of the world have started employing technology in their teaching; however, many of the studies have reported that there is a deficiency in employing it in the teaching environment. This chapter focuses on previous studies that are closely linked to the factors both external and internal that influence the use of technology in the educational setting.

Studies have indicated that the use of computer technology in teaching and learning improves educational opportunities (Neal, 2015; Raikes & Gates, 2014). Neal (2015) stated that "[t]he infusion of digital learning enabled by the mobile devices provided a unique opportunity for students to develop important college and career readiness skills such as critical thinking, problem solving, communications, collaboration and digital citizenship (p.2). However, studies have proven that many teachers do not integrate or use technology efficiently in their instructional methods. Ertmer et al. (1999) categorised barriers that impede the use of technology into two categories namely; first order and second order barriers. First order barriers also referred as extrinsic or external factors were relate to the external factors such as access to technological tools, training facilities, inadequate technical and administrative support (Ertmer et al., 1999). On the other hand second order barriers or intrinsic or internal factors were beliefs and attitudes of teachers (Ertmer et al., 1999).

Afshari et al. (2009) categorised the barriers as manipulative and non-manipulative school and teacher factors with reference to teachers' decision on ICT integration in teaching. Afshari et al. (2009) noted "Non-manipulative are factors that cannot be influenced directly by the school, such as age, teaching experience, computer experience of the teacher or governmental policy and the availability of external support for schools" (p.79). Then again manipulative factors those factors associated to teachers' attitudes and beliefs toward the use of technology in teaching and learning environment (Afshari et al., 2009).

Afshari et al. (2009) identified both manipulative and non-manipulative factors, which influenced teachers' use of ICT in teaching and concluded that these factors overlapped. Further, they observed that successful implementation of ICT did not depend on the absence or availability of individual factors. Instead, many interrelated factors influenced the process.

Similarly, Drent and Meelissen (2008) study was focused on factors, which encourage or discourage the innovative use of ICT by teacher educators. Authors categorised these factors into two categories namely; exogenous and endogenous factors. Exogenous factors (non-manipulative) were defined as "factors that cannot be influenced directly by school" such as teachers' age, teaching experience, teacher qualification (p.189). On the other hand endogenous factors (manipulative) were identified as attitudes toward technology, professional development programs, support, knowledge and skills (Drent & Meelissen, 2008). According to Drent and Meelissen (2008), innovative use of ICT is "the use of ICT applications that aid the educational objectives based on the needs of the current knowledge society" (p.197). They concluded that "personal entrepreneurs" are the main facilitator for teacher educators to integrate technology effectively into their teaching (Drent & Meelissen, 2008). Personal entrepreneurship is defined "'the amount of contacts a [teacher] keeps for his own professional development in the use of ICT (Drent & Meelissen, p. 195, 2008). Thus researchers accentuated that personal entrepreneurship can have a positive influence to the attitudes towards technology to effectively use in teaching and learning.

Teo, Lee, Chai and Choy (2009) stressed that in order for teachers to employ technology effectively in teaching and learning depends on number of external factors. These include availability and accessibility of technological resources or resources, time constraint, curriculum and technical support (Al-Ruz & Khasawneh, 2011). Similarly, internal factors are directly related to teachers which includes teachers' attitudes and beliefs as was discussed in previous chapters, do have a huge influence on how technology is infused in teaching and learning environment. External factors are considered to be easier to address because these are depends on the finance such as purchasing resources or organising PD programs. On the other hand, Ertmer (1999) indicated that internal factors such as attitudes and beliefs causes more difficulties because they require a fundamental change in an existing belief. Moreover, some factors are interrelated that encourages or discourages teachers' to use technology in the educational setting (Teo et al., 2009; Chai & Lim, 2011). Therefore, it is crucial to explore these factors as there is no guarantee that technology will be employed efficiently even if one or more factors are present. The following section is a synthesis of the literature of some of the factors related to technology use in schools.

6.02 Some factors related to the use of technology in education

Indeed, integration of technology into teaching has numerous benefits, however evidence shows that meaningful use of technology in the educational context remain very much limited due to number of barriers (Al-Ruz & Khasawneh, 2011; Collins & Halverson, 2010; Afshari et al., 2009; Drent & Meelissen, 2008; Gulbahar, 2007; Bebell, Russell & O'Dwyer, 2004; Robinson, 2003; Mumtaz, 2000). These factors are grouped into three categories or themes: teacher demographic characteristics such as age and gender; teacher-related factors such as teaching experience, computer competence academic qualification, teaching qualification; and external factors such as resources and technical support.

6.02.01 Age

Teachers' age was considered as an influencing factor in infusing technology in the educational setting. Lau and Sim (2008) argues that older teachers shows higher level of technology integration than younger teachers. This argument was based on the findings of the mixed research study conducted on "Exploring the extent of ICT adoption among secondary school teachers in Malaysia". A sample size of 250 secondary school teachers participated in this study. The results showed that about 41 percent of the participants integrate technology in the instructional practice in daily basis while 34 percent used on weekly basis. In addition more than 7 percent stated that they use simulation programs on daily while 14 percent in weekly basis. Author presumed that "[t]he main reason could be, senior teachers having vast teaching experience, sound classroom management skills and good knowledge of the curriculum, can easily digitize their materials with ICTs, hence more flexibly apply ICTs in classroom instruction" (Lau & Sim, 2008, p. 29). The authors emphasized the importance of continuous training "rather than a one-off, basis so that their IT knowledge is upgraded over time" (Lau & Sim, 2008, p.35). Henry (2008) pointed that older teachers were more comfortable in the subject content area, as well as pedagogy, affording more time for them to learn and prepare to integrate technology in their instructional practice. Agreeing to the above results, Rana (2013) accentuated in his research that compared to younger teachers, it was found that older teachers effective use of technology.

On the hand, Kumar et al. (2008) investigated whether age influences the use of technology among teachers. A sample of 358 teachers working at 65 Malaysian schools participated. Around 60 percent of the teachers in the study were in the age group of between 20 and 30. It was expected that these teachers were exposed to computer assisted training or had learnt computer. The results revealed that there is a significant difference between participants' age and use of technology. Young (2000) studies revealed that use of computers among young teachers were more because of their computer fluency and also being exposed to technology in their teacher training. Similarly, Becta (2004) reported that older teachers of less involvement in technology were because of their advanced age.

In contrast, Youssef, Youssef and Dahmani (2013) study showed that teachers "age plays a marginal role" in the use of technology with a path coefficient score of 0.105. Similarly, Inan and Lowther (2010) and Brunk (2008) reported in their study that age is not significantly related to technology use. Mahdi and Al-Dera (2013) study revealed similar outcome, showing that teachers' age does not have any significant differences in the use of technology in the teaching environment both quantitative and qualitative results. Only one interviewed participant with a contrasting view indicated that "young teachers are more enthusiastic and more energetic than senior ones" (Mahdi & Al-Dera, 2013, p.61). Authors contend that teachers' age does not have any direct effect to the use of technology in educational setting. Similarly, Hermans, Tondeur, van Braak and Valcke (2008) study also revealed that age does not have any significant impact to use of technology in teaching and learning. Guo, Dobson and Petrina (2008) accentuated that young teachers were expected to use technology more in instructional practice, however, in their studies indicated that there is not much differences between the age groups and employing technology.

In summary, research have disclosed conflicting results on teachers' age and use of technology. Some studies revealed that age influences the use of technology (Rana, 2013; Kumar et al., 2008; Lau & Sim, 2008; Becta, 2004; Young, 2000) while other indicated that it does not contribute to the use of technology (Mahdi & Al-Dera, 2013; Youssef et al., 2013; Inan & Lowther, 2010; Brunk, 2008; Hermans et al., 2008; Guo et al., 2008).

6.02.02 Gender

With regard to gender issues, recent studies have pointed that gender is not an apparent factor in using ICT in teaching and learning (Bakr, 2011; Yusuf & Balogun, 2011; Gorder, 2008; Hammond, Reynolds & Ingram, 2011; Sang et al. 2010). Hammond et al. (2011) indicated that "[gender] was not apparent within either the quantitative or qualitative data" of their study (p. 201). Similarly, Gorder (2008) research analysis showed that there is no significant difference among female and male teachers in integration of ICT. However, researcher noted that teachers do not use ICT in a constructivist environment, but instead delivering of instruction. Teo, Chai, Hung and Lee (2008) reported that the conflicting result between past and present studies is because of "... the increased use of computers for teaching and learning in schools and the opportunities created by the policy makers for all students to acquire computer skills to cope with greater challenges in education" (p.170). At present schools are accommodated with variety of technology tools and teachers are provided training to use it for in-depth learning (UNESCO, 2014). In addition schools have technology coordinators to provide continuous training and facilitate and guide teachers to use technology effectively. Moreover, technical support officers ensure that the tools are well maintained. Certainly, the education system is shaped according to the educational policies. These policies need to be revised and re-structured to ensure the education systems is effective efficient, productive and competent according to "the country's needs in its religious, social, cultural, and economic development" (Al-Zahrani, 2015, p.152).

Cherry's (2014) doctorial research study was to investigate the influencing factors for teachers' level of technology adoption in teaching and learning. Participants for the study were selected by using stratified random sampling technique. Research questionnaire was sent by e-mail to 725 teachers' from Minnesota secondary schools of US, of which 187 were returned (26 percent of the total). 44.39 percent of the respondents were males while 55.61 percent were females. The participants were from Business (30%), English Language Arts-ELA (18%), Mathematics (16%), Science (19%) and Social Studies (17%). The results revealed that gender is not a significant factor in technology adoption for teaching and learning. The author believe that gender is not significant because participants (both male and female counterparts) were exposed to a variety of continuous training sources.

Thus, this implies that gender factor is no longer a hindrance in the use of ICT in education. Similar results were found in Roza's (Roza, 1994) research study on "Computer literacy, attitude toward computers, and experience with computers of teachers in senior high schools in the provinces of West Sumatra and Riau, Indonesia" found that there is no significant difference in attitude toward computers among male and female teachers. However, regarding computer literacy and computer experience she indicated that male teachers had scored more than female teachers. In support Albirini (2004) study also proved that there aren't any significant differences among males and females attitudes toward computers.

On the other hand, researchers have previously affirmed that gender have a significant effect on the ICT use (Hermans et al., 2008; van Braak et al., 2004; Samak, 2006). Hamans et al. study was on the impacts of teachers' educational beliefs. The research questionnaire was distributed to a sample of 525 primary school teachers from 68 schools in Flanders, Belgium. 81 percent of the participants were females while 19 percent were males. The findings revealed that constructivist teachers integrated technology effectively in instructional practice while traditional teachers had a negative impact on the use of technology. Regarding the gender, it was found that it had an impact on the use of technology. Male teachers inclined to use technology more than female coworkers. North and Noyes (2002) (cited in Samak, 2006) comprehended computing as a "masculine activity" (p. 51), and their study has indicated that there is a positive correlation between gender and technophobia. Ogan, Herring, Robinson and Manju (2009) argue that gender-based social inequities is the naturalization of a gender hierarchy according to which males are expected to succeed in activities perceived as especially challenging or difficult, and are rewarded for doing so, while females are expected to be less ambitious and concern themselves with work that is necessary but less highly rewarded by society.

Similarly, van Braak (2001) research study supports the effect of gender on computer use. The individual characteristics considered in the study were age, gender, teaching subject, computer attitude and innovativeness. The sample of the study was 357 secondary teachers representing 37 Dutch speaking schools in Brussels. About 49.5 percent of the respondents were female and 50.5 percent were male teachers. The findings revealed that male teachers' computer usage is significantly higher than that of female teachers of 47.9 percent to 35.3 percent respectively. Likewise, the European Commission report (2002) results have indicated that 69 percent of male teachers use computers in off-line equated with 62 percent of female teachers. This figure is more significant when compared internet users among males and females which is 44 percent to 31 percent respectively. As the research has given commixed results in the use of ICT in regard to gender, it is worthwhile to investigate the situation of technology use among males and females in instructional practice in a developing country such as Maldives.

6.02.03 Years of Teaching Experience

Teaching experience is a teacher related factor which research has shown conflicting results between teaching experience and technology implementation in teaching and learning. This section will present the literature of teaching experience and use of technology in instructional practice.

Lau and Sim (2008) revealed from their study that older teachers with numerous years of teaching experience tend to frequently use technology more in teaching and learning compared to younger teachers. Authors noted that, although new qualified teachers had higher technology skills than older teachers, they did not display higher levels of pedagogical technology use (Lau & Sim, 2008). The major reasons proposed for these outcome is:

- Firstly, senior teachers with their immense experience in teaching, good classroom management skills and thorough content knowledge makes it easier to for them transform and employ technology in teaching. On the other hand, the first few years of teaching are challenging, and new teachers typically spend most of their time and energy in getting acquainted with curriculum and classroom management instead of technology integration.
- Secondly experienced teachers are more confident in infusing technology and acknowledge the use of technology in enhancing students' learning.

Similar results were revealed on Russell, O'Dwyer, Bebell and Tao (2007). Authors concluded that level and efficiency of technology integration was related to years of teaching experience in their current school. Authors emphasized that when teachers' transfers to a new school shows a negative impact to the level of technology use compared to their coworkers regardless of their teaching experience (Russell, 2007). This may be because teachers need time to adjust to the new school environment, instructional materials and resources (technological tools) as well as to the curriculum.

In contrast, to the above argument, Baek, Jung and Kim (2008) contended that more experienced teachers does not take the full advantage of ''using the enhanced functions of technology'' in their teaching (p.233). Thus, experienced teachers were more unprepared in infusing technology in education setting than inexperienced teachers. Moreover authors argued that experienced teachers decision in use of technology in teaching and learning is due to the external pressures or as an "involuntarily response" compared to junior teachers willingness in infusing it in their teaching (Baek et al., 2008, p.233). In support, Inan and Lowther (2010), Korte and Hüsing (2006) and Ritzhaupt, Dawson and Cavanaugh (2012) study revealed that teaching experience has a positive effect on the use of technology. Based on this finding, Ritzhaupt et al. (2012) indicated the importance of preparing teachers and providing guidance in induction programs for novice teachers.

Similarly, a study conducted in Australia has shown that there is a positive correlation with teaching experience and the ICT usage in teaching. This study was conducted among Western Australian government school teachers. A total of 1500 teachers participated in this survey study. The result of the study indicates that ICT competence of the teachers decreases as to the number of years of teaching increases with a "score of 59 for teachers with less than 1 year teaching experience to 49 for teachers with 20 plus years' experience" (Teacher ICT Skills, undated, p.73). In support, Mathews and Guarino (2000) posited that teaching experience is indirectly related to the teachers' computer usage. Thus teachers with vast teaching experience are inclined to the low integrators of computer. Gibbone, Rukavina and Silverman (2010) study revealed similar results; nevertheless authors argued that "[p]ositive attitudes and experience, however, do not necessarily translate into technology use" (p.36).

Nonetheless, few studies have indicated that there is not any relationship between teaching experience and the attitude toward technology use. The study conducted by Gorder (2008) showed that technology integration and technology use among teachers does not show any statistically significant difference to the number of years of teaching. Similarly, Tweed

(2013) reported that there is not a significant correlation between teaching experience and the classroom technology usage in his study on "Technology Implementation: Teacher Age, Experience, Self-Efficacy, and Professional Development as Related to Classroom Technology Integration". Likewise, McConnell, (2011) ascertained that teaching experience is not related to the use of technology in a constructivist learning setting. This could be the reason of the training programs offered to teachers especially to novice teachers. Author noted that teachers were employed after once they completed a one-to-one training program (McConnell, 2011).

Finally, the literature shows a conflicting outcome regarding the teaching experience and level of technology integration. It is also observed some studies indicated a positive effect to the experience and level of technology implementation while others showed a negative relationship. Moreover other concluded that there isn't any effect between experience and use of technology.

6.02.04 Computer competency and literacy

"Due to the explosion of knowledge, educational institutions including schools cannot continue as venues that transmit knowledge from the teacher to the learner or use the textbook as the only source of information" (Mathipa & Mukhari, 2014, p.1213). To acquire the necessary skills and knowledge required for 21st century, schools need to employ new technologies for efficient, continuous and lifelong learning. On the other hand, by only furnishing schools with the latest technology equipment's does not mean that it will be used effectively by teachers to achieve the required target. Earle (2002) argues that for an effective outcome of ICT integration in the education system, all the elements need to be connected together, meaning resources, teachers, curriculum, policies, management support etc. need to work closely together. However, teachers are the generators for creating "the culture of learning" that facilitate opportunities for students' to use technology successfully for their learning (UNESCO, 2014, p.1). Therefore, the "role and capacity of teachers" to create a technology integrated learning environment has "become more critical than ever before" (UNESCO, 2014, p.1). Indeed, this depends on the level of ICT knowledge that teachers have (Varol, 2013; Fakeye, 2010).

The terms "computer competence", "computer literacy" and "computer knowledge" is being used interchangeably in the educational context (Poelmans, Truyen & Deslé, 2009). Bhalla (2014) accentuated that in earlier days, computer literacy was defined as the understanding of both hardware and software with the knowledge of computer programming languages. Furthermore Bhalla (2014) pointed that in earlier days the term "computer literacy" was used than "computer competence". At present computer literacy is defined as "the ability to use computers [and applications] at an adequate level for creation, communication and collaboration in a literate society" (Son, Rob & Charismiadji, 2011, p.27). Mason and McMorrow (2006) posited that computer literacy is composed of awareness and competence. Authors further explained that "awareness" refers to the knowledge of how computers affect individuals' daily life. "Competence" was referred to the level of proficiency on handling software application. Bhalla (2014) defines "computer competence and literacy" as "achieving mastery of skills in application of technology tools in support of learning, communication, research, problem solving and decision-making" (p.71). At present, with the availability of ready-made applications and software, individuals do not necessarily require the knowledge of computer programming to use it. In the educational context computer competence and literacy is the knowledge and skills on how to use the application effectively to create a collaborative learning environment. In this study computer literacy and competence will be defined as the knowledge and skills to use computers and applications.

Gülbahar and Güven (2008) conducted a research study to investigate the use of ICT and the perceptions of Social Studies teachers in Turkey. A total of 326 teachers completed the survey. The participants of the study indicated as one of the main barriers was lack of knowledge to prepare materials based on technology. The authors indicated that participants were incompetent in using computers and their level of computer knowledge was average (Gülbahar & Güven, 2008). Kirschner and Davis (2003) emphasized the importance of teacher training program in providing the requirements for novice teachers to be more computer competent for their future professional practice. Indeed, continuous training need to be provided to be more comfortable and also for effective use of available technology in instructional practice (Enochsson & Rizza, 2009). Yeung, Lim, Tay, Lam-Chiang and Hui (2012) study disclosed that teachers tend to use computer applications for personal use then for instructional practice. The authors posited that one of the influential factors for teachers' use of technology was self-perception of competence in using certain technology. Yeung et al. (2012) accentuated that teachers who have were competent in using technology tend to use it more often.

Similarly, Bhalla (2012) investigated the barriers impeding the use of computers in teaching and learning among teachers in the Indian context. Data were collected from twenty schools administered by "Kendriya Vidyalayas" group in Delhi Region. Open-ended questionnaire were distributed to teachers to list the barriers in using computers in the classroom. Regarding the theme on teachers' competence, 22.7 percent of the participants reported as less competent (unable to adapt software to curricular needs) while about 13.3 percent posited that they do not have required knowledge and skills to use computers in the classroom. Bhalla (2012) reported teacher competence [lacking computer knowledge and skills] as predominant (p.264).

Similarly, Samak (2006) doctoral research study was on investigating factors that influence the attitudes towards ICT. This study was a replication of Albirini's research study. The sample was 380 teachers working in schools in Amman district of Jordan. The factors explored in the study were attitudes towards ICT, Perceived ICT Attributes, Cultural Perceptions, Perceived Computer Competence (self-competence- to use computer and certain software application), Perceived Computer Access and Teacher Characteristics such as age, gender, qualifications, grade level, teaching experience, International Computer Driving License (ICDL) certificate, and teaching method. The analysis of the results revealed that there is a strong relationship level of competence and attitudes towards ICT ($r = .504$, $p < 0.01$). Participants had a moderate competence to much competence in using computers and certain application which contributed to the use of technology in instructional practice. Regarding the computer training, 83 percent of the responded that they had received training while 17 percent of the teachers did not receive any training at all. 56 percent reported that they had in-service training offered by Ministry of Education while about 34 percent of teachers stated that they were self-trained. Regarding the type of training received and attitudes towards ICT results indicated that these factors were not related.

Agyei and Voogt (2011) study was focused in exploring ICT integration in teaching Mathematics in Ghanian senior higher schools. Data was collected via interviews and surveys from 180 in-service and pre-service mathematics teachers. The results affirmed that there are number roadblocks associated in integrating technology in teaching and learning process. The study observed that lack of technology knowledge among teachers is been identified as one of the hindering factors that affected the way in teachers integrated technology during lessons. Similar to this observation Uslu and Bümen (2012) corroborate in their study that limited technology knowledge among teachers as a barrier to integrate technology successfully in the educational setting. Similarly, Tezci (2009) affirms that teachers with high level of technological knowledge tend to use technology more in their teaching. Zhang and Martinovic (2008) posited "[w]ith numerous global advancements in ICT it is essential that educators have a thorough working knowledge of these media and their influence on the performance and engagement of their students" (p.3).

Tezci (2010) study explored the teachers' influence in the use of technology in Turkish schools. The sample size was 1540 teachers from 330 schools. Research questionnaire was sent by post and some were sent by email. Number of factors such as teaching experience, gender, duration of computer use, knowledge of technology and frequency of technology use were explored in the study. Teachers' technology knowledge was on their ability to use the specific applications and software such as word, database, simulations, modelling software etc. The result shows that teachers' technology knowledge and frequency of use is positively related. Furthermore, the results also revealed that there is a significant difference between participants' previous participation in a computer course and use of technology in instructional practice. Thus, teachers' low level of technology use in the instructional practice was influenced by their lack of technology knowledge and low level of expertise. Therefore, technology knowledge is crucial for effectively use technology in the teaching and learning environment.

Number of researchers had revealed that teachers ICT literacy and competency as an influential factor in the use of technology effectively in teaching and learning (Agyei & Voogt, 2011; Chigona & Chigona, 2010; Zhang & Martinovic, 2008; Youssef et al., 2013). Mumtaz (2000) regarded teachers' computer competence as a significant influential factor in the use of technology in the classroom such as managing technology related activities, pedagogical orientation and also in dealing with technical problems. As "[t]echnology does not hold the potential to be transformative on its own" (Bhalla, 2012, p.259), Yusuf and Balogun (2011) argued that teachers' competence and positive attitudes toward technology plays a crucial role to use of the technology effectively. In fact they contended that the quality and quantity of technological tools in the school environment does not guarantee that it used efficiently for educational purposes. Newhouse (2002) in his literature review reported that teachers with limited technology knowledge and skills in using computers were not keen in expanding their knowledge and to use it in their instructional practice. Korte and Hüsing (2006) reported that "[d]epending on the country and type of school, there are different levels of competence and skills among teachers for using computers in class" (p. 3). As research has revealed that lack of computer competence and literacy as a strong barrier that prevents the use of technology effectively in teaching, it is crucial to investigate the situation to address the issue.

6.02.05 Resources and Accessibility

Many of the research has identified lack of resources and inaccessibility to resources as one of the barriers in the use of technology among teachers. Hew and Brush (2007) noted that 40 percent of the past studies analysed, lack of resources was identified as one of the main barriers that impede the use of technology in teaching and learning. Authors explicated that lack of resources could be one or more of the following:

- Availability of technology resources
- Access technology resources

Researches argued that deficiency in resources will minimise the opportunity for teachers to use technology in the required curriculum (Hew & Brush, 2007). On the other hand, furnishing with technology does not necessarily assure that it is used efficiently. In fact "[a]ccess to technology is more than merely the availability of technology in a school; it involves providing the proper amount and right types of technology in locations where teachers and students can use them" (Hew & Brush, 2007, p. 226). According to NEA (2008) a number of teachers working in urban schools reported "insufficient and outdated equipment and software" which prevent them using it effectively in their teaching.

Teachers in Kenya considered hardware issues as a serious hindrance to effective ICT implementation in schools (Martin, Khaemba & Chris, 2011). Schools have few computers and printers and teachers termed the situation as 'serious or very serious' concern for their efforts. Apart from limited hardware, teachers raised concerns on outdated software issues (NEA, 2008). For instance, teachers mentioned lack of relevant software or software with appropriate content as an inhibitor to ICT adoption. Consequently, such teachers could not adopt ICT in their classrooms. Some of the issues that the study associated with lack of software included "relating courseware to curriculum, evaluation, quality control, acquisition, setting priorities, security, placement, and appropriate use" (Martin, Khaemba & Chris, 2011, p.5). WestEd (2002) report on "Investing in Technology: The Learning Return" posited that "[s]uccess depends on students and teachers having enough computers as well as convenient, consistent, and frequent access to them" (p.2). In a similar study in Turkey, Özen (2012) found out that 72.7 percent of respondents emphasised "the existence of old versions of computer and Internet facilities in classrooms as barriers to ICT integration" (p. 189).

Numerous researches stressed that access to both hardware and software application is essential for the use of technology in teaching and learning (Martin, Khaemba & Chris, 2011; Bauer & Kenton, 2005; Norris, Sullivan, Poirot, & Soloway, 2003; Zhao, Pugh, Sheldon & Byers, 2002). According to WestEd (2002) "[s]uccess depends on students and teachers having enough computers as well as convenient, consistent and frequent access to them" (p.2). Hepp, Hinostroza, Laval and Rehbein (2004) posited that "technology becomes obsolete only if it cannot be used properly for a given task" (p.38) and emphasized the necessity of upgrading and replacements (NEA, 2008). Authors stressed about providing computers in teachers room for teachers to use it without any pressure from students (Hepp et al., 2004). Becker, Ravitz and Wong (1999) research showed that the emplacement of computers in the school environment has an effect on how effectively it is used. Furthermore, Becker et al. (1999) argued that teachers' use of computers for instructional purpose are tend to be more when it is available in the classroom rather than in the computer lab. Similarly, NEA (2008) posited "if technology is to be integrated into instruction, more computers must be made available for students' use" (p. 3). Norris et al. (2003) research study on "No access, no use, no impact: Snapshot surveys of educational technology in K-12" conducted in four states of US. Data were collected via a questionnaire from 3665 teachers located in New York, California, Nebraska and Florida. Questions were basically on teachers' demographic characteristics, attitudes, classroom practices and accessibility to technology. The results revealed that access to technology as the main the predictor in using technology among K-12 teachers ($t=3.67$, $p<0.001$). Authors concluded that "[t]he magnitude of the relationship between technology access and technology use is so strong as to support meaningful prediction of teachers' technology use based on particular patterns of technology access both in individual classrooms and in shared computer labs" (Norris et al., 2003, p.25). Similarly, Bauer and Kenton (2005) contended that restrained accessibility to technological tools makes it harder for teachers' as well as for students to use in productively. In fact the study showed that 47 percent of the teachers had experience some kind of difficulty with equipment such as antiquated computers making it as the biggest obstacle. Thirteen percent of the teachers revealed of problems with the software such as compatibility and availability. Thus, researchers suggested that for a successful integration of technology it is crucial for the accessibility of "[...] resources: always for more hardware, but especially software. Sufficient bandwidth, reliable servers, sufficient storage capacity for student files, and a complete, school wiring network are all within their purview" (Bauer and Kenton, 2005, p.539).

6.02.06 Technical Support

A number of researches have revealed that technical support as one of the barriers in teacher's use of technology in the instructional practice (Cox et al., 2000; Goktas, Gedik & Baydas, 2013; Kala, 2013; Liu, Wivagg, Geurtz, Lee & Chang, 2012; Scrimshaw, 2004; Tondeur, Kershaw, Vanderlinde & van Braak, 2013). Li and Walsh (2010) remarked that teachers' willingness in employing new technology is associated to the level of support provided from the school such as technical support, management support and fillip provided by the colleagues. Hammond et al. (2011) indicated that "support appears to be an intervening or mediating factor than a casual condition" in using ICT among teachers. In support, Thieman (2008) indicated in her study that lack of technical support and sufficient time to handle and use the technological tools as a "hurdle" in using technology efficiently in teaching and learning environment (p. 356). ISTE (2009) reported that the technical support provided from school need to be consistent and reliable.

Schriever (2011) study concluded that "access to technical support presented a considerable and ongoing barrier to their ability, willingness and confidence to use and integrate ICTs within their pedagogical practices" (p. 4). In Schriever's study participants reported that on-site technical support was only "available only once a fortnight" and as a result teachers were frustrated and were not able to employ the available resources effectively (Schriever, 2011, p. 4). Similarly, Inan and Lowther (2010) conducted a path analysis study revealed the overall support has a strongest indirect effect on technology integration among teachers with a score of 0.349 while technical support was the third out of the eight variables studies with a score of 0.184. The authors emphasized that among the school level variables, technical support was considered as one of the influential factors in technology integration.

Hofer, Chamberlin and Scot (2004) contended that teachers need both technical and pedagogical support in order to effectively employ in teaching and learning. Authors further emphasized that the support provided for teachers is most effective if both technical support officer and technology coordinator work together in collaboration with teachers. Chai and Lim (2011) posited that if the required support and encouragement are available in the school environment at all times then it is more likely that teachers tend to employ technology in their teaching. Korte and Hüsing (2006) reported that computers and internet use among the European countries have increased immensely indicating that 96 percent of all the European schools have internet access. However, authors reported that in some countries ICT related support is hardly provided and stressed the demand of it among teachers. In addition ISTE (2009) reported that schools need to have "[p]olicies, financial plans, accountability measures, and incentive structures to support the use of ICT and other digital resources for learning and in district school operations" (p. 1).

From the research studies it is clear that technical support is a vital factors for teachers' use of technology. Many researchers indicated technical support as a booster for teachers to employ technologies into teaching and learning. Kessler and Plakans (2008) argued that by providing appropriate technical support for teachers facilitates in developing their confidence and comfortableness in using technology effectively in teaching context. By providing adequate technical support will ensure that the technical problems are dealt promptly (Kessler & Plakans, 2008).

6.03 Conclusion

ICT integration in teaching and learning is a complex process that involves the use of technology in the education system to enhance teaching and learning. Therefore, its success depends on number of factors. This literature review has looked into number of barriers; both manipulative and non-manipulative factors. Teachers encountering these barriers prevent them from using technology efficiently in the teaching process.

Ertmer et al. (1999) categorised technology integration barriers into two groups namely, extrinsic first-order (exogenous) and intrinsic second-order barriers (endogenous). Researchers have noted that exogenous factors cannot be shaped directly from school. These are teacher related factors such as teachers' age, gender, teaching experience and teacher qualification. However factors such as resources, professional development programs and technical support can be addressed from school. As argued by many researchers, a number of factors affect teachers' use of technology in teaching. In order to assist and tackle the problems that teachers face in using technology in teaching, it is crucial to explore and understand them. Previous research has shown conflicting results and moreover, researchers have emphasised that barriers depends on country, type of school, level of exposure, availability of resources, support and the training programs.

Research has revealed conflicting results to the teacher related factors such as age and gender to the use of technology in teaching and learning. Some studies reveal that teachers' age is a critical factor in the use of technology while other studies reported that age is not significantly related to the use of technology. Similarly, studies have revealed that the level of the use of technology depends on the teachers' gender. However recent studies reported that gender is not an influential factor to the use of technology.

Availability and accessibility of required technology resources is considered as a crucial factor for teachers using the technology in the classroom. However, accessibility to technology does not necessarily mean that it is adequately used as in many cases teachers have reported that the tools are outdated or software's are not age appropriate. On the other hand, researchers emphasised that by furnishing schools with quality technology tools does not guarantee that it will be used effectively. In fact teachers' level of computer competence is a motivator that encourages them in employing it. On the other hand, the level of exposure to technology use in teaching and learning need to be explored in order to assist teachers to overcome the issues that teachers face.

The effectiveness and the level of exposure to technology in instructional practice offered in ongoing professional development programs and teacher training programs have been highlighted as one of the important and necessary conditions to successfully use of ICT in teaching. Research has emphasised how the professional development programs are carried out to the level of use of technology into instructional practice. Therefore, it is crucial to explore the how the professional development programs are designed and implemented.

Similarly, research studies have stressed the significance of technology in teacher training programs. Thus, many researchers have argued that teacher training programs should train teachers to efficiently use technology needed for 21st century classroom teaching. Therefore, it is important to investigate on what and how training should be supplied. Pre-service teachers level of exposure, experience, skill and knowledge of technology use in instructional practice need to be focused when training teachers. Pelgrum (2001) study disclosed that only 20 percent of the participated teachers stated that they were considerably trained in technology use in teaching and learning. He further stated that the lack of knowledge and skills and inadequate training are the main roadblocks for teachers' technology use in the educational setting. Foulger et al., (2013) emphasized "to eliminate a standalone technology class and replace it with technology-infused courses in our teacher preparation programs" in order to successfully use technology for future teaching classes.

Studies have demonstrated that various schools and teachers experience diverse challenges in relation to integration of ICT in teaching. These factors also overlap and interrelate. Therefore, successful implementation of ICT initiative requires effective control of various dynamic processes. In order to increase the use of technology effectively among teachers, it is crucial to understand the problems or loopholes of the educational setting to identify why teachers are not using technology. When factors that prevent teachers' use of technology are not addressed, no matter how fully the schools are equipped, they will not be able to employ technology successfully in their teaching. As teachers are the gatekeepers of the technology use, it is on their hand to efficiently use it in the instructional practice.

CHAPTER 7

Methodology

CHAPTER 7

METHODOLOGY

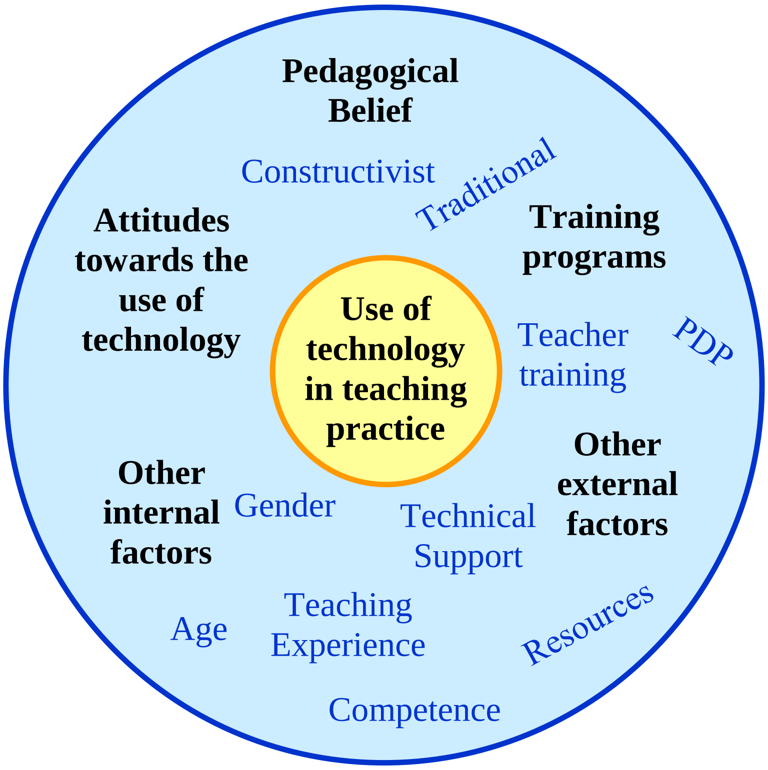
7.01 Introduction

This chapter presents the research methodology that was followed carry out research study. Moreover discusses research design, research instrument, data collection method, procedures and sample size. The chapter will start by restating the research purpose, objectives and research questions.

7.02 Purpose of the study

The main purpose of the research study is to explore the situation of ICT usage in teaching practice among lower secondary teachers of Maldives. Basically the factors that facilitate the use of technology among the teachers investigated in this study are as shown in Figure 12 given below.

Figure 14: Research focus



In particularly the research study seeks to:

- Describe the pedagogical belief (constructivists' and traditional approach) among the teachers of lower secondary schools in Male', Maldives. In addition, the relationship between pedagogical belief and the use of technology for teaching practice will be explored.
- Describe how teachers' attitude toward the use of technology in teaching environment. This question will explore the relationship between teachers' attitude toward the technology and use of technology for teaching practice. In addition relationship between attitudes toward technology and to the perceived ease of use and perceived usefulness will be explored.
- Explore the external and internal factors affecting the use of technology for teaching practice among teachers. This question is aimed to find the factors that facilitate the

use of technology among the teachers. Factors selected in this study were demographic characteristics such as age, gender and teaching experience. Other factors addressed were computer literacy (how knowledge was learnt) and competence (self-rate on whether participants were prepared to use technology for instructional practice), professional development program, teacher education program, technical support and resources.

The four main components focused in the study were on use of technology pedagogical beliefs, attitudes toward technology and internal and external factors such as demographic characteristics, resources, teaching experience, teacher education programs and professional development programs. The literature review in chapters 3, 4 and 5 disclosed the research conducted in the mentioned areas and have revealed that teachers are not effectively using technology in their instructional practices. These researches have highlighted several barriers or obstacles on why teachers were not using technology in a productive manner in their teaching. Moreover the barriers such as beliefs and attitudes are personal factors that were formed from the individual's environment; therefore the previous research studies conducted in other countries cannot be generalized to all the teachers. In Maldives the situation of use of technology among teachers is unknown.

7.03 Objectives of the study

The main objective of the research is to investigate the situation of ICT usage among teachers at the lower secondary schools in Maldives. The researcher believes the study will provide adequate information needed to improve the use of ICT among teachers in the schools of Maldives. It is hoped that this research would contribute immensely for teachers in the Maldives towards the use of appropriate Information and Communication

Technology in classrooms. The researcher also aims at investigating how teachers in Maldives use ICT when they are teaching and developing or formulating appropriate teaching practices which will incorporate adequate use of ICT. In addition, the research seeks to explore the impacts of ICT use by teacher in their teaching practices.

This study will explore how ICT is used to equip the student with required skills needed in the rapid growing technological world. The literacy level of the teachers in terms of ICT usage needs to be understood so that the appropriate strategies can be used to make them more competent as professionals. In addition, the study will also focus on the impacts of ICT to the lives of students so as to find out the areas that need emphasis.

7.04 Research Questions

In order to ascertain the aim and objectives of the research, four main research questions addressed in this study were:

1. Explore the relationship between the teachers' pedagogical belief and to the use of technology for teaching practice.
2. Explore teachers' attitudes (affiliations) toward technology, perceived ease of use and to perceived usefulness to the use of technology for teaching practice.
3. Explore the relationship between training programs and the use of technology.
4. What are the internal and external factors that facilitate the use of technology for teaching practice?

The auxiliary questions formulated to address the main research questions were:

1. What is the relationship between teaching orientation and use of technology?

2. What is the relationship between teachers' attitudes (affiliation) toward technology, perceived ease of use and to perceived usefulness to the use of technology for teaching practice?
3. What is the relationship between use of technology for teaching practice and the training programs (initial teacher training and in-service professional development programs)?
4. What is the relationship between use of technology for teaching practice and other internal and external factors?
    a) Age
    b) Gender
    c) Teaching experience
    d) Computer literacy (attended any computer course) and competence (self-rate on whether participants were prepared to use technology for teaching practice after completion of teacher training program)
    e) Technical support
    f) Availability and accessibility of Resources

7.05 Research design

The research focuses on exploring ICT usage among teachers in the lower secondary schools. Based on the research studies conducted in other countries, the most significant research method in acquiring the desirable result seems to be a quantitative research (Jumani & Rehman, 2011; Luck & Peng, 2010; Mumcu & Usluel, 2010; Nachmias, Mioduser & Forkosh-Baruch, 2010; Savage, 2010; Tella, Tella, Toyobo, Adika & Adeyinka, 2007; Voogt, 2010). This is the most significant research method for this study because as Jones (2004) stated "… unless human behaviours can be expressed in numerical terms, it cannot be accurately measured" (p.1). In addition, "[quantitative] procedures ensure that your [researcher's] own personal biases and values do not influence the results" (Creswell, 2008, p. 58). Agreeing with Creswell, Sukamolson (2007) stated quantitative research applies empirical methods which are defined "[...] as a descriptive statement about what "is" the case in the "real world" rather than what "ought" to be the case" (p. 2). He further indicated that quantitative research is particularly useful to "quantify opinions, attitudes and behaviors and find out how the whole population feels about a certain issue" (Sukamolson, 2007, p. 9). Similarly, Williams (2011) emphasized that the purpose of quantitative research is to "establish, confirm, or validate relationships" and to formulate generalizations to previous findings or theories (p. 66).

On the other hand, qualitative research designs were also carried out in numerous research studies. Madrigal and McClain (2012) suggest that qualitative approach is most applicable in studies focused on "about human behavior, emotion, and personality characteristics" (p.1). On the other hand, McBride and Schostak (2008) articulate that quantitative research moreover concentrates on what participants do rather than understanding their actions. MacDonald (2007) contend that qualitative method focus on participants within the natural research context and is applicable in situations where little is known. However there are strengths limitations in qualitative research.

One of the main strengths of the qualitative research is that it enables to interact the research participants and openly and freely discuss the situation based on their experiences (Cohen, Manion & Morrison, 2007). For instance, open ended questions will enable the individual to express their views freely without having any limitations. In addition, data collection could be carried out in flexible ways, subsequent analysis and interpretation of the information collected. For instance, rather relying on a questionnaire, interviews could also be carried out to collect data. This will help researcher to obtain richer information, and in cases could even probe further to inquire information.

Likewise there are limitations in qualitative research. There is a possibility of inadequate consistency and reliability. This is because the researcher could apply various techniques of probing and the participant can prefer to answer some and ignore others. The conclusions of the information could be established based on the personal characteristics of the researcher.

According to Schulze (2003) quantitative surveys are the best method in exploring a particular need of a group. Creswell (2005) indicated that surveys are used to “examine current attitudes, beliefs, opinions, or practices” (p. 356). Moreover Creswell (2008) emphasised that the most appropriate method to minimise the measurement error is to “use a good [research] instrument” (p. 394).

Even though mixed research method could be best method, this study employed quantitative method. One of the main reason is due to time constraints it was not easy to conduct qualitative study. However, in quantitative study, data could be collected from a bigger sample size within a short period of time. Schulze (2003) argued that unlike quantitative research, qualitative research cannot be generalized across the context though it provides in-depth information from a small sample. Likewise, qualitative method usually uses case studies by selecting few individuals which in most cases may not show the actual picture for the entire population. Williams (2007) posited that “the qualitative method allows the researcher to explore and better understand the complexity of a phenomenon” with a small sample while quantitative research "provides an objective measure of reality" (p. 70).

From the different types of quantitative research methods, this study uses ex-post-facto research. Simon and Goes (2013) posited that this type of research is ideal for studies involved human characteristics. In research where human participants are involved it is not often practically acceptable or due to ethical code to apply true experiments. In these situations ex-post-facto research is employed. Therefore, in this study this method is the most suitable as it involves human participants.

7.06 Research Instrument

In order to explore teachers' pedagogical belief, attitudes towards the use of technology and other external and internal factors in using technology in the education setting a research questionnaire was used.

The use of closed ended questions in the questionnaire will enable the individual to answer the questions only from the provided responses. Creswell (2008) assure that this would "… enable researcher to conveniently compare responses (p. 398). Sukamolson (2007) defined survey research as a "systematic gathering of information from respondents for the purpose of understanding and/or predicting some aspects of the behavior of the population of interest" (p.12). Moreover, by providing responses would be easier to assign numerical values (coding) to use when analyzing data (Creswell, 2008, p.398).

There are number of advantages of using survey questionnaires. Among them Creswell (2005) pointed that can be "administer in a short time, they are economical as a means of data collection, and they can reach a geographically dispersed population" (p. 379). Furthermore Sukamolson (2007) indicated that this method asserts participants anonymity and their responses. On the other hand there are limitations as Creswell noted "[s]urvey data is self-reported information, reporting only what people think rather than what they do. Sometimes the response rates are low and researchers cannot make claims about the representativeness of the results to the population" (p.379). Furthermore questionnaires do not allow for probing, thus, researchers it is not possible to explore any questions in more detail.

The questionnaire used in this study was developed based on pool of questions that were previously developed and validated and from the findings of the literature review as given below. The main part of the study were pedagogical belief of teachers, attitudes and use of technology for teaching practice.

In "Pedagogical Orientation and use of technology" instrument was developed by using a pre-existing instrument developed by Teo and Sing in 2008. All the items were validated. The instrument was used by number of studies conducted in many of the Asian countries with minor adaptations. The items were divided into four subsection; traditional teaching belief (TTB), constructivist teaching belief (CTB), traditional use of technology (TUT) and constructivist use of technology (CUT).

The survey questions on "Attitudes towards the use of technology among teachers" section was again validated items that were previously used by number of researches and later adapted and composed by Teo in 2012. However, for this study the items selected were from perceived ease of use (PEU), perceived usefulness (PU) and Attitude towards usage (ATU).

Items on “Professional development programs” were from OECD’s Teaching and Learning International Survey (TALIS) on Creating Effective Teaching and Learning Environment. The study was a comparison study among the 23 OECD countries who participated in this study. The main focus of the study was on in-service professional development programs focused to teachers that examines the extent and needs and support of the teachers that they have received. This study also focuses on the teachers professional development programs basically on the use of technology and its impact. Therefore this questionnaire was very much related to this study which examines the different types of professional development programs and whether teachers were satisfied or in other words its impact. The impact was analysed by calculating the average scores of the participants.

The research questionnaire (see Appendix A) contained 8 sections consisting of 40 questions on a likert-scale. These sections were as follows:

Section 1 is on participants’ demographic data. In this section was composed of eleven questions. Questions such as school, age gender, teaching experience, academic qualification were asked. Other questions were the participants’ employment status, which was whether they were permanent, permanent on probation, on contract or assistant teachers. The mode of employment (full-time or part-time) were also clarified. In addition, whether the participant was a local (Maldivian) or expatriate was inquired.

Section 2 was on computer knowledge and experience. This section had three questions. First question was on how participant learnt computer knowledge/skills. The main sources were given and participants were asked to check the main sources. The next question was on the number of hours per day they spent on using computers. The final question was to the activities participants use computer other than educational purpose such as socializing, entertainment etc.

Section 3 was on teacher education programs. This section had of seven questions which were mainly focused on the participants' teacher education programs. The first question was whether participant had completed any teacher education program. The next was the highest teacher education program they had completed followed by the year of completion. The fourth question was based on the institute they had completed the program, whether it was a local institute or overseas.

Question 5 had 10 items which was on the technology use in the teacher education program. Question 6 was the participants' self-competence on the level of preparedness to use technology in instructional practice. The final question in this section was participants' opinion on what services/lessons that need to be included in the teacher education program.

Section 4 was on internet accessibility. This section had 11 questions basically on the availability of computers and other technology tools, internet reliability etc.

Section 5 was on teaching practice and pedagogical belief. This section had 2 questions. The first questions contained 11 items which was focused on teachers' pedagogical belief. The participants' pedagogical belief was on constructivist or traditional belief. 5 of the items (a, b, c, e, f) were on traditional belief while 6 items (d, g, h, I, j, k) were focused on constructivist belief.

The second question had 10 items and was focused on teaching practice. Teaching practice was also divided into two groups, traditional and constructivist. 5 of the items (a, b, c, d, j) were on constructivist and the remaining 5 items (e, f, g, h, i) were on traditional.

Section 6 was on attitude towards the use of technology. This section had one question with nine items divided into three subsections. They were perceived usefulness, perceived ease of use and attitude towards the use of technology. The first three item (a, b, c) were on perceived usefulness, the next three (d, e, f) were on perceived ease of use and items (g, h, i) were on attitudes toward the use of technology.

Section 7 was on professional development programs. This section was composed of four questions. Two were identify whether participants had participated in any of the professional development programs in the last two years and its impact. Participants were also asked the reason why they could not participate. The last question was to find percipients opinion the type of programs they need.

Section 8 was on technical support and resources. This section had only one question with 12 items. Main focus was to identify the technical support available in the school and also inquired about the software application and hardware available in the school.

The final research instrument was finalized based on the pilot study.

7.07 Pilot Study

A pilot study was carried out to enhance the validity of the research instrument and to ensure that the questions were clear and understandable by the participants. Also whether the instrument was appropriate for the Maldivian context. Creswell (2008) posited that the “instrument need to be revised before sending it to the sample in the study” based on the pilot study (p.402). The purpose of carrying out a pilot study was to test the reliability and identify whether it reflects to answer the respective research questions. In addition, the pilot study also assisted to understand the familiarity of the technology tools used by teachers and how those were used in the educational context.

Initially the pilot research was conducted to a focus group consisting of 7 secondary teachers. The purpose was to obtain feedback on the questions and whether participants were able to understand or need to clarify any of the questions. Based on their feedback, few questions were rephrased. In addition researcher noticed that it took more than one hour to complete and they had difficulties in understanding some of the technology tools.

The pilot study was conducted in August 2013 in one of the secondary schools in Male’. The pilot instrument consists of 7 sections with a total of 38 questions. Out of twenty five teachers, nineteen teachers completed and submitted the questionnaire. Before distributing the questionnaire researcher met the teachers and briefly explained the purpose of this study and how the data would be used. In addition the importance of the pilot study to the actual research was also explicated.

Based on pilot survey responses, feedback and analysis, several changes were made to clarify item and answer the research questions. In addition, there were items that were repeated. In these cases, item were removed, combined together. Some items were added to address the research question while were removed because they were not relevant to this study. Some questions were modified to relate it to the research. The modification and changes made are shown in Table 01 given below.

Table 01: Changes made to the research instrument

Item	Changes made
i) How many hours you have to spend on each day at school? ii) On average how much time do you spend on teaching per week?	Question was removed.
On average how many hours per day do you spend in using computers?	New question was added.
Use of technology for communication and/or networking.	Teacher educators/lecturers use different kinds of technology enhanced activities in the teaching to inquire, discuss and communicate ideas
Use technology for your own development and learning.	Teacher educators encouraged student teachers to use technology to find information for their own and work independently.
Use technology to facilitate teaching-specific concepts or skills.	Teacher educators used technology in teaching to engage students in solving real world problems.
-Use technology as a management tool for preparing lessons. -Use of technology as a management tool for finding digital learning resources.	Teacher educators used internet only to get information for reading and lecture preparation.
Use of technology to support creativity.	In teacher education program, I used technology related games and simulations in teaching.
Use of technology as a management tool for organising your work and keep records.	- Teacher educators/lecturers use PowerPoint for instructional delivery. - Teacher educators/lecturers use computer/smart-board for instructional delivery.
Technology course/unit.	New item was added.

How well were you prepared for using computer-based technologies in your teaching from teacher education program(s) that you have undertaken?	New question was added.
Which of the following services do you feel the teacher education programs should provide ready access to students?	New question was added.
Do you have accessible computer at home?	Question was removed.
Is the working computer connected to internet?	Question was removed.
From the list below, please indicate whether any kind of hardware/software devices; a) have used in teacher education program b) available in the classroom/school c) current of using these	Question was removed.
The main role of the teacher is to transmit knowledge.	Good teaching encourages students to think for answers by themselves.
My students spend the majority of their seatwork time working individually.	Mostly learning occurs by drilling and practicing.
Teaching is simply telling, presenting or explaining the subject matter.	My primary role is to help students become learners, not to teach particular content.
Effective learning encourages more class discussion and group activities.	I make it priority in my classroom to give students time to work together when I am not directing.
During discussions I ask many open-ended questions and encourage students to ask questions to each other.	Teaching should be designed in such a way to help students to construct knowledge from their learning experience.
I generally use the teachers' guide to lead class discussions of a story or text.	Teaching is to provide students opportunity to do research to establish facts and knowledge.
I involve students in evaluating their own work and setting their own goals.	Every child is unique or special and deserves an education tailored to his/her particular needs.
I am a firm believer in paper-and-pencil test.	Learning means remembering what teachers have taught. Students have really learnt if they can remember it later.

I prefer to cluster students' desk or use tables so they can work together. I invite students to create many of my bulletin boards.	Students should be given many opportunities to explore, discuss and present their ideas.
I base students' grades primarily on homework, quizzes and tests.	Item was removed.
I believe that students learn best when there is a fixed schedule.	Item was removed.
I have centers in my classroom that students can work at, but only after their assigned work is finished.	Item was removed.
I prefer to assess students informally through observations and conferences.	Item was removed.
Question 34 (items a to j) which was on how teachers use technology for teaching practice.	New question was added.
Question 31, 32 and 33	Questions were removed.
Using computers will improve my performance in work.	New item was added.
Using computers will enhance my effectiveness.	New item was added.
Using computers will increase my productivity.	New item was added.
My interaction with computers is clear and understandable.	New item was added.
I find it easy to do work by using computers.	New item was added.
I find computers easy to use.	New item was added.
Computers make learning more interesting.	New item was added.
Working with computers is fun.	New item was added.
I look forward to the jobs that require me to use computers.	New item was added.
Training in the use of computers/basic computer.	Courses/workshops/training on the use of computer.
Education conferences or seminars on use of technology in teaching and learning (where teachers and/or researchers present their research results and discuss educational problems).	New question was added
Training on the pedagogical use of ICT in teaching and learning.	Training on the use of ICT in teaching and learning.

Course on multi-media (using digital video, equipment, etc.)	Item was removed.
Word processing (e.g. Microsoft word)	Item was removed.
Spreadsheet (e.g. Excel)	Item was removed.
Presentation software (e.g. PowerPoint)	Item was removed.
Database (e.g. Access)	Item was removed.
ICT training provided by school staff.	Item was removed.
Integrating the use of technology across subject areas maximises students learning.	Item was removed.
Integrating the use of technology across the subject areas maximises students learning.	Item was removed.
I think there is too much emphasis on using technology in the classroom.	Item was removed.
New technologies have a positive effect in transforming instruction.	Item was removed.
I do not plan to use technology in the classroom.	Item was removed.
Inefficiency of guidance by ICT coordinator/mentor.	Efficiency of guidance by ICT coordinator/mentor.
Not sufficient technical assistance for operating and maintenance of technical problems.	Adequate technical assistance for operating and maintenance of technical problems.
Inefficiency of school technical infrastructure about instructional technology.	Efficiency of school technical infrastructure about instructional technology.
Insufficient number of media (printer, scanner etc.) for effective use of computers.	Sufficient number of media (printer, scanner etc.) for effective use of computers.
Insufficient number of computers teachers use.	Sufficient number of computers teachers use.
Problems about accessible to the existing hardware (computer, overhead projector etc.).	Accessible to the existing hardware (computer, overhead projector etc.).
Accessible to hardware resources for students (printer, scanners etc.).	New item was added.
Outdated educational software and CD-ROMS.	Updated educational software and CD-ROMS.
Shortage copies of software for instructional purposes.	Adequate copies of software for instructional purposes.

Software is specific and/or adaptable for use.	Software is specific and/or adaptable for use.
Inefficiency number of school computer laboratory.	Sufficient number of school computer laboratory.
Sufficient number of computers for students use.	New item was added.

After making all the changes made to the research instrument based on the pilot survey results, the final data collection was carried out on June 2014.

7.08 Procedures for administering the research

Ministry of Education of Maldives was contacted to get the permission to conduct the research in the schools of Maldives (Appendix D) after approval from the University of Deusto (Appendix C). Once the grant was given (Appendix E), letters were sent to the heads of the respective schools to get the permission (Appendix F). School principals selected a senior staff (Senior Assistant Principal or leading teacher) from the school to coordinate and assist in the research. A meeting was organized with the coordinators and was briefed about the research. Furthermore, researcher stressed on the privacy and anonymity of the participants and no personal information such as names to be collected during the research. No identification numbers was used in the research instrument.

In some schools coordinators were able to organize a meeting with the teachers. During the meeting the purpose of the study was explained. Participants were also informed of their voluntary participation and ensured the anonymity and confidentiality of the study. Furthermore, they were assured that no personal identification data will be collected.

To the teachers who could not attend the meeting and to the schools where meetings could not be organized, coordinators were told to explain about the purpose of the research, privacy and anonymity of the participants. This is to ensure that the participants were well informed of the research, in case, if they left any statements without reading or unable to understand any of the statements from the consent form.

Coordinators were asked to get the signed informed consent form (Appendix G) from the participants before handing over the research package. Participants had to return the completed questionnaire to the coordinator in an enclosed envelope.

The research package consisted of:

- A copy of the consent letter of Ministry of Education, Maldives (Appendix E)
- Notification letter from Department of Education, University of Deusto (Appendix C)
- Cover letter stating the purpose of the research and contact details (Appendix G)
- Research questionnaire (Appendix A)
- Envelope

Separately, set of consent forms (Appendix H) were handed to the coordinators which is to be signed by the participants and given to the coordinator before handing over the research pack.

7.09 Population and Sampling

According to Ministry of Education statistics (School Statistics 2013, 2013), there are a total of 187 schools that provide lower secondary education of which 14 are located in the capital city Male’ which is also considered as the only urban island in the country. Remaining 173 schools are in different islands of the atolls. A total of 8223 teachers are working in these schools of which 7513 are trained teachers. The number of teachers working in the schools located in Male' is 1848 of which 593 were working in the lower secondary school. 365 (62 percent) were local teachers while 228 (38 percent) were expatriates (Statistics, 2013).

The population for this study were teachers working in lower secondary schools located in the capital city, Male' which were 593. All the teachers were given the questionnaire. Of the 593 possible research participants, 373 submitted the completed survey questionnaire, a response rate of nearly 68 percent (N=373). In social science if the response rate is 50 percent or more is considered as an acceptable rate (Richardson, 2005).

Table 02: Demographic data of the participants

Variable	Group	N	Percent
Gender	Female	242	64.9
	Male	131	35.1
	Missing	0	0
	Total	373	100
Age (years)	Under 20	3	0.8
	20 to 29	129	34.6
	30 to 39	142	38.1
	40 to 49	75	20.1
	50 to 59	20	5.4
	60 and above	4	1.1
	Missing	0	0
	Total	373	100
Status	Locals (Maldivian)	221	59.2
	Expatriate (Foreigner)	152	40.8
	Missing	0	0
	Total	373	100
Academic qualification	G.C.E O' level	27	7.2
	G.C.E A' level	27	7.2
	Bachelor Degree	206	55.2
	Master's and above	113	30.3
	Missing	0	0
	Total	373	100

Table 02 shows the descriptive information of the participants in this study. Of the 373 teachers who participated in the study, 242 (65%) were male and 131 (34%) were female. According to Ministry of Education (School Statistics 2013, 2013), 62 percent of the teachers working in Maldives are females. When comparing teachers working in the capital, 52 percent are females (School Statistics 2013, 2013). Hence the females working in the teaching sector was higher than that of males.

The age groups of the teachers were between 20 to 60+ years (refer table 02). The data shows that more than 70 percent of the teachers were in the age category of 20 to 39 years. It was also noted that that were few teachers above 60 years and lower that 20 years. In the age category 40 to 49 years were 20 percent while about 5 percent were between 50 to 59 years. The sample represents 59.2 percent of Maldivian teachers while 40.8 percent were expatriate teachers.

Regarding the academic qualification of teachers, more than half (55.2 percent) of the participants have achieved Bachelor’s degree and 30.3 percent have completed master’s degree or above programs.

Table 03: Descriptive data of participants teaching qualification and experience

Variable	Group	N	Percent
Completed any teacher education program	Yes	321	86.1
	No	52	13.9
	Missing	0	0
	Total	19	100
TEP Institute	Local (Maldivian)	191	59.5
	Overseas (foreign)	128	39.9
	Missing	2	0.6
	Total	321	100

Teaching qualification	Teaching Certificate	20	6.2
	Teaching Diploma	73	22.7
	Bachelor of Edu/Teaching	198	61.7
	Master of Education	28	8.7
	Missing	2	0.6
	Total	321	100
Teaching experience	1 to 5 years	127	34.0
	6 to 10 years	107	28.7
	11 to 15 years	53	14.2
	16 to 20 years	39	10.5
	Over 20 years	47	12.6
	Missing	0	0
	Total	373	100
Computer competence	Not prepared	33	10.4
	Not very well prepared	63	19.8
	Adequately prepared	136	42.8
	Well prepared	61	19.2
	Very well prepared	25	7.9
	Total	318	100.0

Table 03 shows the information about participants' teacher education and teaching experience. Approximately 86 percent of the participants have completed a teacher education program. Among the participants, about 60 percent of them completed teacher education program in a teaching institute of Maldives while 40 percent responded that they had completed teacher education program in a foreign country.

More than 53 percent of the respondents are graduate teachers. 62 percent of the respondents had bachelor of education/teaching certificate and 9 percent had completed master of education. Regarding teachers experience, 34 percent of the teachers have 5 or less than years of experience. Only 12 percent of the teachers have more than 20 years of teaching experience.

In addition, participants were asked on how well they were prepared to use technology for teaching practice from the teacher education program that they had undertaken. 43 percent responded that they were adequately prepared while 19 percent stated well prepared. About 30 percent responded that they were not prepared to use technology for teaching practice from the teacher education program.

Table 04: Participants use of computers

Variable	Group	N	Percent
Sources of Computer Skills	Have none	6	1.6
	Self-taught	186	49.9
	Secondary school	94	25.2
	University/College	153	41
	Friends/relatives	98	26.3
	Teacher Education	72	19.3
	Other(s)	61	16.4
Use of computers for activities other than work	Never	6	1.6
	A few times a year	12	3.2
	Almost monthly	21	5.6
	Weekly	76	20.4
	Daily	258	69.2
	Total	373	100

Participants were asked to state the sources where they have learnt computer knowledge and skills. Majority of the participants responded that they had learnt on their own or from friends or relatives (see Table 04). In addition, participants were also exposed to computer knowledge and skills from schools and universities. Regarding the teacher education, about 19 percent stated that they had learnt from teacher education programs.

7.10 Data Analysis Procedure

7.10.01 First stage of Analysis

In the data analysis procedure a variety of statistical methods were used in order to respond the research questions. The statistical software used were IBM SPSS Statistics 20 and LISREL8.72. The structural equation modelling (SEM) from LISREL8.72 was used to perform Confirmatory Factor Analysis of some scales. To determine the reliability and validity of the instrument various analysis such as internal consistency, Exploratory factor analysis and confirmatory factor analysis. In order to answer the research questions, a variety of analysis such as descriptive statistics (e.g. frequencies), ANOVAs, correlation were conducted.

In this research ANOVA was conducted to investigate the relation between participants' demographic characteristics and to the variables such as technology use, engage in the use of technology and pedagogical orientation. On the other hand Pearson correlation coefficient was used to explore the relationship between factors. For example the relationship between the pedagogical orientation and the use of technology among the participants.

During the interpretation of the results, it was noticed that there were strong correlation between factors resulting one-dimensional. There are number of reasons that this could happen. Among them could be due to social desirability response bias or extra intensity of the responses. The social desirability is referred to as individuals or participants prefer to be considered in a positive way by others. Error of proximity which is the tendency to respond the items that are near to each other similarly. Alternatively respondents tend to rate most items in the middle category which is referred to as central tendency error. According to Ross (2005) this could happen if the participants often dislike extreme positions or due to lack of knowledge. On the other hand, participants inclined to respond to give high ratings to most of the items or by agreeing with everything. This is known as Error of leniency. In contrast, there are participants who prefer to disagree or dislike to most of the items which is referred to as Error of severity. Also there are participants to tend to rate items according to how they feel about it in general. This is referred to as Halo effect error which is also commonly seen in Likert responses. With these, there are many other problems in the rating of the items which may cause problems in the analysis. In order to resolve these errors, ipsatization was carried out.

7.10.02 Computation of Ipsatization scores for survey

Self-reporting questionnaires tend to have number of disadvantages. Participants may not be willing to respond the questions or reveal their feelings. Moreover, there is the possibility of faking and purposely lying to the questions. Or else the tendency to respond extreme ratings or preference of disliking items. These errors as discussed in detail in the previous sections obviously could result bias due to dishonesty and inability of response. In order to reduce these bias, Ipsative scores were computed to the variables (Fisher, 2004). Ipsatizative scores computed in this study was by subtracting the mean of each case of all items within the scale from the individual item. To the result four points were added to make it non-negative value.

IT(Ipsative) = (ITEM Number– [Mean score of the total items in the scale]) + 4

For example: To calculate the ipsative score for IT34a

IT34aM = (IT34a – IT34M) + 4;   IT34M= mean score of all the items in 34

In the data analysis procedure a variety of statistical methods were used in order to respond the research questions. The statistical software used were IBM SPSS Statistics 20. By using two-step cluster analysis for the groups or clusters were derived. In order to answer the research questions, a variety of analysis such as descriptive statistics (e.g. frequencies) and CROSSTABS were conducted.

To investigate the various groups or clusters, cluster analysis was computed. Cluster analysis is an exploratory technique used to formulate homogeneous groups or clusters (share certain properties) of items or variables together. This would allow to see which participants or what characteristics the group may have common. In this study two-step clustering method was used with the algorithm Log-likelihood distance and Schwarz clustering criterion. The minimum number of clusters were specified as 2, 3, 4 and 5. All the clusters were analyzed and later were chosen the best cluster solution for the variables.

7.10.03 Limitations of Ipsatizative score

Certainly "ipsative scores make sense when comparing relative strength of traits within one individual" (Brown & Maydeu-Olivares, 2013, p.9). However, by using the ipsatizative score, it is not possible to measure the construct validity. Moreover, this violates to perform factor analysis as the correlation matrix is an artifact because the ipsativization force correlation (positive or negative) between variables (Brown & Maydeu-Olivares, 2013). For this reason, statistical analysis strategy used in this study will be cluster analysis for identification profiles or typologies of teachers.

7.11 Item analysis

The research instrument consists of eight sections composed of 40 items on a likert-scale. The first section was on demographic data of the participants and section two was about the computer knowledge and experience. The details of the item distribution and analysis are given in Table 05.

Table 05: Research questions, items and corresponding analysis

#	Research Question	Auxiliary Questions		Section	Item	Analysis
1)	What is the relationship between teaching orientation and use of technology?	a)	What is the relationship between participants' pedagogical orientation (constructivist) to use of technology (constructivist)?	Section 5 (IT33) & Section 5 (IT34)	ORI33_CT / TP34_CT	CROSSTABS
		b)	What is the relationship between participants' pedagogical orientation (constructivist) to use of technology (traditional)?		ORI33_CT TP34_CT	
		c)	What is the relationship between participants' pedagogical orientation (traditional) to use of technology (constructivist)?		ORI33_TT TP34_CT	
		d)	What is the relationship between participants' pedagogical orientation (traditional) to use of technology (traditional)?		ORI33_TT TP34_CT	
2)	What is the relationship between teachers' attitudes toward the use of technology and use of technology?	a)	Is there a relationship between participants' attitude towards the use of technology (IT35_AT) to the constructivist use of technology (TP34_CT)?	Section 6 (IT35) & Section 3	IT35_AT & TP34_CT	CROSSTABS
		b)	Is there a relationship between participants' attitude towards the use of technology (IT35_AT) to the traditional use of technology (TP34_TT)?		IT35_AT & TP34_TT	

<table>
<tr><td rowspan="2">3)</td><td rowspan="2">What is the relationship between perceived ease of use and perceived usefulness to use of technology?</td><td>a)</td><td colspan="2">Is there a relationship between teachers' attitudes toward the use of technology (IT35_AT) to perceived ease of use (IT35_PEU)?</td><td rowspan="2">Section 6 (IT35)</td><td>(IT35_PEU)?</td><td rowspan="2">CROSSTABS</td></tr>
<tr><td>b)</td><td colspan="2">Is there a relationship between teachers' attitudes toward the use of technology (IT35_AT) to perceived ease of use (IT35_PU)?</td><td>&
(IT35_PU)?</td></tr>
<tr><td rowspan="4">4)</td><td rowspan="4">What is the relationship between the training programs and use of technology?</td><td></td><td colspan="2">What is the relationship between participants' use of technology in teaching to:</td><td rowspan="4">Section 1 & section 5 (TP34_CT/ TP34_TT)</td><td rowspan="4">TEP19
IT15_CT
IT15_TT
IT16_HTE
IT36_ATP</td><td rowspan="4">Univariate Analysis of Variance/

Correlation</td></tr>
<tr><td></td><td>TP34_CT</td><td>TP34_TT</td></tr>
<tr><td>a)</td><td>Teacher education program (CT & TT)</td><td>Teacher education program (CT & TT)</td></tr>
<tr><td>b)</td><td>Professional development program</td><td>Professional development program</td></tr>
<tr><td rowspan="8">5)</td><td rowspan="8">What is the relationship between use of technology and other internal and external factors?</td><td></td><td colspan="2">What is the relationship between participants' use of technology in teaching to:</td><td rowspan="8">Section 1 & section 5 (TP34_CT/ TP34_TT)</td><td rowspan="8">IT03_SEX,
IT04_AGE,
IT05_TE,
IT20
IT12(a-g),
IT40_TS,
IT40_RS</td><td rowspan="8">Univariate Analysis of Variance/

Correlation</td></tr>
<tr><td></td><td>TP34_CT</td><td>TP34_TT</td></tr>
<tr><td>a)</td><td>gender</td><td>gender</td></tr>
<tr><td>b)</td><td>age</td><td>age</td></tr>
<tr><td>c)</td><td>teaching experience</td><td>teaching experience</td></tr>
<tr><td>d)</td><td>Computer literacy/competence</td><td>Computer literacy/competence</td></tr>
<tr><td>e)</td><td>Technical support</td><td>Technical support</td></tr>
<tr><td>f)</td><td>Resources</td><td>Resources</td></tr>
</table>

7.11.01 Descriptive Statistics of the items

This section consists of the descriptive statistics of the items focused on teacher education program, pedagogical orientation, technology use, Attitudes towards the use of technology and resources.

Table 06: Descriptive Statistics for the items

NAME	LABEL	N	Mean	S.D.	Skewness	Kurtosis
IT19aM	learnt to use technology to support various learning styles	319	3.760	0.8560	-0.565	0.491
IT19bM	use different kinds of technology enhanced activities	319	4.096	0.6133	-0.019	-0.101
IT19cM	technology to find information on their own and work independently.	319	4.381	0.8300	-0.568	0.928
IT19dM	technology to collaborate with each other.	319	4.092	0.7238	-0.260	0.576
IT19eM	technology related games and simulations in teaching.	319	3.672	0.7617	-0.520	0.591
IT19fM	technology used to engage students in solving real world problems.	319	3.882	0.7188	0.460	1.398
IT19gM	used internet only to get information for preparation.	319	3.804	1.0662	-0.390	0.305
IT19hM	use PowerPoint for instructional delivery.	319	4.553	0.8499	-0.347	0.973
IT19iM	use computer/smart-board for instructional delivery.	319	3.795	0.9445	-0.659	0.390
IT19jM	Technology course/unit	319	3.964	0.6470	0.061	0.074
IT33aM	The main role of teacher is to transmit knowledge	365	3.9014	1.09733	-1.045	0.993
IT33bM	Mostly learning occurs by drilling and practicing	365	3.7671	1.04895	-0.805	0.663
IT33cM	Teaching is simply telling, presenting or explaining content.	365	2.3068	1.32884	-0.001	-0.864
IT33dM	Teaching is to provide students opportunity to do research	365	4.3178	0.74877	-0.927	2.505
IT33eM	Learning means remembering what the teaches has taught	365	2.6959	1.18115	-0.427	-0.593
IT33fM	Students have really learned something when they can remember it.	365	3.6877	0.94143	-1.217	2.152
IT33gM	Teaching encourages more class discussion and group activities	365	4.5973	0.69932	-0.990	2.916
IT33hM	… many opportunities to explore, discuss and present their ideas.	365	4.7205	0.63270	-0.553	1.574
IT33iM	… for students to construct knowledge from learning experiences.	365	4.6767	0.65058	-0.614	1.172
IT33jM	… need to be tailored to his/her particular needs.	365	4.5726	0.76723	-0.485	0.596
IT33kM	Good teaching encourages students to think by themselves.	365	4.7562	0.67801	-0.284	1.164

IT34aM	use word processor to writing lesson plans and making hand-outs	371	4.6836	1.08897	-0.495	1.658
IT34bM	Computers are used for students' grades	372	4.2854	1.18633	-0.644	0.547
IT34cM	I use internet to get information from internet for lessons	372	4.8902	0.89206	-0.500	2.027
IT34dM	I use PowerPoint to present information to students	372	4.4332	0.89354	-1.001	1.427
IT34eM	Using technology, can engage in solving real world problems.	372	3.9843	1.11319	-0.939	1.016
IT34fM	I use different kind of technology enhanced activities in my teaching to inquire, discuss and communicate their ideas.	372	4.1429	0.89085	-0.686	1.280
IT34gM	I am able to facilitate my students to use technology to find more information on their own and work independently.	372	3.9547	0.91361	-0.499	1.314
IT34hM	I facilitate my students to use technology to collaborate	372	3.7424	1.03097	-0.416	0.250
IT34iM	I use technology related games and simulations in teaching.	372	3.4467	1.11462	-0.365	-0.115
IT34jM	I use computer/ smart board for instructional delivery.	372	2.4386	1.44936	0.217	-0.160
IT35aM	Using computers will improve my performance in work.	372	4.04869	0.50260	-0.966	3.715
IT35bM	Using computers will enhance my effectiveness.	372	4.07019	0.42062	-0.116	1.902
IT35cM	Using computers will increase my productivity.	372	4.07826	0.52369	-2.185	15.022
IT35dM	My interaction with computers is clear and understandable.	372	3.82557	0.548993	-1.256	3.279
IT35eM	I find it easy to do work by using computers.	372	4.11858	0.519793	-0.635	4.159
IT35fM	I find computers easy to use.	372	4.12664	0.475996	-0.130	2.906
IT35gM	Computers make learning more interesting.	372	3.93578	0.481280	-1.575	10.093
IT35hM	Working with computers is fun.	372	3.86320	0.643247	-2.183	8.952
IT35iM	I look forward to the jobs that require me to use computers.	368	4.162	1.2017	0.419	1.479
IT40aM	Efficiency of guidance by ICT coordinator/mentor.	368	4.162	1.2017	0.419	1.479
IT40bM	Adequate technical assistance for operating and maintenance	368	4.374	0.9484	0.705	1.736
IT40cM	Efficiency of school technical infrastructure	368	4.091	0.7840	0.281	0.651
IT40dM	Sufficient number of media (printer, scanner etc.)	368	3.817	0.8531	0.137	0.751
IT40eM	Sufficient number of computers teachers use.	368	3.689	0.9134	0.035	2.378
IT40fM	Accessible to the existing hardware (computer, projector etc.)	368	3.885	0.7851	0.468	1.453
IT40gM	Accessible to hardware resources for students (printer, scanners).	368	3.827	0.6610	-0.088	2.323
IT40hM	Updated educational software and CD-ROMS	368	4.254	0.8728	0.562	0.420
IT40iM	Adequate copies of software for instructional purposes	368	4.026	0.7869	0.201	2.289

IT40jM	Software is specific and/or adaptable for use.	368	4.061	0.8581	0.648	3.331
IT40kM	Sufficient number of school computer laboratory.	368	3.890	0.7158	-0.092	0.775
IT40lM	Sufficient number of computers for students use.	368	3.925	1.0360	0.249	2.041

Descriptive statistics (Table 06) were conducted to calculate range, minimum and maximum value, mean, standard deviation, kurtosis and skewness. Values for skewness and kurtosis for majority of the items were are normal. However the items IT35aM, IT35cM, IT35gM and IT35hM deviated strongly from normality. When computing analysis including these items have to be extra cautious regarding the analysis of the results.

CHAPTER 8

Analysis and presentation of findings

CHAPTER 8

ANALYSIS AND PRESENTATION OF FINDINGS

This chapter presents the analysis and results of the findings of the research. The purpose of this research study was to investigate the use of technology among teachers and to explore the factors that facilitate the use of technology. The following section gives the analysis of the research.

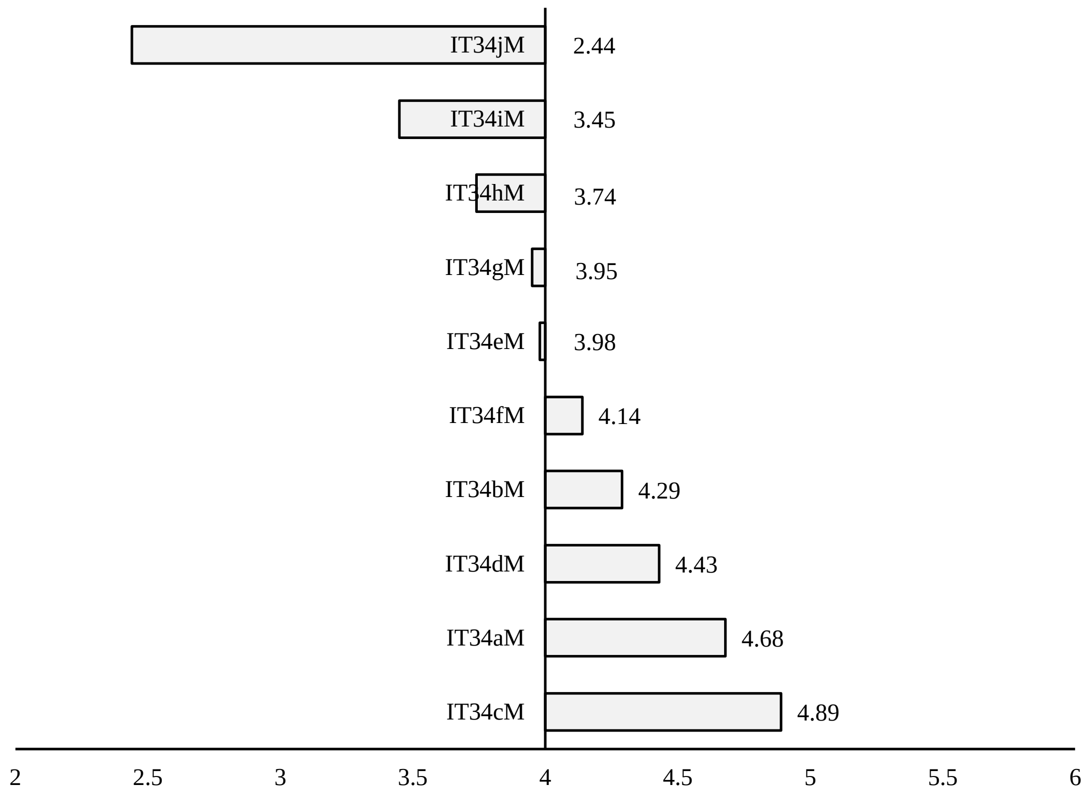
8.01 Technology use in teaching practice

The use of technology consists of 10 items. Table 07 shows the descriptive statistics of the items

Table 07: Descriptive statistics of Technology use

Name	Label	N	M	SD
IT34cM	I use internet to get information from internet for lessons	372	4.89	0.892
IT34aM	use word processor to writing lesson plans and making hand-outs	372	4.68	1.089
IT34dM	I use PowerPoint to present information to students	372	4.43	0.894
IT34bM	Computers are used for students' grades	372	4.29	1.186
IT34fM	I use different kind of technology enhanced activities in my teaching to inquire, discuss and communicate their ideas.	372	4.14	0.891
IT34eM	Using technology, can engage in solving real world problems.	372	3.98	1.113
IT34gM	I am able to facilitate my students to use technology to find more information on their own and work independently.	372	3.95	0.914
IT34hM	I facilitate my students to use technology to collaborate	372	3.74	1.031
IT34iM	I use technology related games and simulations in teaching.	372	3.45	1.115
IT34jM	I use computer/ smart board for instructional delivery.	372	2.44	1.449

Figure 15: Mean score for technology use in teaching practice



From the descriptive statistics, it is clearly seen that the mean for traditional use of technology was higher than the items for constructivist use of technology. Among them, the highest was to get information from internet for the lessons. In addition, using word processor to write lesson plans and prepare handouts had a mean score.

8.01.01 Difference by gender and age in technology use in teaching practice

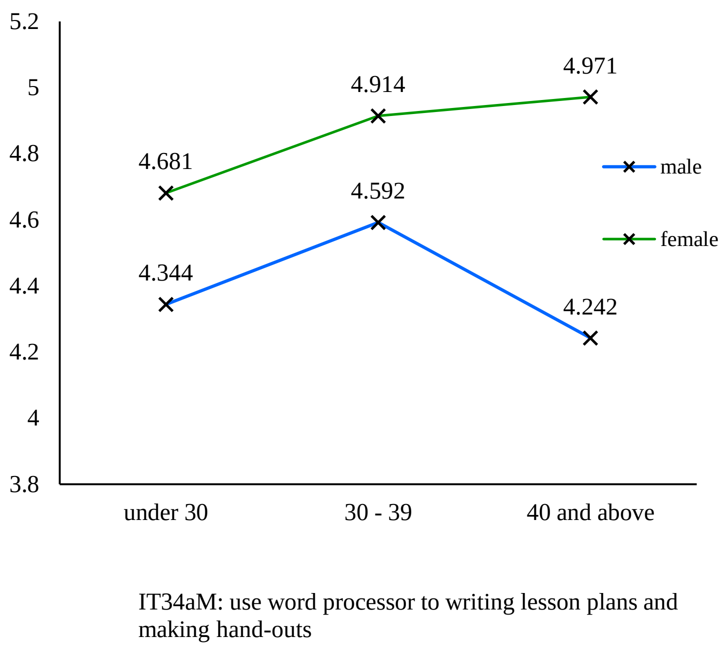
Univariate ANOVA was conducted between gender and age groups (independent variable) and the items of technology use in teaching practice (dependent variable). The output of the analysis were as given below.

Table 08: Descriptive Statistics of gender and age and use of technology

Independent variable	N
Male	131
Female	240
under 30	132
30 - 39	141
40 and above	98

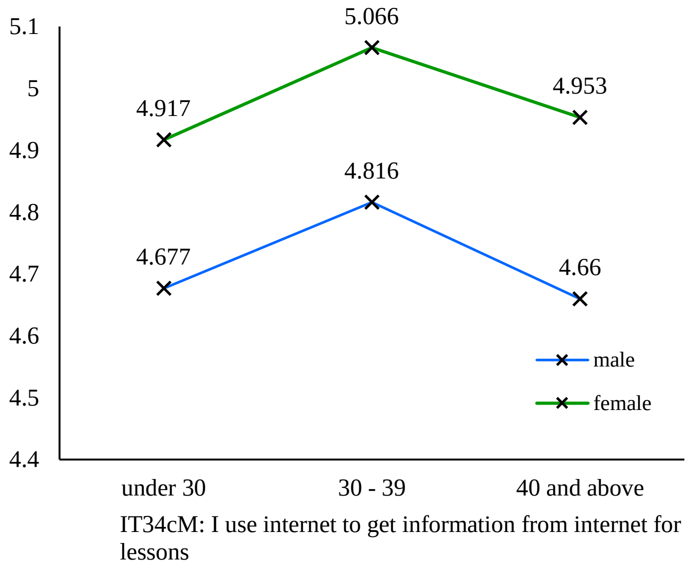
Univariate ANOVA was conducted to the items on technology use in teaching practice (see Table 36 and Table 37 in appendix B). From the results it is noted that some of the items had noticeable differences. To these items graphs were drawn below.

Figure 16: Difference in age and gender of IT34aM



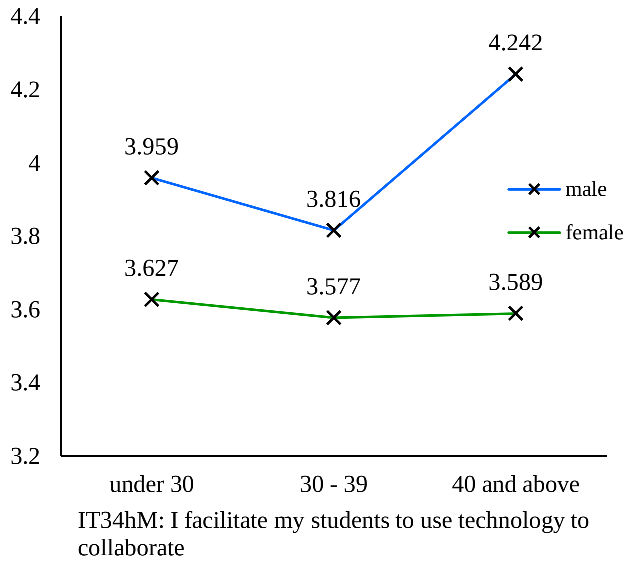
For the IT34aM on use of word processor for writing lesson plans and making hand-outs, the Univariate ANOVA result shows $F(1, 370) = 15.500$, $p < 0.001$, $\eta^2=0.041$. This item has a significant difference as seen in the above graph (Figure 16). This item is referred as traditional use of technology. The above graph shows that females use of word processor for writing lesson plans and making hand-outs was more compared to the male participants in all the age groups. Participants who were 40 years and above the difference between male and female was very significant compared to the younger participants.

Figure 17: Difference in age and gender of IT34cM



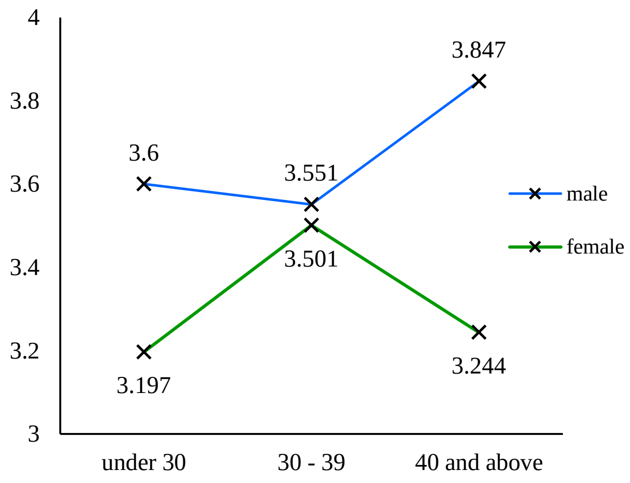
IT34cM on use of internet to get information from internet for lessons referred to as traditional use of technology, the Univariate ANOVA result shows F (1, 370) = 5.516, $p < 0.009$, $\eta^2=0.019$. This item has a difference as seen in the above graph (Figure 17). The above graph shows that females use of internet to get information from internet for lessons were more compared to the male counterparts in all the age groups.

Figure 18: Difference in age and gender of IT34hM



For the IT34hM on use of technology for collaboration, the Univariate ANOVA result shows F (1, 370) = 13.731, $p < 0.001$, $\eta^2=0.035$. This item is referred as constructivist use of technology. This item has a significant difference as seen in the above graph (Figure 18). The above graph shows that female use of technology for collaboration was less compared to their male counterparts. The difference is significant in the age group 40 and above.

Figure 19: Difference in age and gender of IT34iM



IT34iM: I use technology related games and simulations in teaching.

For the IT34cM on use of technology related games and simulations in teaching, the Univariate ANOVA result shows $F (1, 370) = 10.221, p < 0.005$, $\eta^2=0.023$. This item is referred as a constructivist use of technology. This item has a significant difference as seen in the above graph (Figure 19). The above graph shows that male participants use of technology related games and simulations were more compared to the female counterparts in all the age groups. However, it is noticeable that in the age group of 30 to 39 years does not shows major difference.

8.01.02 Typologies of technology use for teaching practice

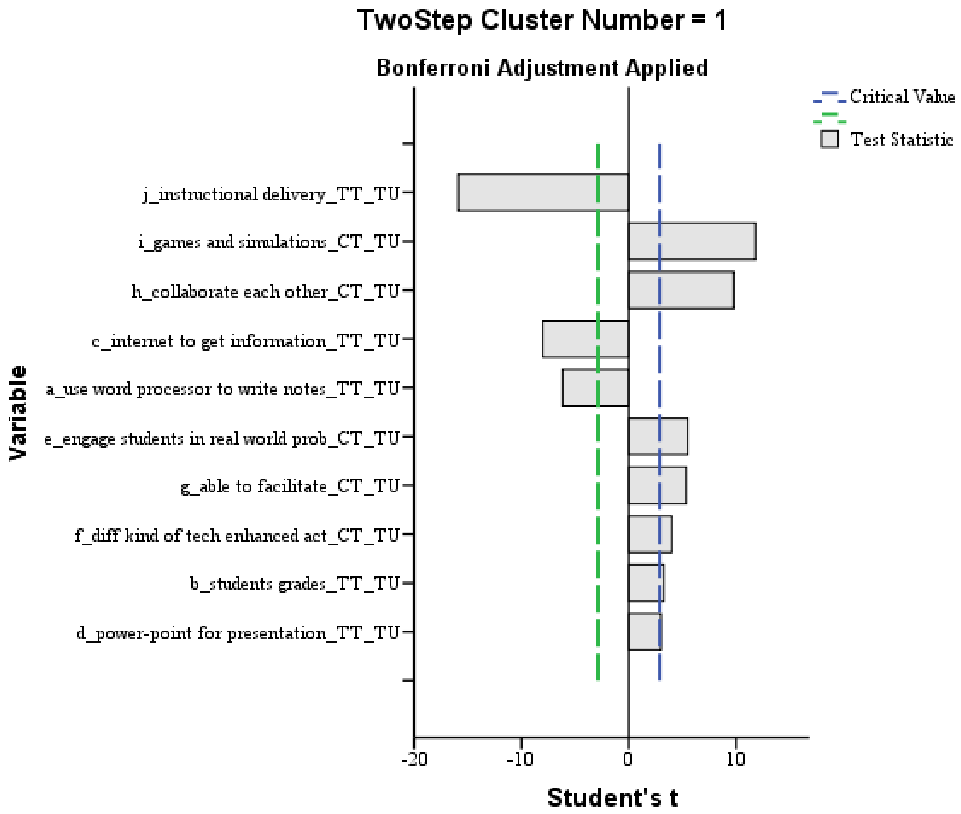
The two-step cluster analysis were carried out. The number of clusters were predefined. To determine the final clusters, various clusters heterogeneity were compared. To determine the items that were more significant in each group or cluster, the critical line on Bonferroni Adjustment graph were analyzed. These lines determines the significance level. Using two-step cluster analysis, technology use items were categorized into 5 homogeneous subgroups.

Table 09: Distribution of Technology use clusters

		N	% of Combined	% of Total
Cluster	1	91	24.5%	24.4%
	2	42	11.3%	11.3%
	3	112	30.2%	30.0%
	4	74	19.9%	19.8%
	5	52	14.0%	13.9%
	Combined	371	100.0%	99.5%
Excluded Cases		2		0.5%
Total		373		100.0%

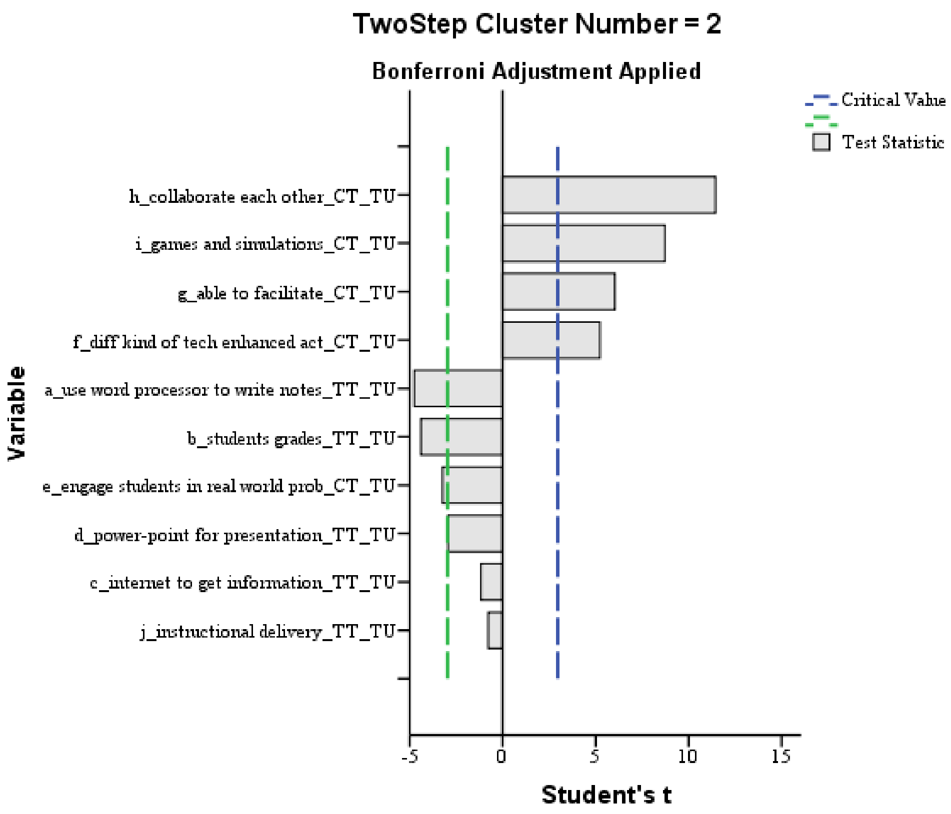
Table 09, shows the distribution of the clusters. The cluster or typology 3 contains 30.2 percent of the total participants, showing a high level compared to the other clusters. The graphs (Figure 20 to 24) shows the distributions of the items in each cluster. Also indicates which of the items within the cluster were significant.

Figure 20: Cluster 1 of technology use in teaching practice



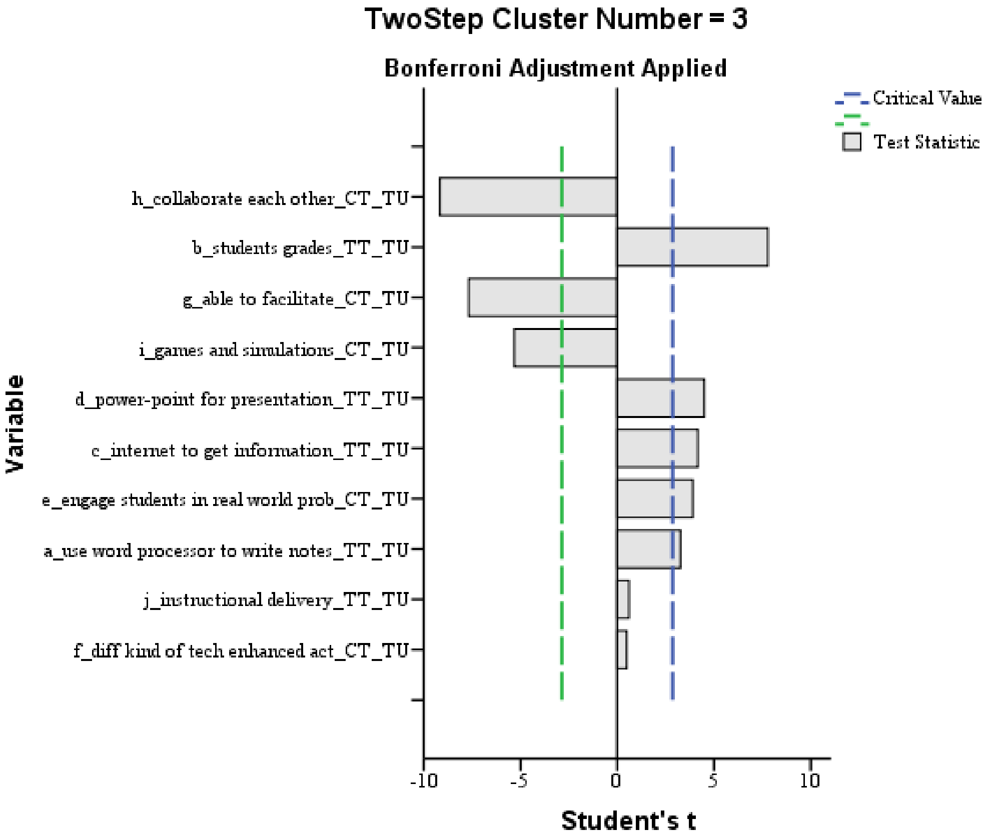
The first cluster or typology in Figure 20, contains 24.5 percent of the total participants which is also the second largest cluster. Looking at the items within the cluster, IT34iM (games and simulations) and IT34hM (collaboration) were seeing to be the dominant compared to the other items (value Student t greater than 10). Both this items were referred as advanced use of technology for students learning. This cluster is labelled as **Constructivist (innovative learning environment)**.

Figure 21: Cluster 2 of technology use in teaching practice



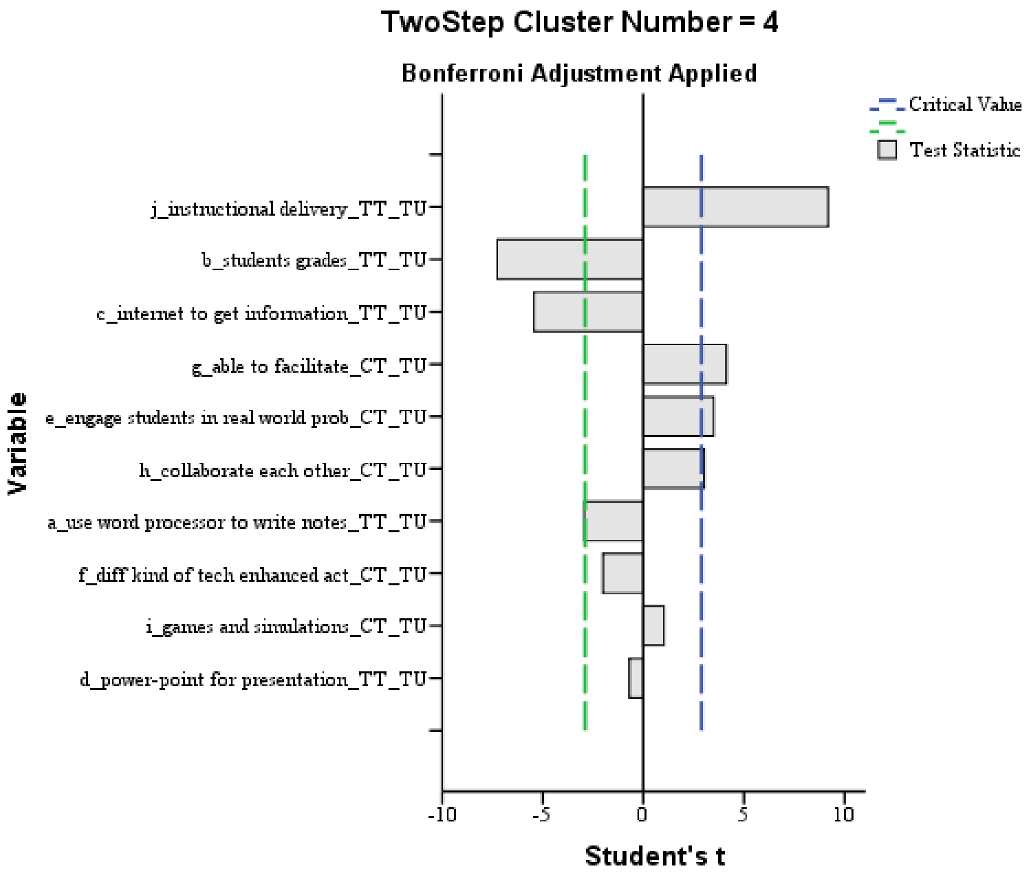
The second cluster or typology (Figure 21) composed of 42 participants which was 11.3 percent of the total. The four items in this cluster shows a high level of significance (value Student t between 5 and 15). It is also noted that all four items belong to the constructivist use of technology in teaching practice. In comparison to the first cluster or typology, this cluster also includes the IT34iM (games and simulations) and IT34hM (collaboration) but in addition to these two items, the items IT34gM (technology to facilitate) and IT34fM (various technology enhanced activities) shows significant to this cluster. Thus, this cluster is referred to as **Constructivist (emphasis on collaborative tools)**.

Figure 22: Cluster 3 of technology use in teaching practice



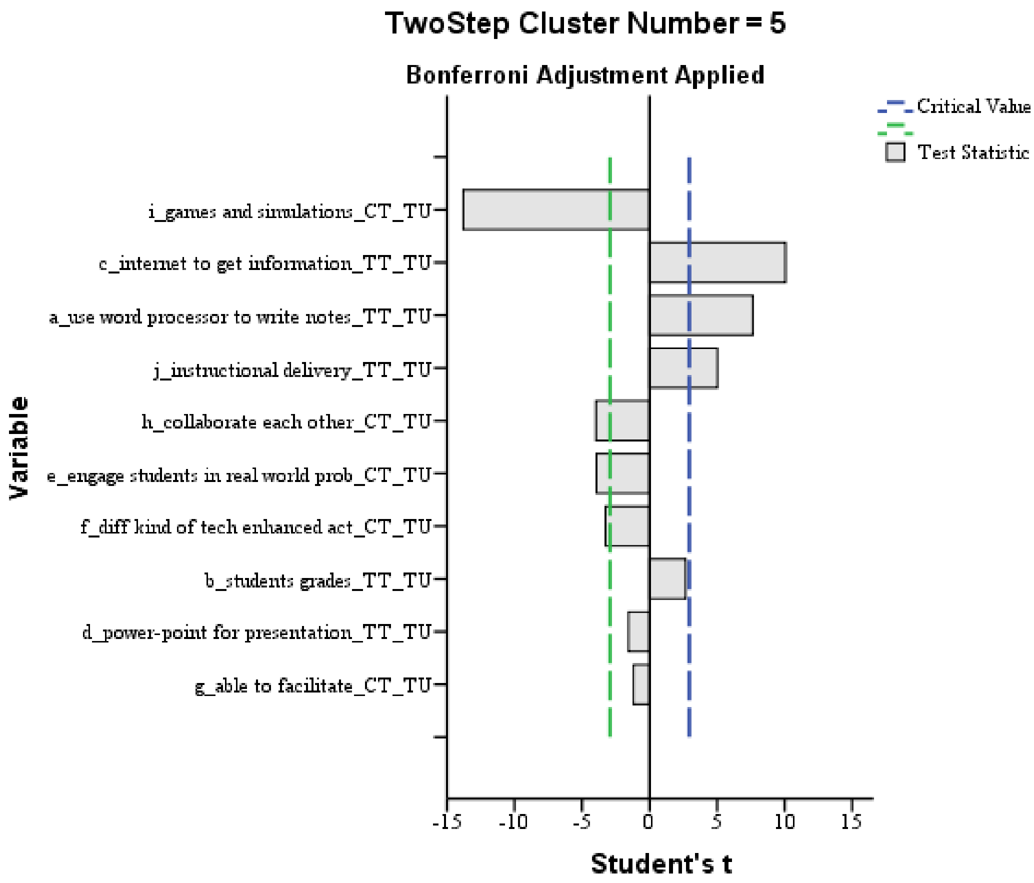
The third (Figure 22), which is the biggest cluster or typology consists of 113 participants which is 30.2 percent of the total. This cluster was composed of both traditional and constructivist use of technology in teaching practice. However, it was noted that the item IT34bM on teachers' use of technology for students' grades was the highest (value Student t close to 10). The other items IT34cM, IT34dM, IT34eM and IT34aM were also significant to this cluster. It is also noticed that IT34eM (use of technology to engage students in solving real world problems) which is the only constructivist use of technology item in this cluster has a value Student t of about 5. Thus, this cluster is labelled as **Mixed (emphasis on individual learning).**

Figure 23: Cluster 4 of technology use in teaching practice



This cluster or typology (Figure 23) consists of 74 participants which is 19.9 percent of the total. This cluster is composed of both traditional and constructivist use of technology items. However, it is noted that IT34jM use of technology (computer/smart board) for instructional delivery is very high (value Student t is about 10). The other items, IT34gM, IT34eM and IT34hM were all constructivist use of technology. All these items showed a value Student t below than 5) but shows a significant to the cluster. Thus, this cluster is labelled as **Mixed (emphasis on delivery)**

Figure 24: Cluster 5 of technology use in teaching practice



This cluster (Figure 24) is composed of 52 participants which is 14 percent of the total. The items in this cluster were IT34cM, IT34aM, IT34jM and IT34bM. It is noted that all these items were traditional use of technology, which is not seeing by the other clusters. Therefore, this cluster is labelled as **Traditional (emphasis on supporting work performance)**.

After identifying the clusters, CROSSTABS was computed between the cluster of use of technology and gender and age groups to analyse its distribution among the gender and age groups.

Table 10: Distribution of gender and age to use of technology clusters

			Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Total
Gender	Male	Count	41	20	33	30	7	131
		% within Clusters	**45.1**	**47.6**	29.5	40.5	**13.5**	35.3
	Female	Count	50	22	79	44	45	240
		% within Clusters	54.9	**52.4**	**70.5**	59.5	**86.5**	64.7
Total		Count	91	42	112	74	52	371
		% within Clusters	100	100	100	100	100	100
Age groups	under 30	Count	33	14	40	26	19	132
		% within Clusters	36.3	33.3	35.7	35.1	36.5	35.6
	30 - 39	Count	35	12	48	26	20	141
		% within Clusters	38.5	**28.6**	**42.9**	35.1	38.5	38.0
	40 and above	Count	23	16	24	22	13	98
		% within Clusters	25.3	**38.1**	**21.4**	29.7	25.0	26.4
Total		Count	91	42	112	74	52	371
		% within Clusters	100	100	100	100	100	100

Cluster 1= Constructivist (innovative learning environment)
Cluster 2= Constructivist (emphasis on collaborative tools)
Cluster 3= Mixed (emphasis on individual learning) Cluster 4= Mixed (emphasis on delivery)
Cluster 5 = Traditional (emphasis on supporting work performance)

Table 10 above shows that male participants has a major profile to Cluster 1 on constructivist (innovative learning environment) and Cluster 2 on constructivist (emphasis on collaborative tools) and noted a smaller attachment to traditional use of technology. As for female participants, a significant margin to cluster 5 on traditional use of technology and cluster 3 on mixed (strong traditional use) and less attachment to cluster 2 on constructivist (emphasis on collaborative tools). Generally male participants tend to use constructivist technology for teaching more than female counterparts. Many of the literature had pointed that gender is not apparent in recent studies (Bakr, 2011; Yusuf & Balogun, 2011; Sang et al., 2011). Haman et al (2008) revealed that male teachers tend to use technology more than female teachers. The results further revealed that constructivist teachers employ technology effectively in instructional practice then traditional teachers.

Looking at the age groups, participants in the age group of 30 to 39 tend to have a high profile to mixed (emphasis on individual learning) use of technology and low profile to constructivist (emphasis on collaborative tools). On the other hand, participants in the age group of above 40 shows an opposite result, tendency to have a high profile to constructivist (emphasis on collaborative tools) and low profile to mixed (emphasis on individual learning) use of technology. Generally, older participants tend to use technology for constructivist teaching compared to younger teachers.

Chi-square test (see Table 38 in appendix B) for association between pedagogical belief and use of technology shows that there was a statistically significant association between gender and use of technology, $\chi^2(16) = 19.998$, $p > 0.0001$. Similarly, there is a statistically significance between age groups and use of technology, $\chi^2(16) = 33.204$, $p > 0.0001$. From the symmetric measures, between gender and use of technology clusters shows a moderate association, however with age groups shows a weak association.

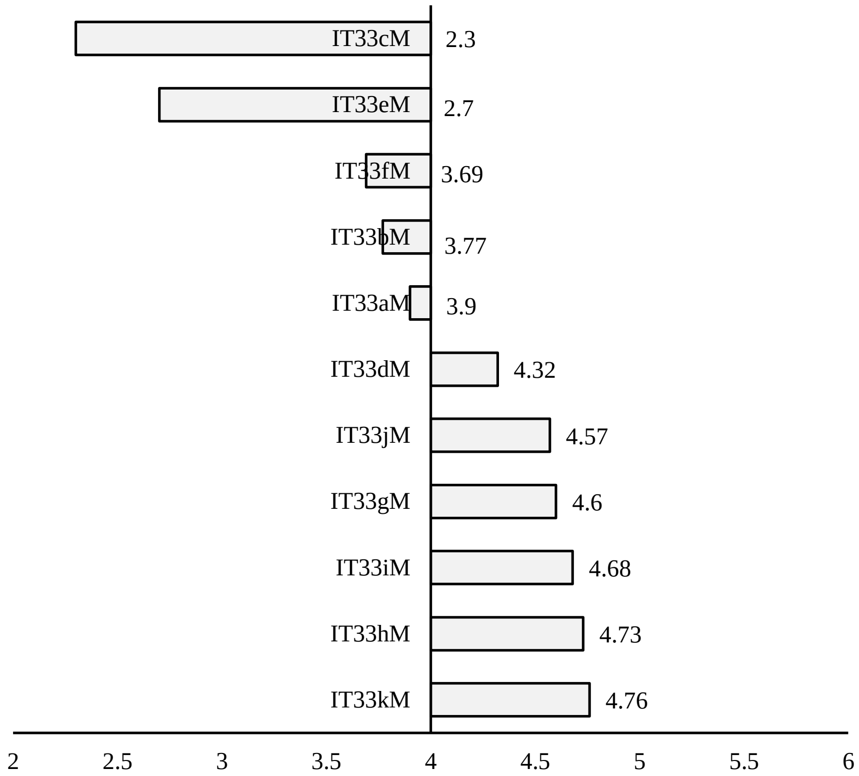
8.02 Pedagogical belief

Pedagogical belief consists of 11 items. Table 11 shows the descriptive statistics of the items

Table 11: Descriptive statistics of pedagogical belief

Name	Label	N	M	SD
IT33kM	Good teaching encourages students to think by themselves.	365	4.76	0.678
IT33hM	… many opportunities to explore, discuss and present their ideas.	365	4.73	0.632
IT33iM	… for students to construct knowledge from learning experiences.	365	4.68	0.651
IT33gM	Teaching encourages more class discussion and group activities	365	4.60	0.699
IT33jM	… need to be tailored to his/her particular needs.	365	4.57	0.767
IT33dM	Teaching is to provide students opportunity to do research	365	4.32	0.749
IT33aM	The main role of teacher is to transmit knowledge	365	3.90	1.097
IT33bM	Mostly learning occurs by drilling and practicing	365	3.77	1.049
IT33fM	Students have really learned something when they can remember it.	365	3.69	0.941
IT33eM	Learning means remembering what the teaches has taught	365	2.70	1.181
IT33cM	Teaching is simply telling, presenting or explaining content.	365	2.31	1.329

Figure 25: Mean score for pedagogical belief



From the descriptive statistics (Figure 25), it is clearly seen that the mean for constructivist pedagogical belief was higher than the items for traditional pedagogical belief. Among them, the highest was to encourage students to think by themselves. Lowest mean was teaching is simply telling, presenting or explaining content.

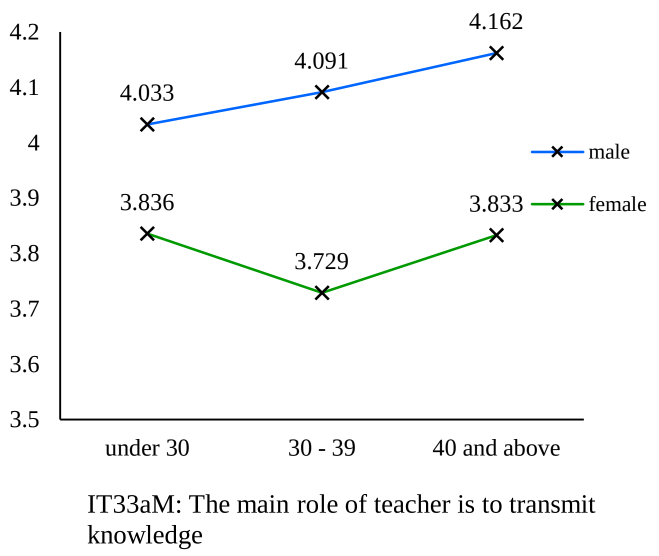
8.02.01 Difference by gender and age groups of pedagogical belief

Univariate ANOVA was conducted between gender and age groups (independent variable) and the items of pedagogical belief (dependent variable). The output of the analysis were in Table 39 and Table 40 (see appendix B).

Table 12: Descriptive Statistics of gender and age and pedagogical belief

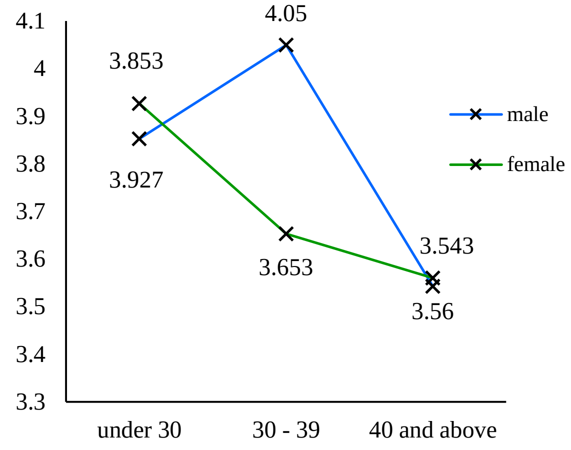
Independent variable	N
Male	130
Female	235
under 30	127
30 - 39	141
40 and above	97

Figure 26: Difference of age and gender of IT33aM



For the IT33aM on main role of teacher is to transmit knowledge, the Univariate ANOVA result shows *F* (1, 370) = 5.973, $p < 0.001$, η^2=0.016. This item has a significant difference as seen in the above graph (Figure 26). This item is referred as traditional pedagogical belief. The above graph shows that female participants' belief on the role of teacher as a transmitter were less compared to the male participants in all the age groups. This difference is more significant in the age group of 30 to 39.

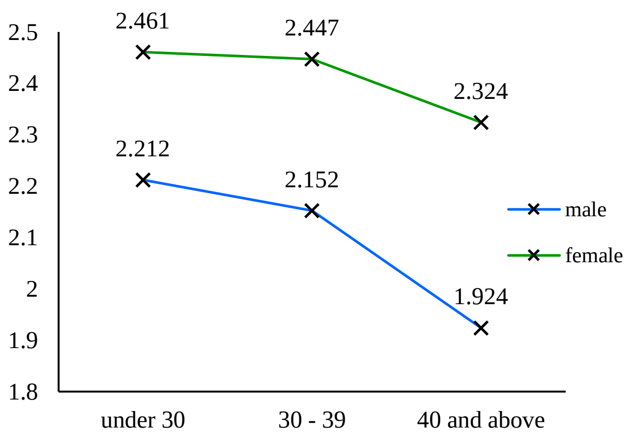
Figure 27: Difference of age and gender of IT33bM



IT33bM: Mostly learning occurs by drilling and practicing

For the IT33bM on learning occurs by drilling and practicing, the Univariate ANOVA result shows F (1, 370) = 4.585, $p < 0.05$, η^2=0.013. This item has a significant difference as seen in the above graph (Figure 27). This item is referred as traditional pedagogical belief. The above graph shows that female participants' belief on learning occurs by drilling and practicing were less compared to the male participants in all the age groups. This difference is more significant in the age group of 30 to 39. Also it is noticed that at the age group of 40 and above no difference is seen.

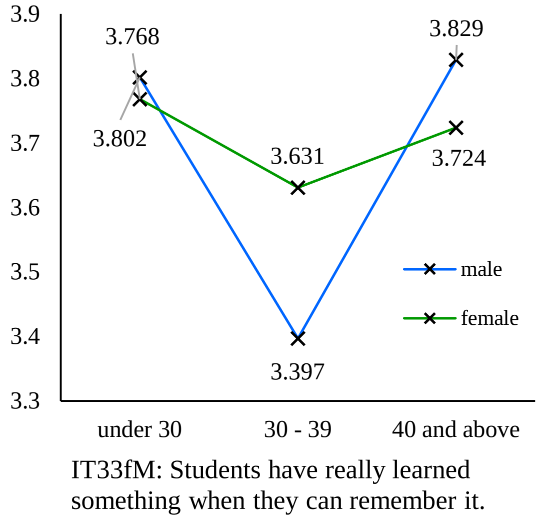
Figure 28: Difference of age and gender of IT33cM



IT33cM: Teaching is simply telling, presenting or explaining content

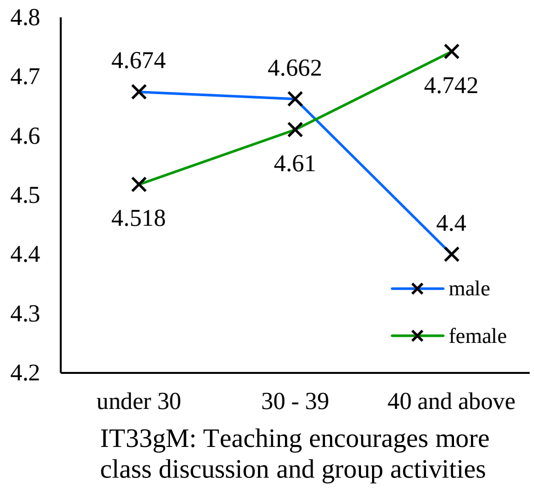
For the IT33bM, the Univariate ANOVA result shows F (2, 369) = 3.198, $p < 0.05$, η^2=0.018. This item has a significant difference as seen in the above graph (Figure 28). This item is referred as traditional pedagogical belief. The above graph shows that female participants' belief on teaching as simply telling, presenting or explaining content were more compared to the male participants in all the age groups. This difference is more significant in the age group of 40 and above.

Figure 29: Difference of age and gender of IT33fM



For the IT33fM on learning as remembering, the Univariate ANOVA result shows *F* (2, 369) = 3.171, $p < 0.05$, η^2=0.017. This item has a significant difference as seen in the above graph (Figure 29). This item is referred as a traditional pedagogical belief. The above graph shows that female participants' belief on learning as remembering were significantly more compared to the male participants in age group 30 to 39. In the other age groups no significant difference is seen.

Figure 30: Difference of age and gender of IT33gM



For the IT33gM on teaching encourages more class discussion and group activities, the Univariate ANOVA result shows *F* (2, 369) = 4.585, $p < 0.05$, η^2=0.020. This item has a significant difference as seen in the above graph (Figure 30). This item is referred as constructivist pedagogical belief. The above graph shows that female participants' of age group under 30's belief on teaching as encourages more class discussion and group activities were less compared to the male participants. However, female participants of age 40 and above were significantly more to male participants. Age group of 30 to 39 does not show major significant difference in this belief.

8.02.02 Typologies of pedagogical belief

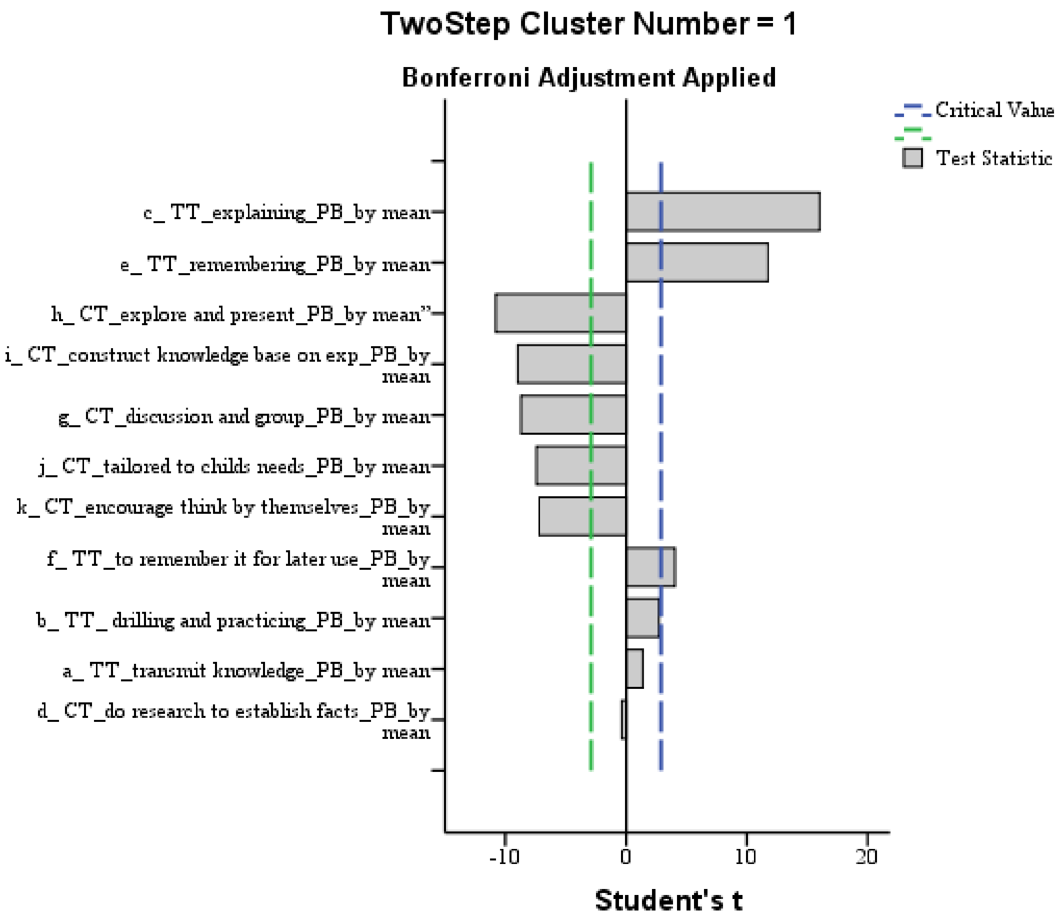
The two-step cluster analysis were carried out to group the pedagogical items. The number of clusters were predefined. To determine the final clusters, various clusters heterogeneity were compared. To determine the items that are more significant in each group or cluster, the critical line on Bonferroni Adjustment graph were analyzed. These lines determines the significance level. Using two-step cluster analysis, technology use items were categorized into 5 homogeneous subgroups.

Table 13: Distribution of pedagogical belief clusters

		N	% of Combined	% of Total
Cluster	1	121	33.2%	32.4%
	2	57	15.6%	15.3%
	3	87	23.8%	23.3%
	4	63	17.3%	16.9%
	5	37	10.1%	9.9%
	Combined	365	100.0%	97.9%
Excluded Cases		8		2.1%
Total		373		100%

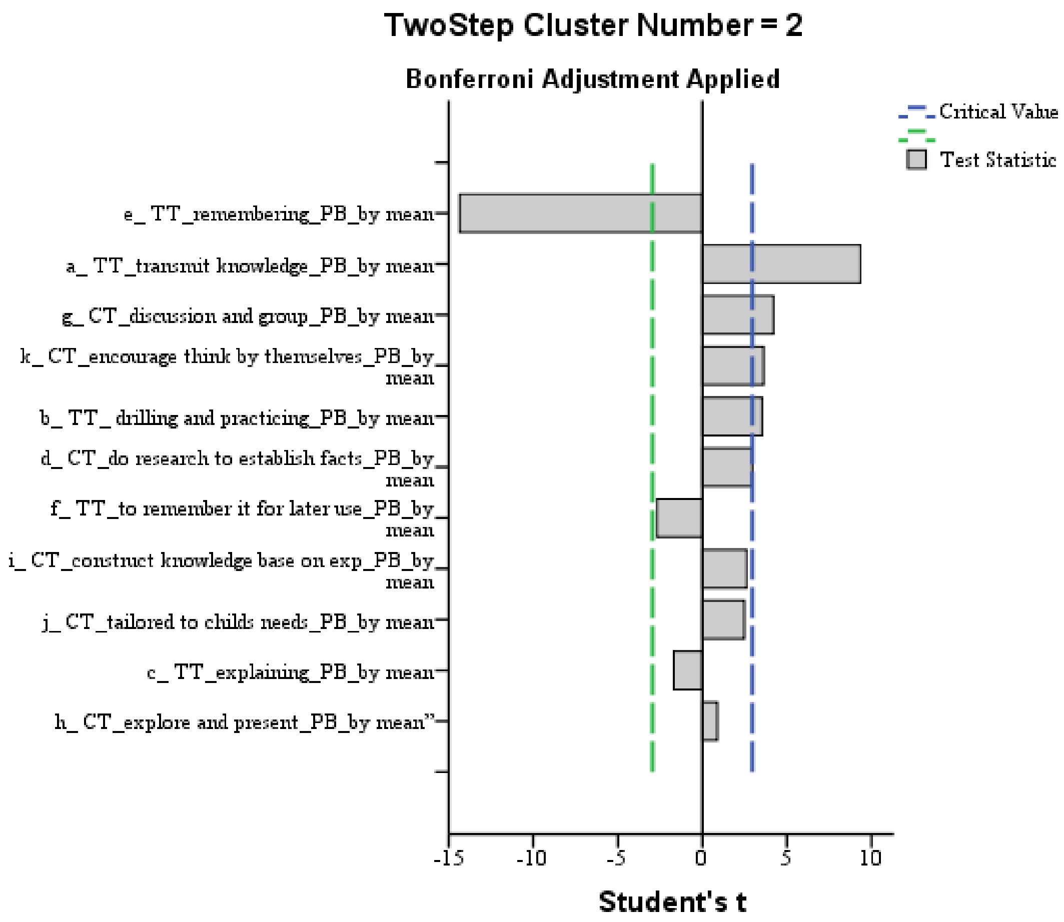
Table 13, shows the distribution of the clusters. The cluster or typology 1 contains 33.2 percent of the total participants, showing a high level compared to the other clusters. The graphs (Figure 31 to 35) shows the distributions of the items in each cluster. Also indicates which of the items within the cluster were significant.

Figure 31: Cluster 1 of pedagogical belief



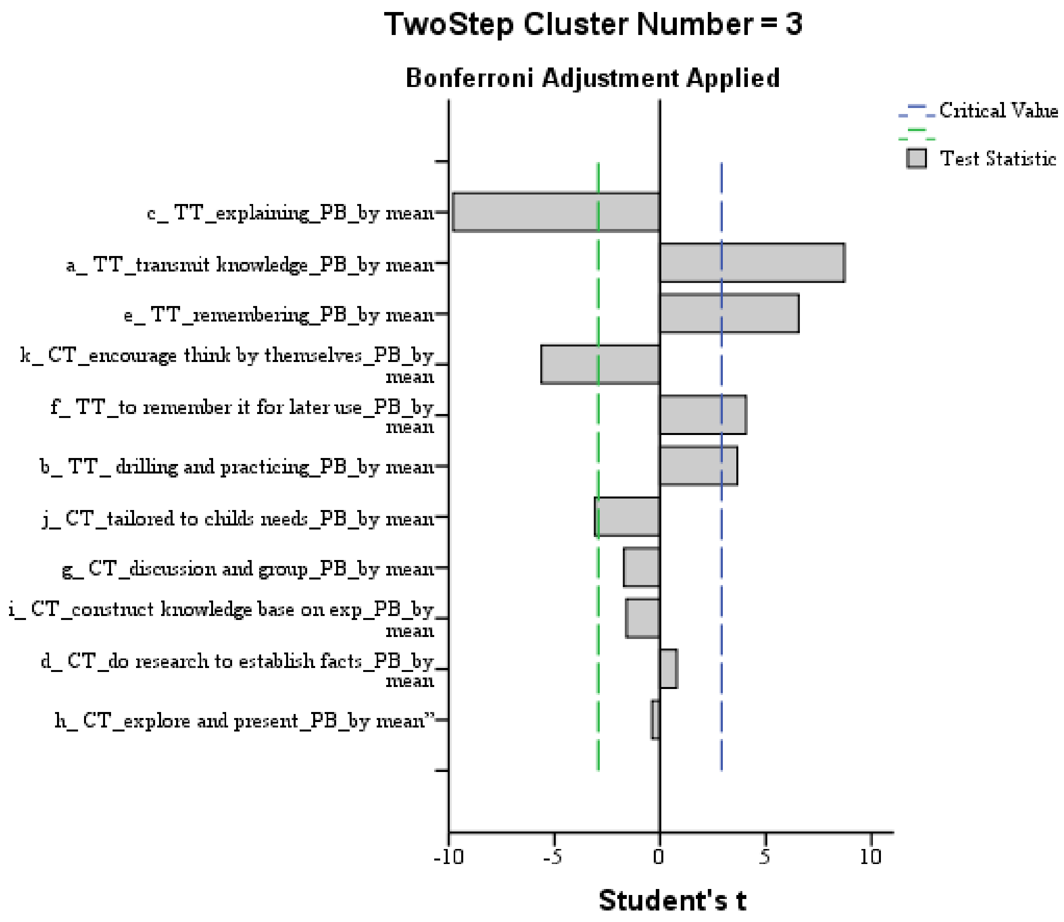
The first cluster or typology shown in Figure 31, contains 33.2 percent of the total participants which is the largest cluster. Looking at the items within the cluster, IT33cM (presenting and explaining content) and IT33eM (learning means remembering) were seeing to be the dominant compared to the other items (value Student t greater than 15). The IT33fM (remembering for later use) was also significant to the cluster. All these items were referred as traditional pedagogical belief. However, as all the traditional pedagogical belief item were not included in this cluster. From the description of the items, the cluster is labelled as **Traditional (emphasis on delivery for remembering)**.

Figure 32: Cluster 2 of pedagogical belief



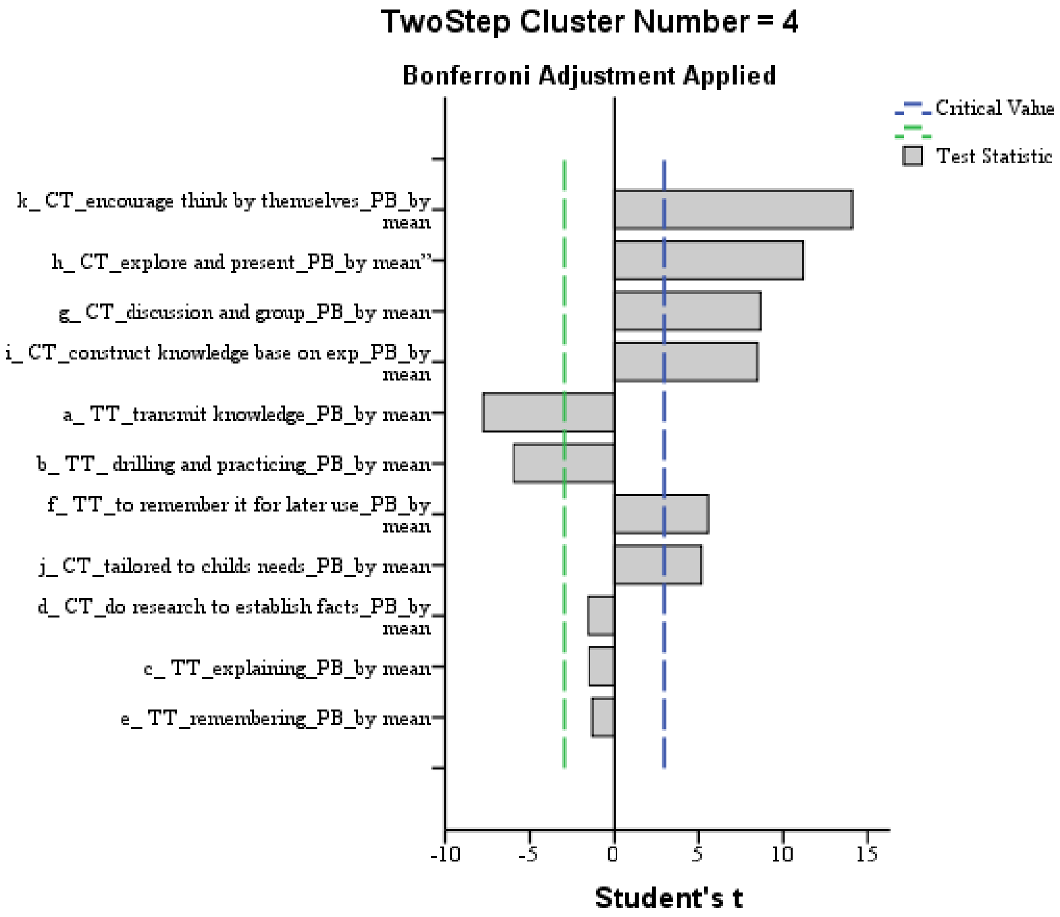
The second cluster or typology (Figure 32) composed of 57 participants which was 15.6 percent of the total. The item IT33aM shows a high level of significance (value Student t close to 10). The other four items in this cluster shows significance to the cluster. It is also noted that all four items belong to the traditional pedagogical belief and one of the item to constructivist pedagogical belief. Thus, this cluster is referred to as **Mixed (emphasis on delivery for understanding)**.

Figure 33: Cluster 3 of pedagogical belief



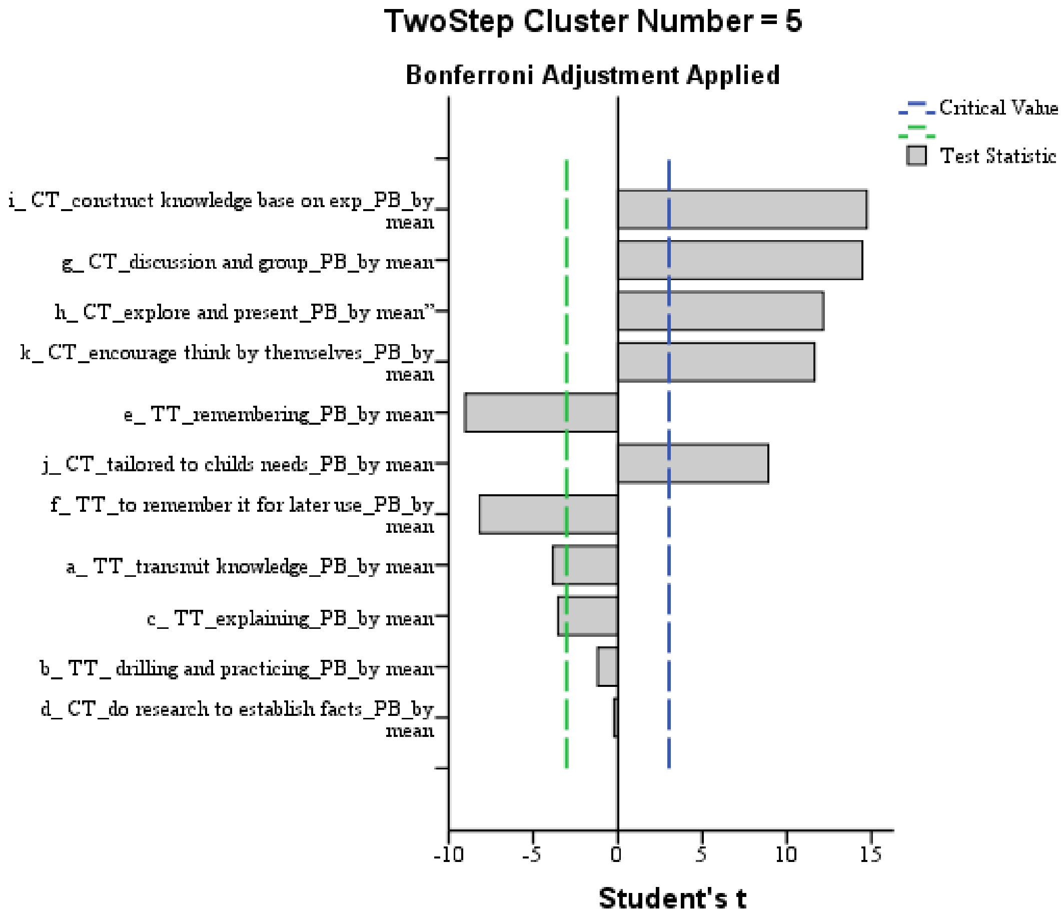
The third cluster or typology is the second largest of the group, consists of 87 participants which is 23.3 percent of the total. This cluster was composed of all traditional pedagogical belief items. However, it was noted that the item IT33aM on transmit knowledge was the highest (value Student t close to 10). Thus, this cluster is labelled as **Traditional pedagogical belief.**

Figure 34: Cluster 4 of pedagogical belief



This cluster or typology consists of 63 participants which is 16.9 percent of the total. This cluster is composed of both traditional and constructivist use of technology items. However, it is noted that IT33kM on encourage students to think by themselves and IT33hM on explore and present were very high (value Student t is greater than 10). The items in this cluster were both traditional and constructivist pedagogical belief but constructivist items were more and highly significant. This cluster is labelled as **Mixed (strong constructivist).**

Figure 35: Cluster 5 of pedagogical belief



This cluster is composed of 37 participants which is 9.9 percent of the total. This is the smallest cluster compared to others. All the items in this cluster belong to constructivist pedagogical belief and were highly significance. Therefore, this cluster is labelled as **Constructivist pedagogical belief.**

After identifying the clusters, CROSSTABS was computed between the cluster of use of technology and gender and age groups to analyse its distribution among the gender and age groups.

Table 14: Distribution of gender and age to pedagogical belief clusters

			Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Total
Gender	Male	Count	13	47	41	14	15	130
		% within Clusters	**29.5**	36.4	**46.1**	35.0	**23.8**	35.6
	Female	Count	31	82	48	26	48	235
		% within Clusters	**70.5**	63.6	**53.9**	65.0	**76.2**	64.4
Total		Count	91	44	129	89	40	63
		% within Clusters	100	100	100	100	100	100
Age groups	under 30	Count	13	46	33	9	26	127
		% within Clusters	29.5	35.7	37.1	**22.5**	**41.3**	34.8
	30 – 39	Count	22	47	28	22	22	141
		% within Clusters	50.0	36.4	**31.5**	**55.0**	34.9	38.6
	40 and above	Count	9	36	28	9	15	97
		% within Clusters	**20.5**	27.9	**31.5**	22.5	23.8	26.6
Total		Count	91	44	129	89	40	63
		% within Clusters	100	100	100	100	100	100

Cluster 1= Traditional (emphasis on delivery for remembering)
Cluster 2= Mixed (delivery for understanding) Cluster 3= Traditional
Cluster 4= Mixed (strong constructivist) Cluster 5 = Constructivist

Table 14 above shows that male participants has a major profile to Cluster 3 on traditional belief and noted a smaller attachment to Cluster 1 on Mixed (emphasis on delivery for remembering) and cluster 5 on Constructivist pedagogical belief. As for female participants, a significant margin to cluster 5 on constructivist pedagogical belief and less attached to cluster 3 on traditional pedagogical belief. Looking at the age groups, , participants in the age group under 30 years tend to have a high profile to constructivist pedagogical belief and low profile to Mixed (strong constructivist). Participants in the age group of 30 to 39 tend to have a high profile to mixed (strong constructivist) belief and low profile to traditional belief. On the other hand, participants in the age group of above 40 shows a high profile to traditional belief and low profile to mixed (emphasis on delivery for remembering).

Chi-square test (see Table 41 in appendix B) for association between pedagogical belief and use of technology shows that there wasn't any statistically significant association between gender and use of technology, $\chi^2(8) = 8.820$, $p > 0.05$. Similarly, no statistically significance between age groups and use of technology, $\chi^2(8) = 10.652$, $p > 0.5$.

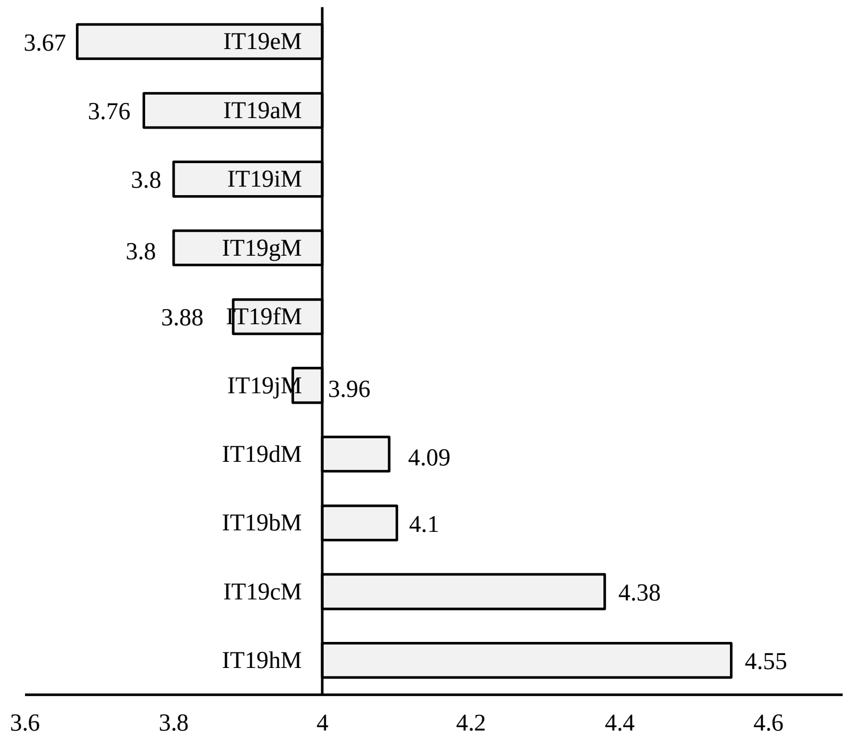
8.03 Teacher Training

Teacher training consists of 10 items. Table 15 shows the descriptive statistics of the items

Table 15: Descriptive statistics of Technology use

Name	Label	N	M	SD
IT19hM	use PowerPoint for instructional delivery.	319	4.55	0.850
IT19cM	technology to find information on their own and work independently.	319	4.38	0.830
IT19bM	use different kinds of technology enhanced activities	319	4.10	0.613
IT19dM	technology to collaborate with each other.	319	4.09	0.724
IT19jM	Technology course/unit	319	3.96	0.647
IT19fM	technology used to engage students in solving real world problems.	319	3.88	0.719
IT19gM	used internet only to get information for preparation.	319	3.80	1.066
IT19iM	use computer/smart-board for instructional delivery.	319	3.80	0.945
IT19aM	learnt to use technology to support various learning styles	319	3.76	0.856
IT19eM	technology related games and simulations in teaching.	319	3.67	0.762

Figure 36: Mean score for technology use in teaching practice



From the descriptive statistics, it is clearly seen that the mean for traditional use of technology was higher than the items for constructivist use of technology. Among them, the highest was for instructional delivery. In addition, to get information from internet for lesson preparation.

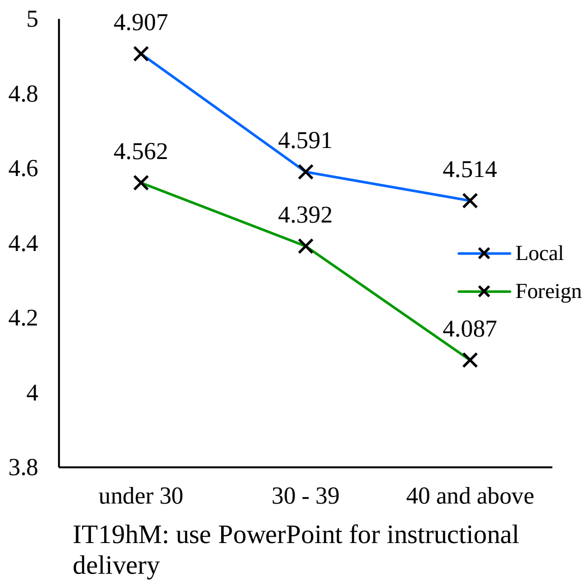
8.03.01 Difference by gender and age of teacher training

Univariate ANOVA was conducted between gender, age groups, local and foreigners (independent variable) and the items of technology use in teaching practice (dependent variable). The output of the analysis were in Table 42 to Table 45 (see appendix B).

Table 16: Descriptive Statistics of gender and age and teacher training

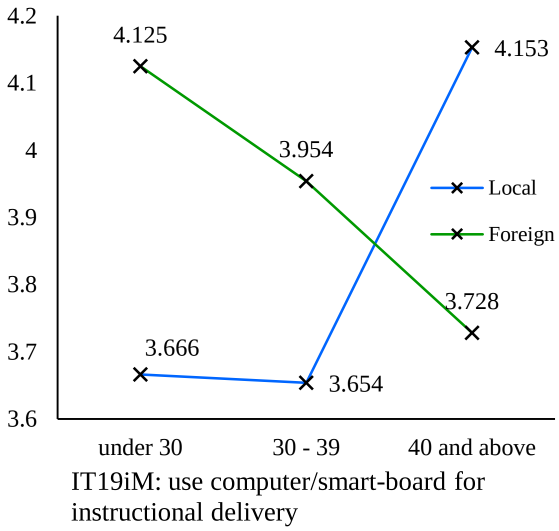
Independent variable	N
Male	104
Female	215
under 30	103
30 – 39	127
40 and above	89

Figure 37: Difference of age and nationality of IT19hM



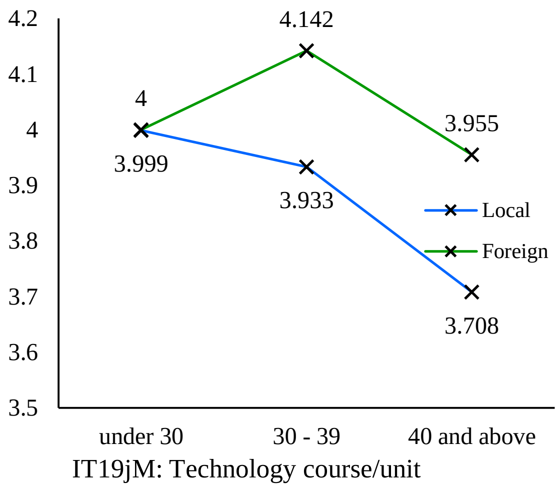
For the IT19hM on use of PowerPoint for instructional practice, the Univariate ANOVA result shows F (1, 370) =9.301, p < 0.005, η^2=0.029. This item has a significant difference as seen in the graph (Figure 37). This item is referred as traditional use of technology. The graph shows that there is a significant difference among the local and foreign participants in their exposure to the use of PowerPoint for instructional delivery in the teacher training program. Local participants tend to be exposed to more than the foreign participants. In the age group 40 and above shows a major significant difference among the two groups compared to the other two age groups.

Figure 38: Difference of age and nationality of IT19iM



For the IT19iM on use of computer/smart-board for instructional delivery, the Univariate ANOVA result shows F (2, 369) = 5.006, $p < 0.009$, η^2=0.031. This item has a significant difference as seen in the graph (Figure 38). This item is referred as traditional use of technology. The graph shows that there is a significant difference among the local and foreign participants in all the age groups. Local young participants tend to show a major significant difference in the use of smart-board while older participants the foreigners tend to show a significant difference compared to locals.

Figure 39: Difference of age and nationality of IT19jM



For the IT19jM on technology coure/unit, the Univariate ANOVA result shows F (2, 369) = 2.683, $p < 0.1$, η^2=0.017. This item has a significant difference as seen in the graph (Figure 39). This item is referred as traditional (stand-alone technology course). The graph shows that there isn't any significant difference among the local and foreign participants in exposure to technology course in their teacher training in the age group 30 and below. However, foreign teachers in the age group 30 and above shows a significant difference compared to local teachers.

8.03.02 Typologies of teacher training

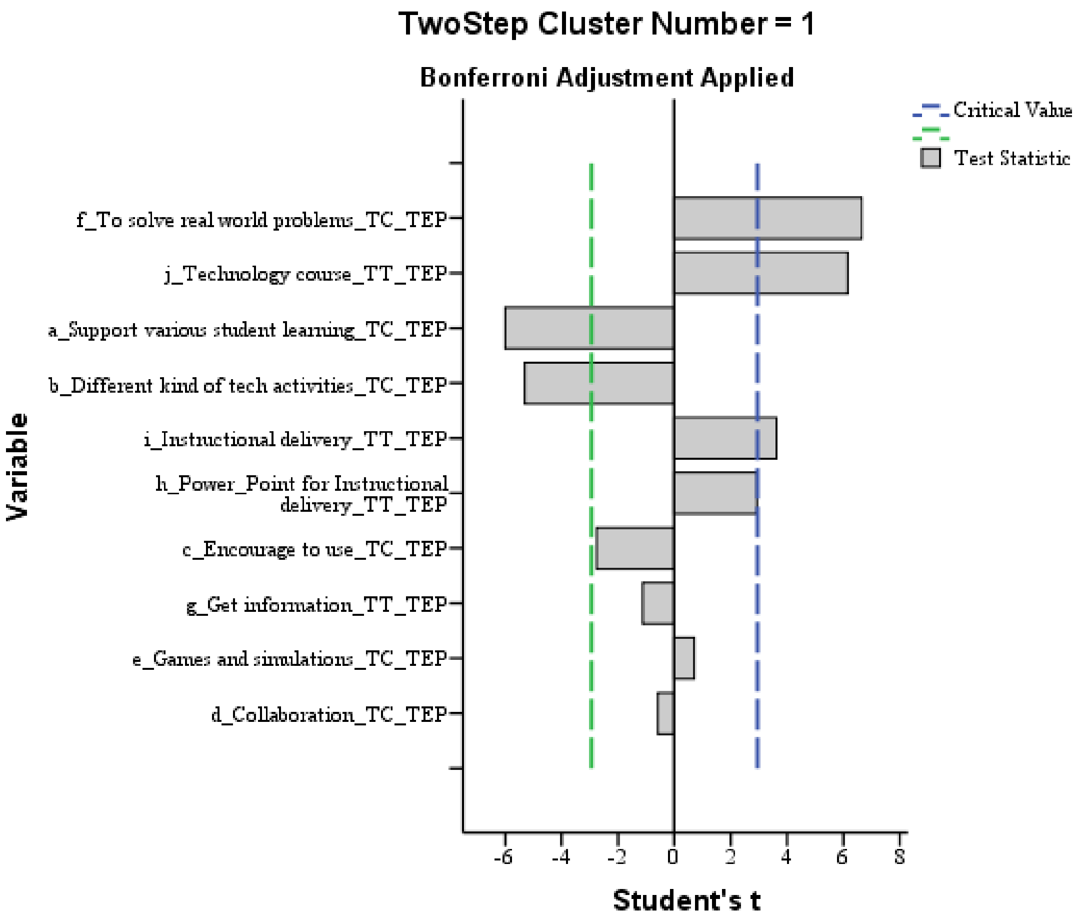
The two-step cluster analysis were carried out. The number of clusters were predefined. To determine the final clusters, various clusters heterogeneity were compared. To determine the items that are more significant in each group or cluster, the critical line on Bonferroni Adjustment graph were analyzed. These lines determines the significance level. Using two-step cluster analysis, technology use items were categorized into 5 homogeneous subgroups.

Table 17: Distribution of Technology use clusters

		N	% of Combined	% of Total
Cluster	1	49	15.4%	13.1%
	2	36	11.3%	9.7%
	3	49	15.4%	13.1%
	4	109	34.2%	29.2%
	5	76	23.8%	20.4%
	Combined	319	100.0%	85.5%
Excluded Cases		2		14.5%
Total		373		100.0%

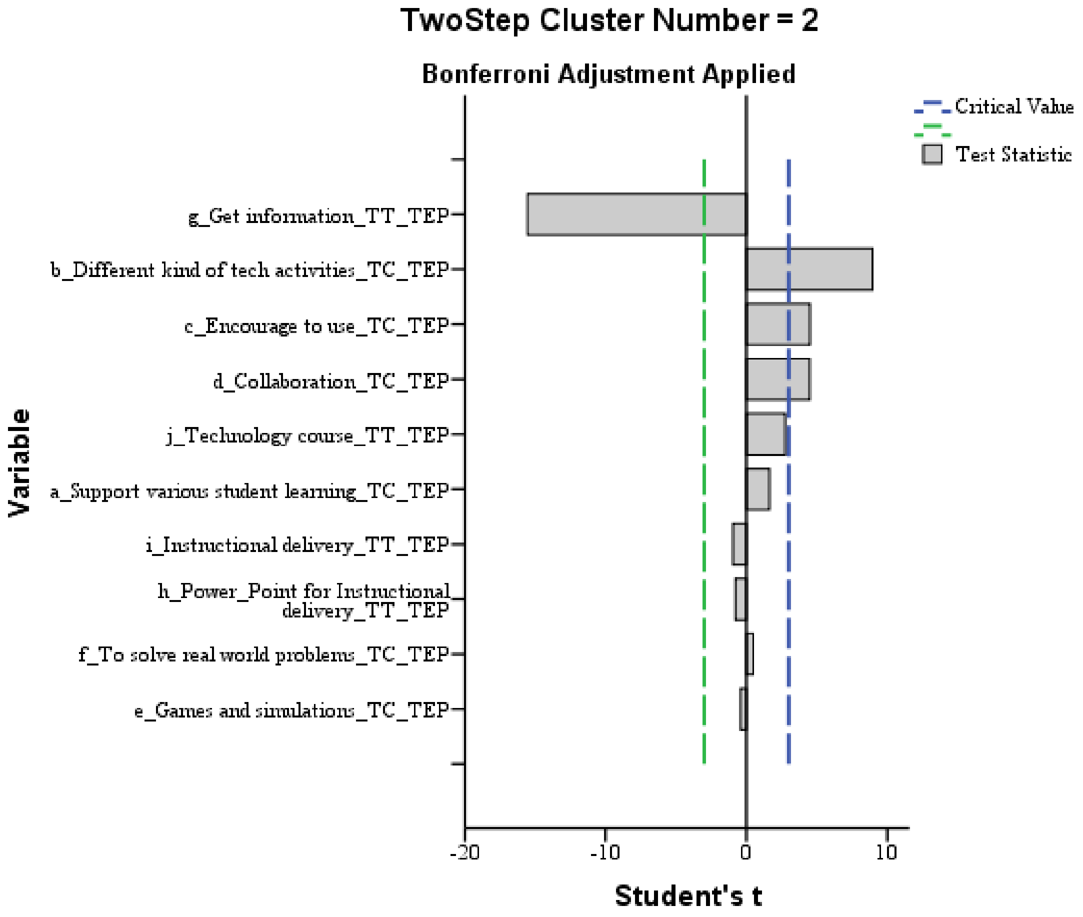
Table 17, shows the distribution of the clusters. The cluster or typology 4 contains 34.2 percent of the total participants, showing a high level compared to the other clusters. The graphs (Figure 40 to 44) shows the distributions of the items in each cluster. Also indicates which of the items within the cluster were significant.

Figure 40: Cluster 1 of teacher training



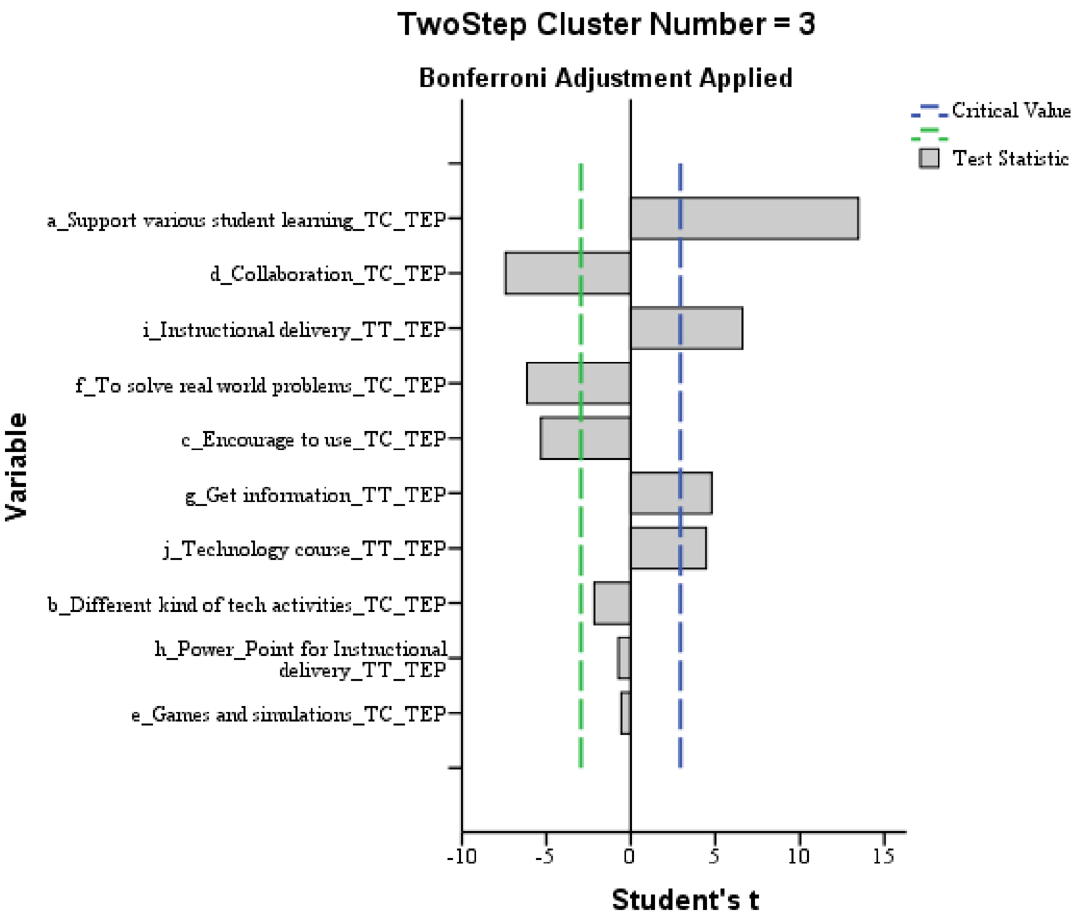
The first cluster or typology shown in Figure 40, contains 13.1 percent of the total participants. This cluster is composed of four items which are IT19fM, IT19jM, IT19iM and IT19hM. The most dominant items were IT19fM which was technology to solve real world problems and IT19jM on technology course. Out of the four items, three items were traditional use of technology. This cluster is labelled as **Traditional (adapted to context).**

Figure 41: Cluster 2 of teacher training



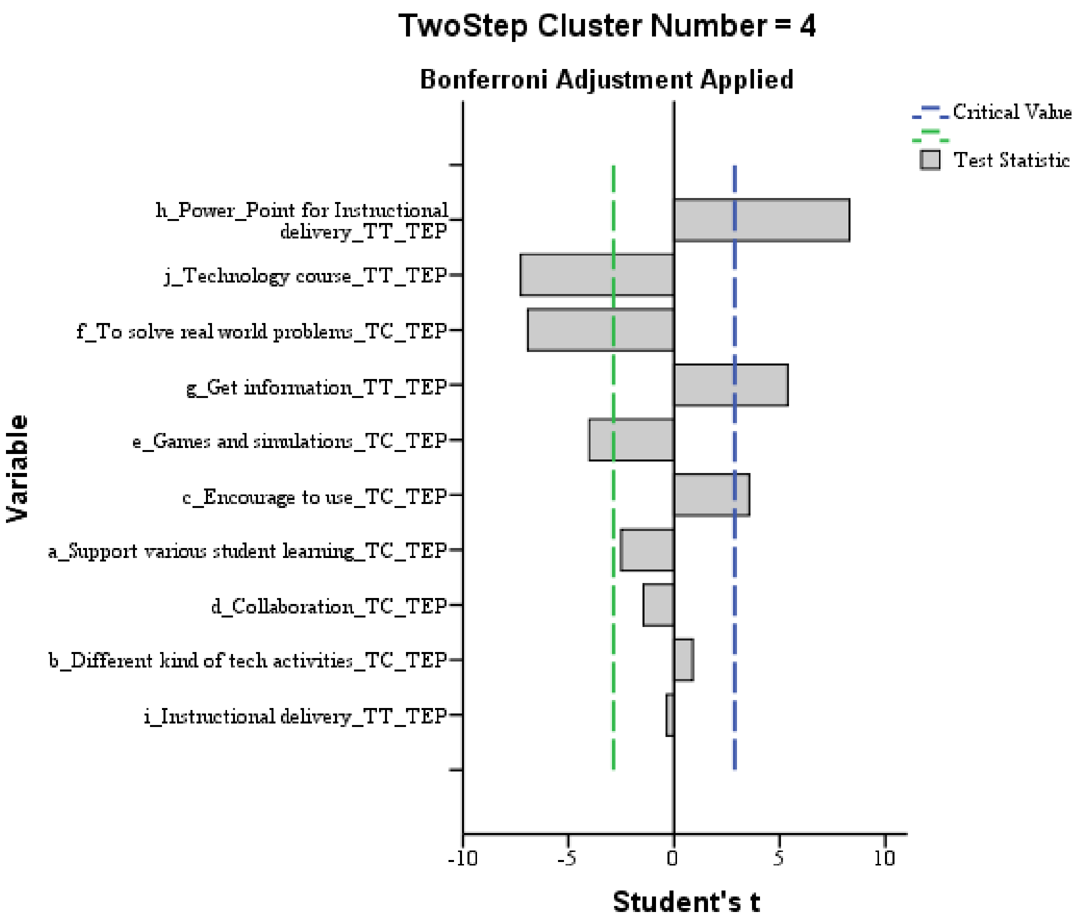
The second cluster or typology (Figure 41) composed of 36 participants which was 11.3 percent of the total. Four items that belong to both traditional and constructivist use of technology were in this cluster. However, three of the constructivist items were more significant. Thus, this cluster is referred to as **Constructivist (emphasis on technology activities)**.

Figure 42: Cluster 3 of teacher training



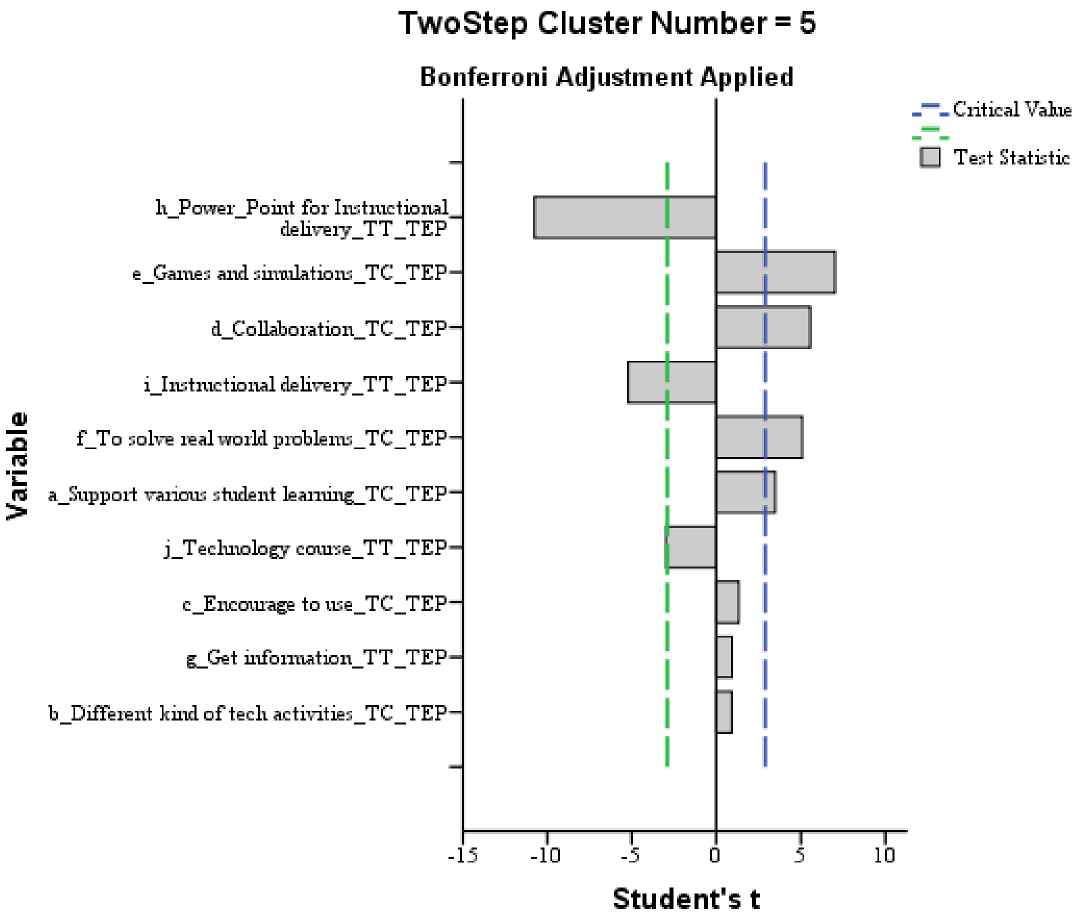
The third which is the biggest cluster or typology consists of 49 participants which is 13.1 percent of the total. This cluster was composed of both traditional and constructivist use of technology in teaching practice. However, it was noted that the item IT19aM on use of technology to support students learning (value Student t close to 15) were the highest and most significant. The other items IT19iM, IT19gM and IT19jM. This cluster is labelled as **Mixed (emphasis to variety of learning styles)**

Figure 43: Cluster 4 of teacher training



This cluster or typology consists of 109 participants which is 34.2 percent of the total which is also the largest cluster. This cluster is also composed of both traditional and constructivist use of technology items. However, it is noted that IT19hM on use of PowerPoint for instructional delivery use of technology (computer/smart board) for instructional delivery is very high (value Student t is close 10). Likewise, IT19gM on getting information for lesson preparation were also dominant. Thus, this cluster is labelled as **Mixed (emphasis on preparation and delivery)**

Figure 44: Cluster 5 of teacher training



This cluster is composed of 76 participants which is 23.8 percent of the total. All the items in this cluster belong to constructivist use of technology. Therefore, this cluster is labelled as **Constructivist (Innovative learning environment).**

After identifying the clusters, CROSSTABS was computed between the cluster of use of technology and gender and age groups to analyse its distribution among the gender and age groups.

Table 18: Distribution of gender, age and nationality to teacher training clusters

			Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Total
Gender	Male	Count	14	11	16	33	30	104
		% within Clusters	**28.6**	30.6	32.7	30.3	**39.5**	32.6
	Female	Count	35	25	33	76	46	215
		% within Clusters	**71.4**	69.4	67.3	69.7	**60.5**	67.4
Total		Count	91	49	36	49	109	76
		% within Clusters	100	100	100	100	100	100
Age groups	under 30	Count	15	14	14	43	17	103
		% within Clusters	30.6	**38.9**	28.6	**39.4**	**22.4**	32.3
	30 - 39	Count	18	14	24	40	31	127
		% within Clusters	**36.7**	38.9	**49.0**	**36.7**	40.8	39.8
	40 and above	Count	16	8	11	26	28	89
		% within Clusters	32.7	**22.2**	**22.4**	23.9	**36.8**	27.9
Total		Count	91	49	36	49	109	76
		% within Clusters	100	100	100	100	100	100
Gender	Local	Count	34	79	29	22	38	202
		% within Clusters	69.4	**72.5**	59.2	61.1	**50.0**	63.3
	Foreign	Count	15	30	20	14	38	117
		% within Clusters	30.6	**27.5**	40.8	38.9	**50.0**	36.7
Total		Count	49	109	49	36	76	319
		% within Clusters	100	100	100	100	100	100

Cluster 1= Traditional (adapted to context) Cluster 2= Constructivist (emphasis to technology activities)
Cluster 3= Mixed (variety of learning styles) Cluster 4= Mixed (emphasis to preparation and delivery)
Cluster 5 = Constructivist (innovative learning environment)

Table 18 above shows that male participants has a major profile to Cluster 5 on Innovative learning environment and noted a smaller attachment to cluster 1 traditional (adapted to context). As for female participants, a significant margin to cluster 1 on traditional (adapted to context) and less attachment to cluster 5 on constructivist (innovative learning environment). Looking at the age groups, participants in the age group of under 30 have a high profile to cluster 4 on mixed (emphasis to preparation and delivery) and cluster 2 constructivist use of technology (technology activities) and low profile to constructivist (innovative learning environment). On the other hand, participants in the age group of above 40 high profile to constructivist (innovative learning environment)and low profile to cluster 2 on constructivist (emphasis to technology activities) and cluster 3 on mixed (variety of learning styles) use of technology. Local participants tend to have a high profile to constructivist (emphasis to technology activities) and low profile to constructivist (innovative learning environment). On the other hand, foreign participants shows a low profile to constructivist (emphasis to technology activities) and high profile to constructivist (innovative learning environment).

Chi-square test (see Table 46 in appendix B) for association between pedagogical belief and use of technology shows that it is not statistically significant between gender and teacher training. Similarly, between age groups and teacher training is insignificant.

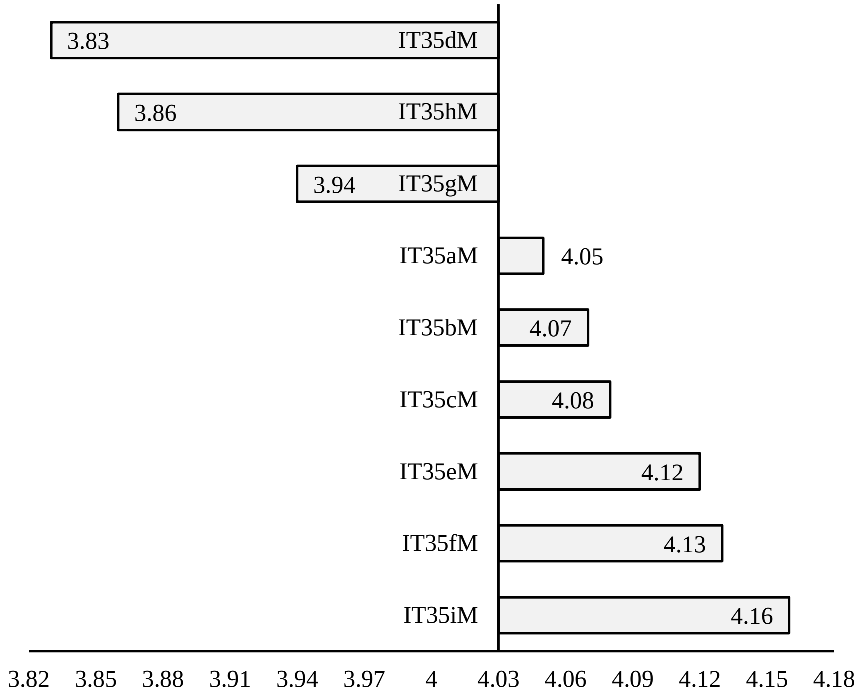
8.04 Affiliation, perceived use and perceived ease of use

The use of technology consists of 9 items. Table 19 shows the descriptive statistics of the items.

Table 19: Descriptive statistics of Technology use

Name	Label	N	M	SD
IT35iM	I look forward to the jobs that require me to use computers.	368	4.16	1.202
IT35fM	I find computers easy to use.	372	4.13	0.476
IT35eM	I find it easy to do work by using computers.	372	4.12	0.520
IT35cM	Using computers will increase my productivity.	372	4.08	0.524
IT35bM	Using computers will enhance my effectiveness.	372	4.07	0.421
IT35aM	Using computers will improve my performance in work.	372	4.05	0.503
IT35gM	Computers make learning more interesting.	372	3.94	0.481
IT35hM	Working with computers is fun.	372	3.86	0.643
IT35dM	My interaction with computers is clear and understandable.	372	3.83	0.549

Figure 45: Mean score for affiliation toward the use of technology and perceived ease and usefulness



From the descriptive statistics, it is seen that the highest mean is affiliation item (IT35iM). Perceived use items (IT35aM to IT35cM) means are very similar.

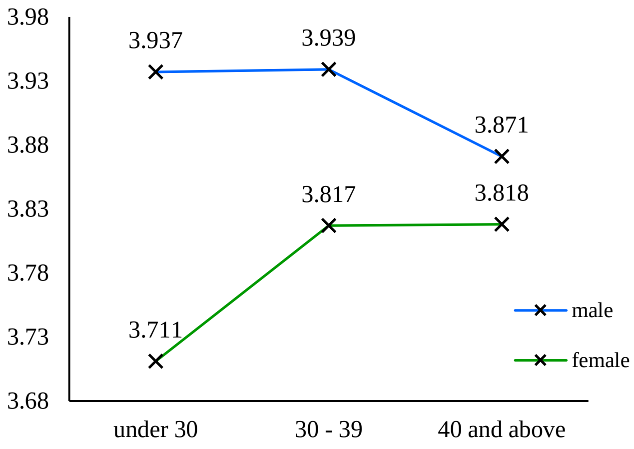
8.04.01 Difference by gender and age in affiliation toward us eof technology, perceived use and perceived ease of use

Univariate ANOVA was conducted between gender, age groups and nationality (independent variable) and the items of attitudes and perceived (dependent variable). The output of the analysis were as given in Table 47 to Table 50 (see appendix B).

Table 20: Descriptive Statistics of gender and age and affiliation and perceived

Independent variable	N
Male	131
Female	241
under 30	132
30 – 39	142
40 and above	98

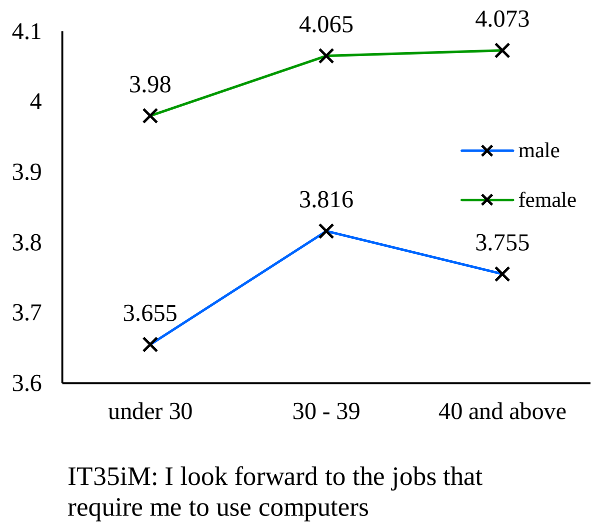
Figure 46: Difference of age and gender of IT35dM



IT35dM: My interaction with computers is clear and understandable

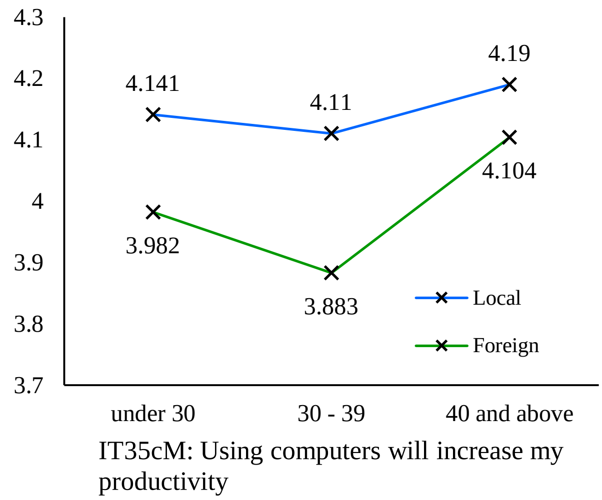
For the IT135dM on interaction with computers is clear and understandable, the Univariate ANOVA result shows *F* (1, 370) = 4.928, $p < 0.05$, η^2=0.013. This item has a significant difference as seen in the graph (Figure 46). The graph shows that there is a significant difference for the item on interaction with computers is clear and understandable among the female and male participants in the age group below 40. However, no significant difference is seen from older participants.

Figure 47: Difference of age and gender of IT35iM



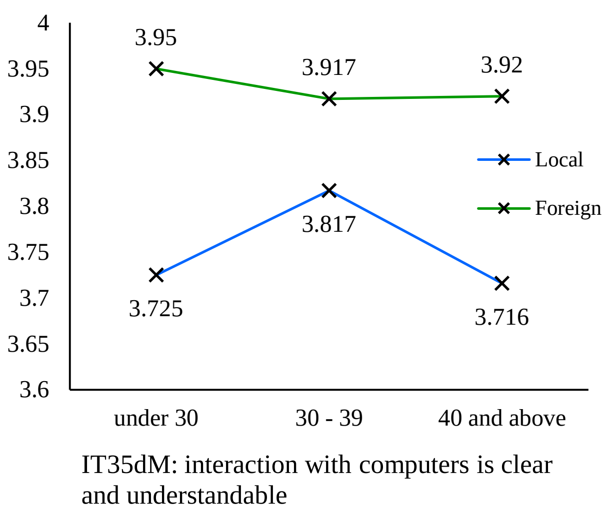
For the IT135iM on looking forward to the jobs that require me to use computers, the Univariate ANOVA result shows F (1, 370) = 15.905, p < 0.001, η^2=0.042. This item has a significant difference as seen in the graph (Figure 47). The graph shows that there is a significant difference on looking forward to the jobs that require me to use computers among the female and male participants in all age groups.

Figure 48: Difference of age and nationality of IT35cM



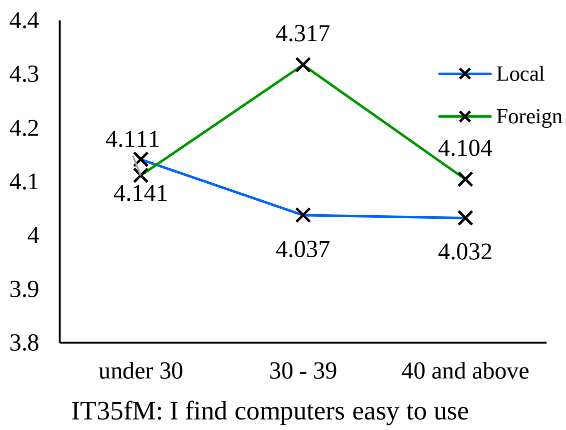
For the IT135cM on use of computers will increase my productivity, the Univariate ANOVA result shows F (1, 370) = 7.269, p < 0.05, η^2=0.017. This item has a significant difference as seen in the graph (Figure 48). The graph shows that there is a significant difference among the local and foreign participants on use of computers will increase my productivity in the age group below 40. However, no significant difference is seen from older participants in the two groups.

Figure 49: Difference of age and nationality of IT35dM



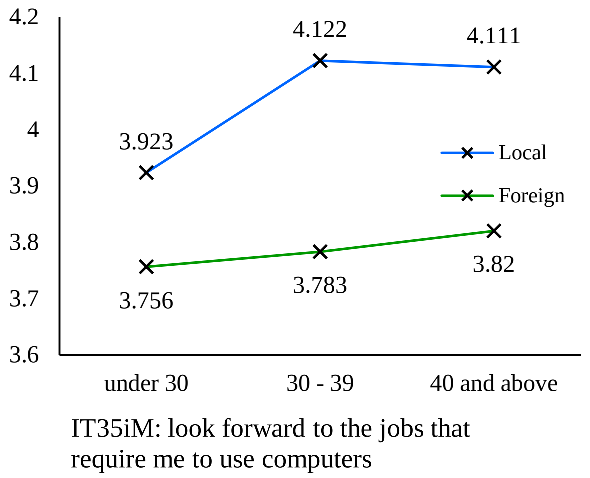
For the IT135dM on interaction with computers in clear and understandable, the Univariate ANOVA result shows F (1, 370) = 8.238, $p < 0.05$, η^2=0.022. This item has a significant difference as seen in the graph (Figure 49). The graph shows that there is a significant difference on interaction with computers in clear and understandable among the local and foreign participants in the age group below 30 and above 40.

Figure 50: Difference of age and nationality of IT35fM



For the IT135fM on computers are easy to use, the Univariate ANOVA result shows F (1, 370) = 3.317, $p < 0.05$, η^2=0.018. This item has a significant difference as seen in the graph (Figure 50). The graph shows that there is a significant difference on computers are easy to use among the local and foreign participants in the age group of 30 to 39.

Figure 51: Difference of age and nationality of IT35iM



For the IT135fM on looking forward to the jobs that require me to use computers, the Univariate ANOVA result shows $F(1, 370) = 12.092$, $p < 0.005$, $\eta^2=0.032$. This item has a significant difference as seen in the graph (Figure 51). The graph shows that there is a significant difference on to the jobs that requires to use computers among the local and foreign participants in all the age groups. However, major significance is seen in the age group of 30 to 39.

8.04.02 Typologies of attitude, perceived use and perceived usefulness

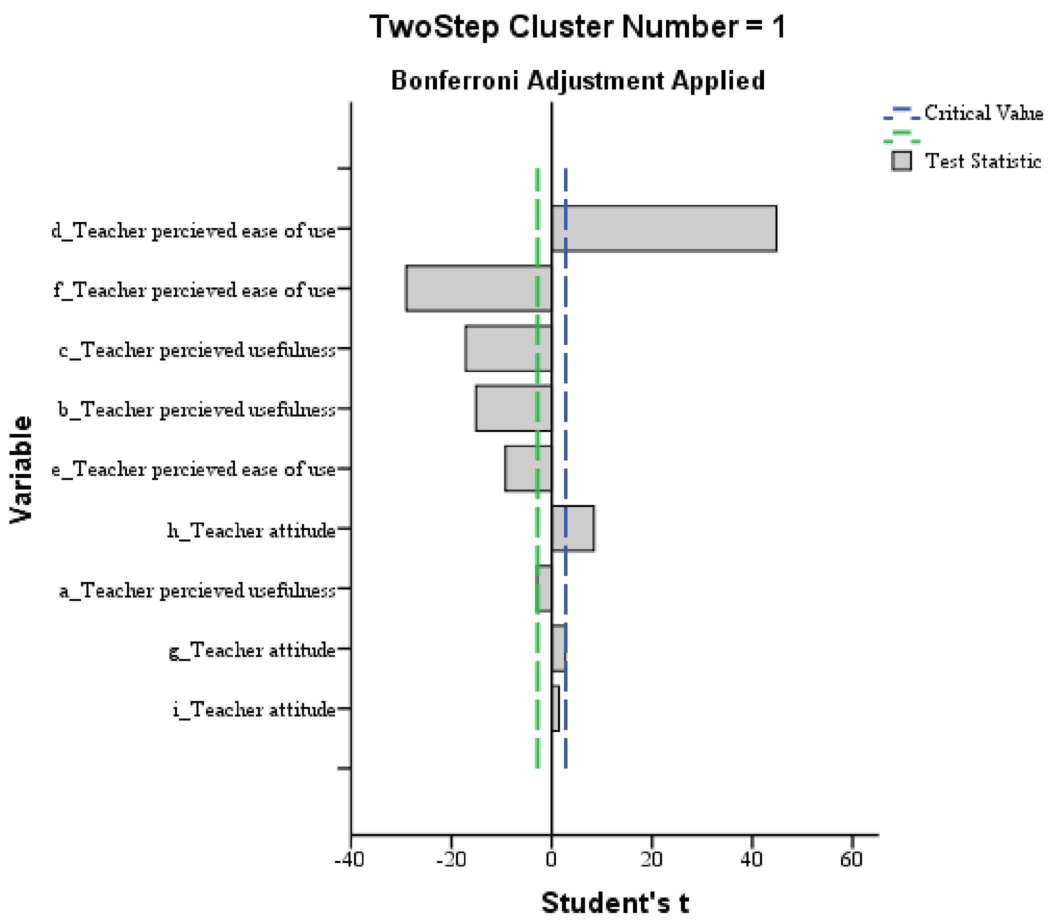
The two-step cluster analysis were carried out. The number of clusters were predefined. To determine the final clusters, various clusters heterogeneity were compared. To determine the items that are more significant in each group or cluster, the critical line on Bonferroni Adjustment graph were analyzed. These lines determines the significance level. Using two-step cluster analysis, technology use items were categorized into 5 homogeneous subgroups.

Table 21: Distribution of Teacher Training clusters

		N	% of Combined	% of Total
Cluster	1	145	39.0%	38.9%
	2	87	23.4%	23.3%
	3	45	12.1%	12.1%
	4	38	10.2%	10.2%
	5	57	15.3%	15.3%
	Combined	372	100.0%	99.7%
Excluded Cases		1		0.3%
Total		373		100.0%

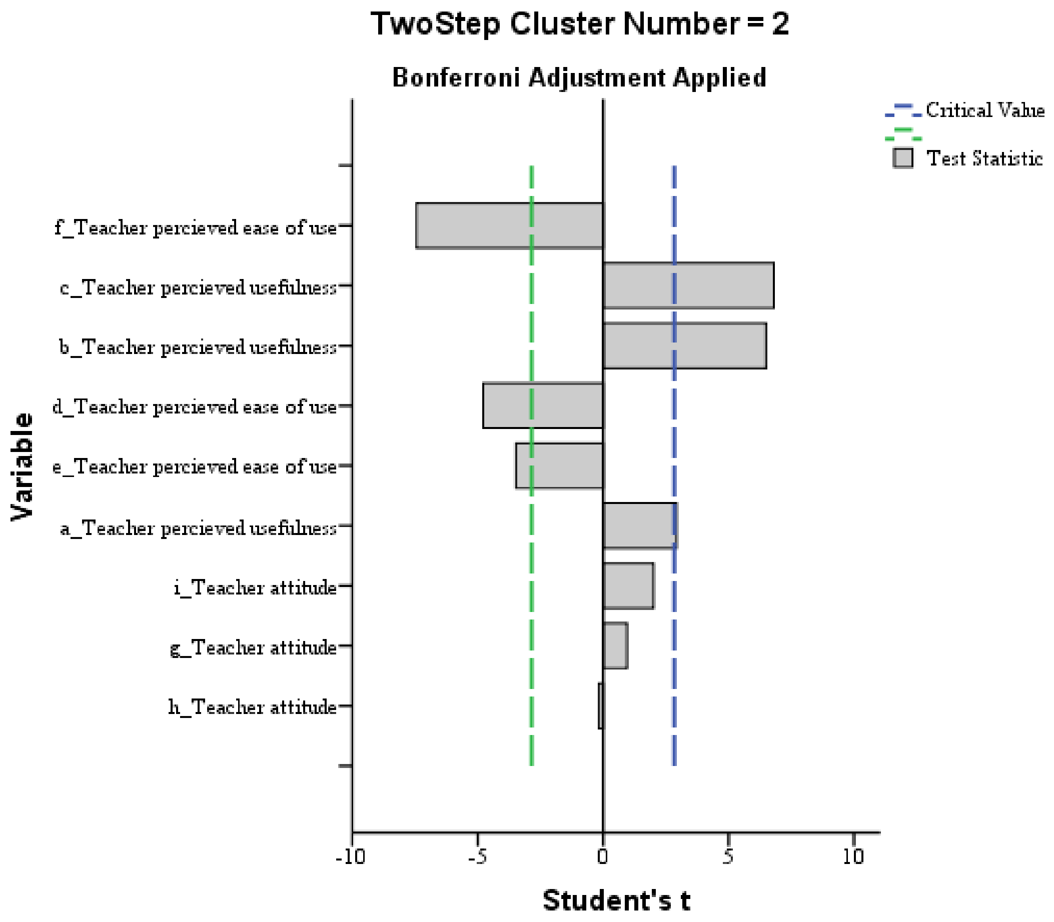
Table 21, shows the distribution of the clusters. The cluster or typology 1 contains 39 percent of the total participants, showing a high level compared to the other clusters. The graphs (Figure 52 to 56) shows the distributions of the items in each cluster. Also indicates which of the items within the cluster were significant.

Figure 52: Cluster 1 of affiliation, perceived use and perceived ease of use



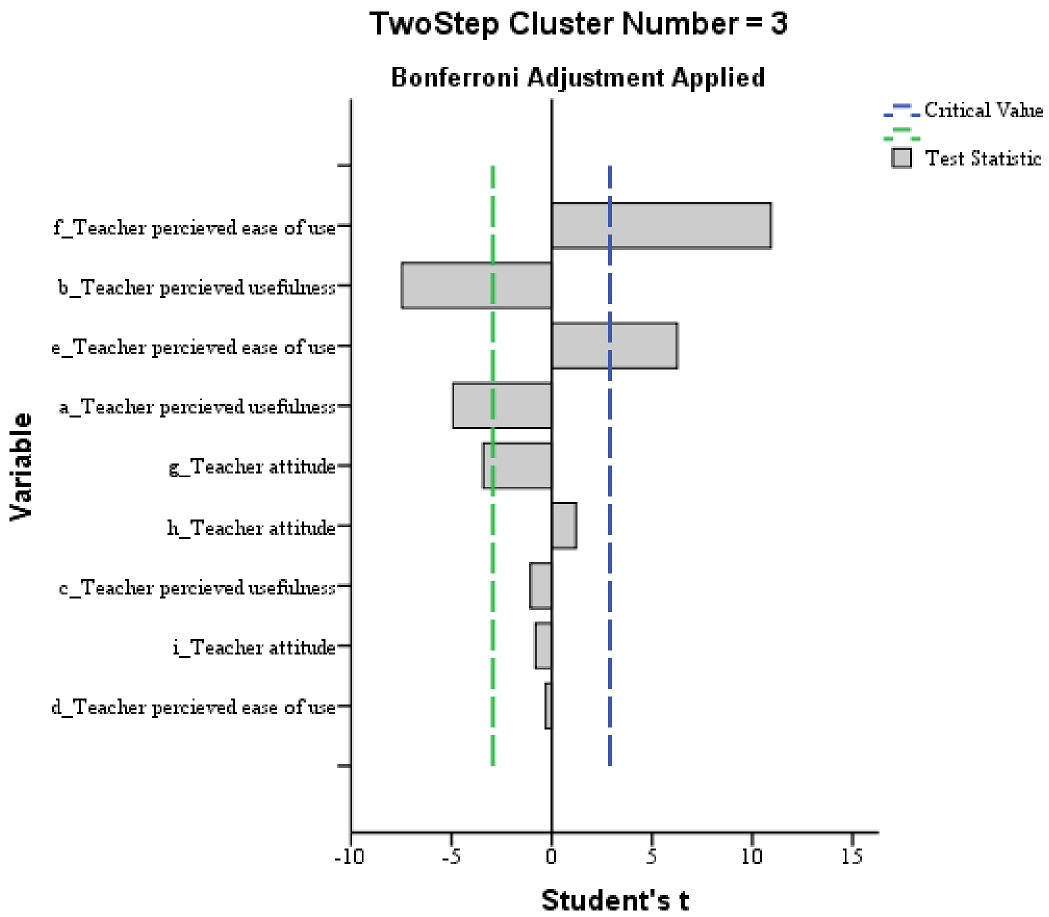
The first cluster or typology shown in Figure 52, contains 39 percent of the total participants which is also the largest cluster. This cluster is composed of two items, and the item IT35dM shows a high level of significance (value Student t of 50). This cluster is labelled as **perceived competence**.

Figure 53: Cluster 2 affiliation, perceived use and perceived ease of use



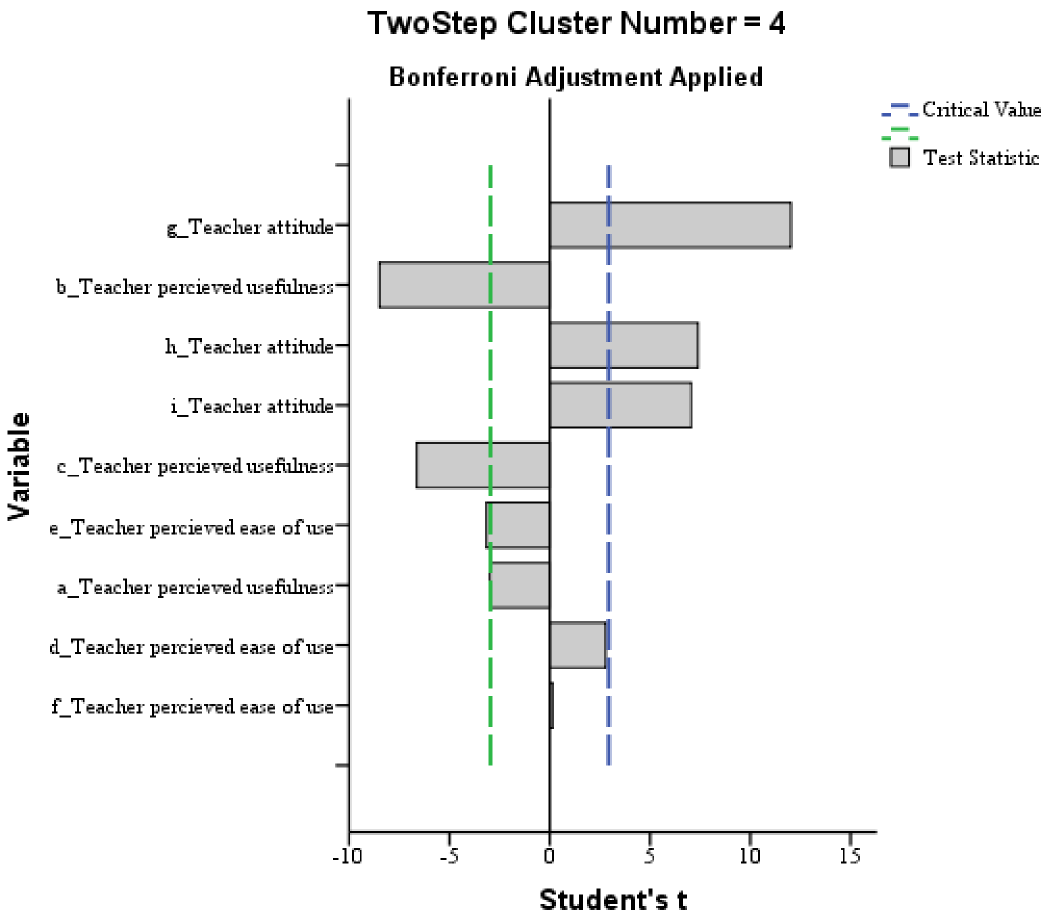
The second cluster or typology (Figure 53) composed of 87 participants which was 23.3 percent of the total. This cluster is composed of three significant items. However two of the items shows a high level of significance (value Student t close to 10). These two items were IT35cM and IT35bM which belong to perceived use. As all the significant items in this cluster belong to perceived use, this cluster is referred to as **utility**.

Figure 54: Cluster 3 affiliation, perceived use and perceived ease of use



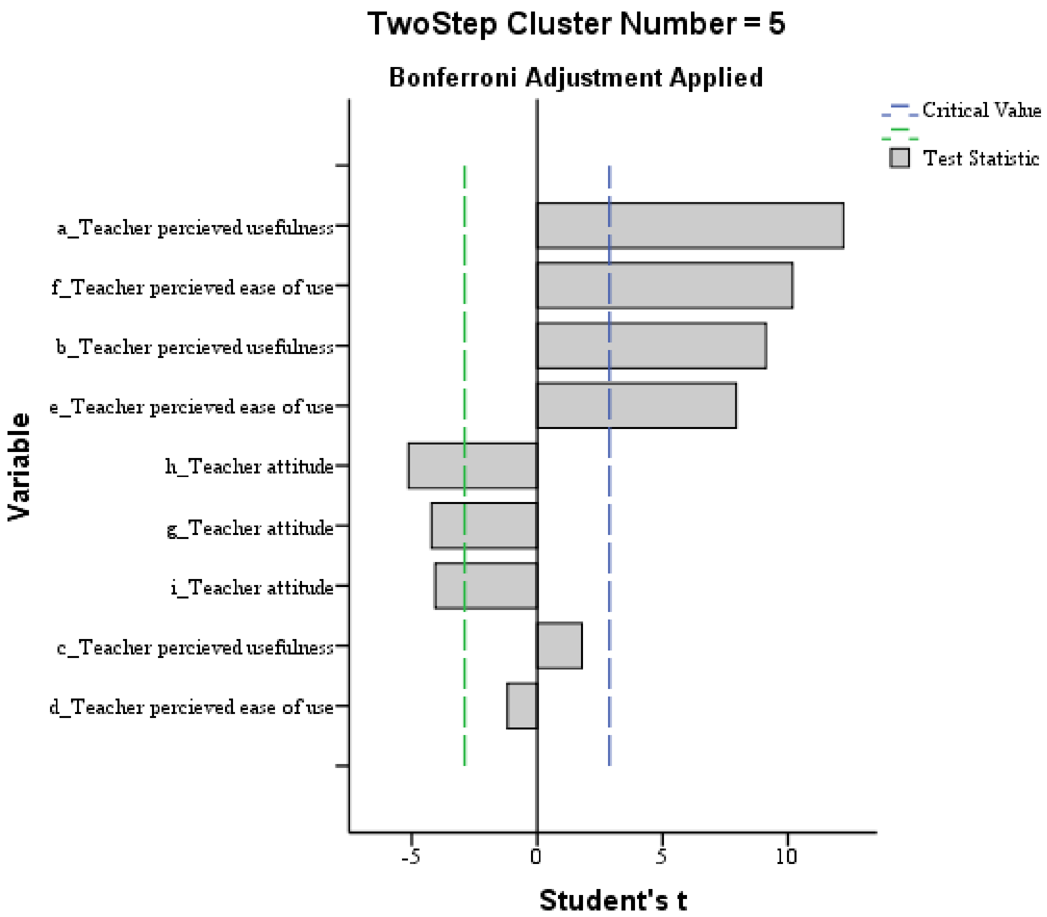
This cluster is composed of 45 participants which is 12.1 percent of the total. The cluster contains only two items of perceived ease of use which shows significant. The value of Student t is around 10. This cluster is labelled as **facilitate**.

Figure 55: Cluster 4 affiliation, perceived use and perceived ease of use



This cluster or typology is composed of 38 participants which is 10.2 percent of the total. The three significant items in the cluster belong to the attitudes toward the use of technology and shows a value of Student t of close and greater than 10. This cluster is labelled as **Affiliation**.

Figure 56: Cluster 5 affiliation, perceived use and perceived ease of use



The fifth cluster or typology is composed of 57 participants which is 15.3 percent of the total. From Figure 56, its shows that this cluster contains mixed items from both perceived use and perceived ease of use. All the items were significant. The cluster is labelled as **Mixed (utility and facilitate)**.

After identifying the clusters, CROSSTABS was computed between the clusters of attitude and perceived use and gender and age groups to analyse its distribution among the gender and age groups.

Table 22: Distribution of gender and age to affiliation and usefulness clusters

			Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Total
Gender	Male	Count	52	27	23	10	19	131
		% within Clusters	35.9	31.0	**51.1**	**26.3**	33.3	35.2
	Female	Count	93	60	22	28	38	241
		% within Clusters	64.1	69.0	**48.9**	**73.7**	66.7	64.8
Total		Count	145	87	45	38	57	372
		% within Clusters	100	100	100	100	100	100
Age groups	under 30	Count	58	30	12	12	20	132
		% within Clusters	**40.0**	34.5	**26.7**	31.6	35.1	35.5
	30 - 39	Count	49	34	17	17	25	142
		% within Clusters	**33.8**	39.1	37.8	**44.7**	43.9	38.2
	40 and above	Count	38	23	16	9	12	98
		% within Clusters	26.2	26.4	**35.6**	23.7	**21.1**	26.3
Total		Count	145	87	45	38	57	372
		% within Clusters	100	100	100	100	100	100
Nationality	Local	Count	34	20	84	37	45	220
		% within Clusters	**37.4**	47.6	75.0	50.0	**86.5**	59.3
	Foreign	Count	57	22	28	37	7	151
		% within Clusters	**62.6**	52.4	25.0	50.0	**13.5**	40.7
Total		Count	91	42	112	74	52	371
		% within Clusters	100	100	100	100	100	100

Cluster 1= perceived competence Cluster 2= utility Cluster 3= facilitate
Cluster 4= Affiliation Cluster 5 = Mixed (utility & facilitate)

Table 22 above shows that male participants has a major profile to Cluster 3 on facilitate and noted a smaller attachment to cluster 4 on affiliation. As for female participants, a significant margin to cluster 4 on affiliation and less attachment to cluster 3 on facilitate. Age group below 30, has a less involvement to cluster 3 on facilitate and more significant to cluster 1 on perceived competence. Participants in the age group of 30 to 39 have a high profile to cluster 4 on attitude and low profile to cluster 1 on perceived competence. On the other hand, participants in the age group of above 40 shows a high profile to cluster 3 on facilitate and low profile to cluster 5 on mixed (utility and facilitate). Looking at the nationality, locals tend to have a high profile to cluster 5 on mixed (utility and facility) and low profile to cluster 1 on perceived competence. On the other hand, foreigners, tend to show high profile to cluster 1 on perceived competence and low to cluster 5 on mixed (utility and facility).

Chi-square test (see Table 51 in appendix B) for association between affiliation towards the use of technology and perceived ease and use and gender shows that there was a statistically insignificant association, $\chi^2(4) = 7.085$, $p < 0.1$. Similarly, there is a statistically insignificance between age groups and use of technology, $\chi^2(8) = 5.829$, $p < 0.1$. On the other hand, between nationality and there is a statistically significance between age groups and affiliation and perceived ease and use, $\chi^2(4) = 50.595$, $p = 0.00$.

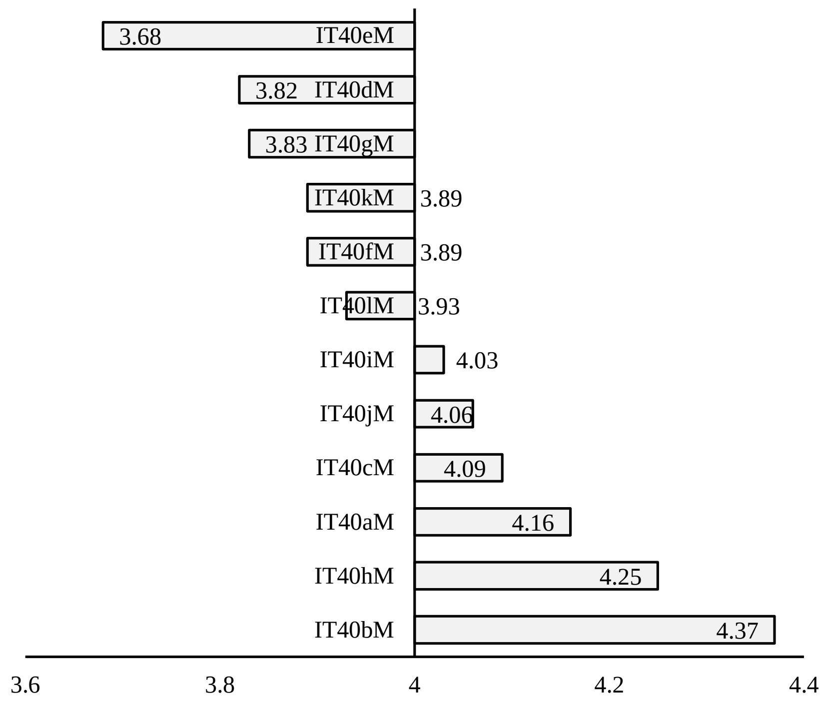
8.05 Technical support and resources

The use of technology consists of 12 items. Table 23 shows the descriptive statistics.

Table 23: Descriptive statistics of technical support and resources

Name	Label	N	M	SD
IT40bM	Adequate technical assistance for operating and maintenance	368	4.37	0.948
IT40hM	Updated educational software and CD-ROMS	368	4.25	0.873
IT40aM	Efficiency of guidance by ICT coordinator/mentor.	368	4.16	1.202
IT40cM	Efficiency of school technical infrastructure	368	4.09	0.784
IT40jM	Software is specific and/or adaptable for use.	368	4.06	0.858
IT40iM	Adequate copies of software for instructional purposes	368	4.03	0.787
IT40lM	Sufficient number of computers for students use.	368	3.93	1.036
IT40fM	Accessible to the existing hardware (computer, projector etc.)	368	3.89	0.785
IT40kM	Sufficient number of school computer laboratory.	368	3.89	0.716
IT40gM	Accessible to hardware resources for students (printer, scanners).	368	3.83	0.661
IT40dM	Sufficient number of media (printer, scanner etc.)	368	3.82	0.853
IT40eM	Sufficient number of computers teachers use.	368	3.68	0.913

Figure 57: Mean score for technical support and resources



From the descriptive statistics, it is seen that the highest mean was technical support item (IT40bM) and hardware item IT40hM.

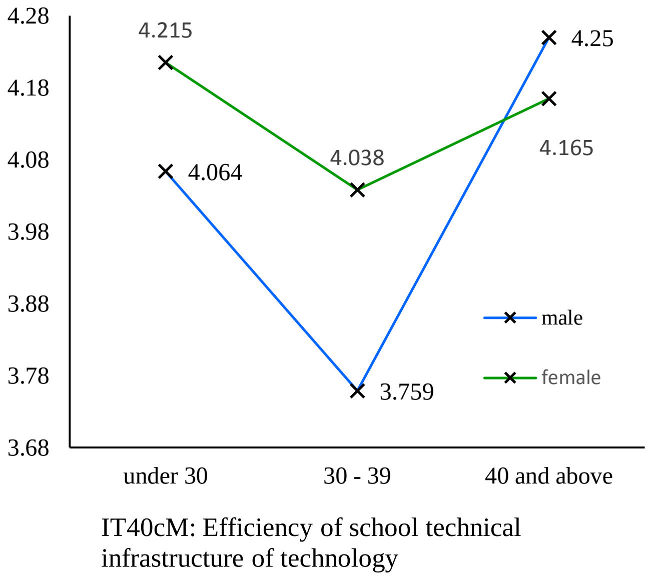
8.05.01 Difference by gender and age of technical support and resources

Univariate ANOVA was conducted between gender and age groups (independent variable) and the items of technical support and resources (dependent variable). The output of the analysis were as given in Table 52 and Table 53 (see appendix B).

Table 24: Descriptive Statistics of gender and age and technical support and resources

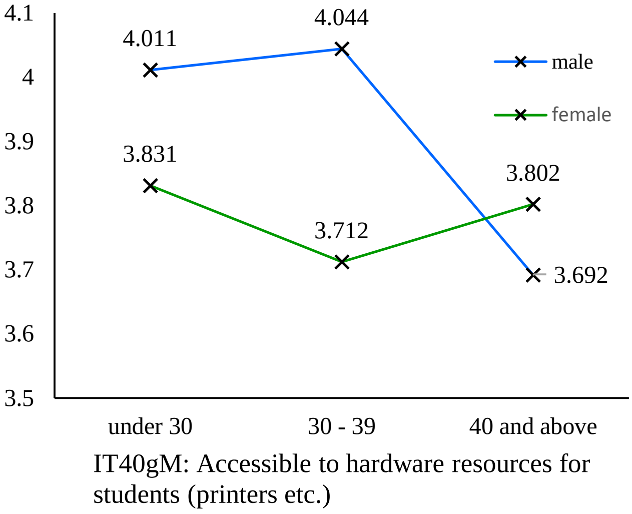
Independent variable	N
Male	130
Female	238
under 30	129
30 - 39	141
40 and above	98

Figure 58: Difference of age and gender IT40cM



IT40cM on efficiency of school technical infrastructure of technology, the Univariate ANOVA result shows F (2, 369) = 5.094, $p < 0.05$, η^2=0.027. This item has a significant difference as seen in the graph (Figure 58). The graph shows that there is a significant difference on efficiency of school technical infrastructure of technology among the female and male participants in the age group below 40. Minor difference is observed in the age group above 40 of which male participants show higher than female counterparts.

Figure 59: Difference of age and gender IT40gM



For the IT135gM on accessibility to hardware resources for students, the Univariate ANOVA result shows F (2, 369) = 3.173, $p < 0.05$, η^2=0.017. This item has a significant difference as seen in the graph (Figure 59). The graph shows that there is a significant difference on accessibility to hardware resources for students among the female and male participants in the age group below 40.

8.05.02 Typologies of technical support and resources

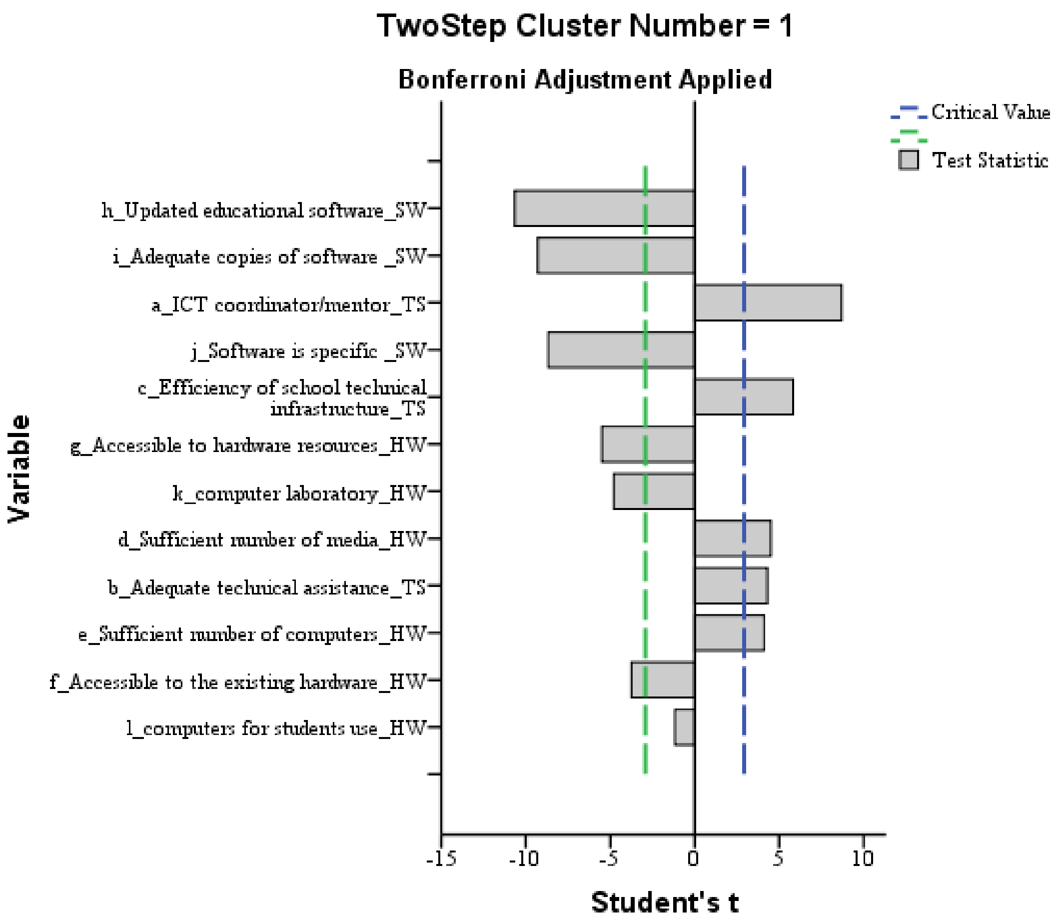
The two-step cluster analysis were carried out. The number of clusters were predefined. To determine the final clusters, various clusters heterogeneity were compared. To determine the items in each group or cluster, the critical line on Bonferroni Adjustment graph were analyzed. These lines determines the significance of the items to the cluster. Using two-step cluster analysis, technology use items were categorized into 3 homogeneous subgroups.

Table 25: Distribution of technical support and resources clusters

		N	% of Combined	% of Total
Cluster	1	105	28.5%	28.2%
	2	203	55.2%	54.4%
	3	60	16.3%	16.1%
	Combined	368	100.0%	98.7%
Excluded Cases		1		1.3%
Total		373		100.0%

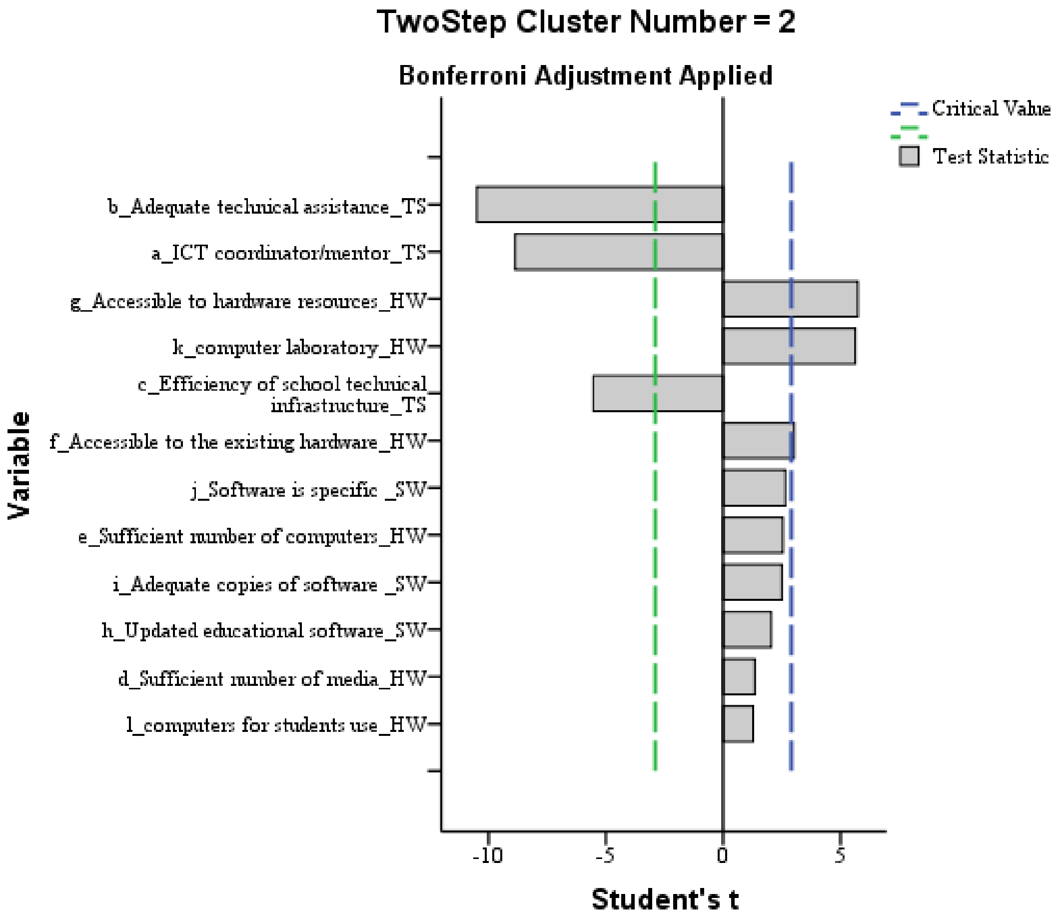
Table 25, shows the distribution of the clusters. The graphs (Figure 60 to 64) shows the distributions of the items in each cluster. Also indicates which of the items within the cluster were significant.

Figure 60: Cluster 1 technical support and resources



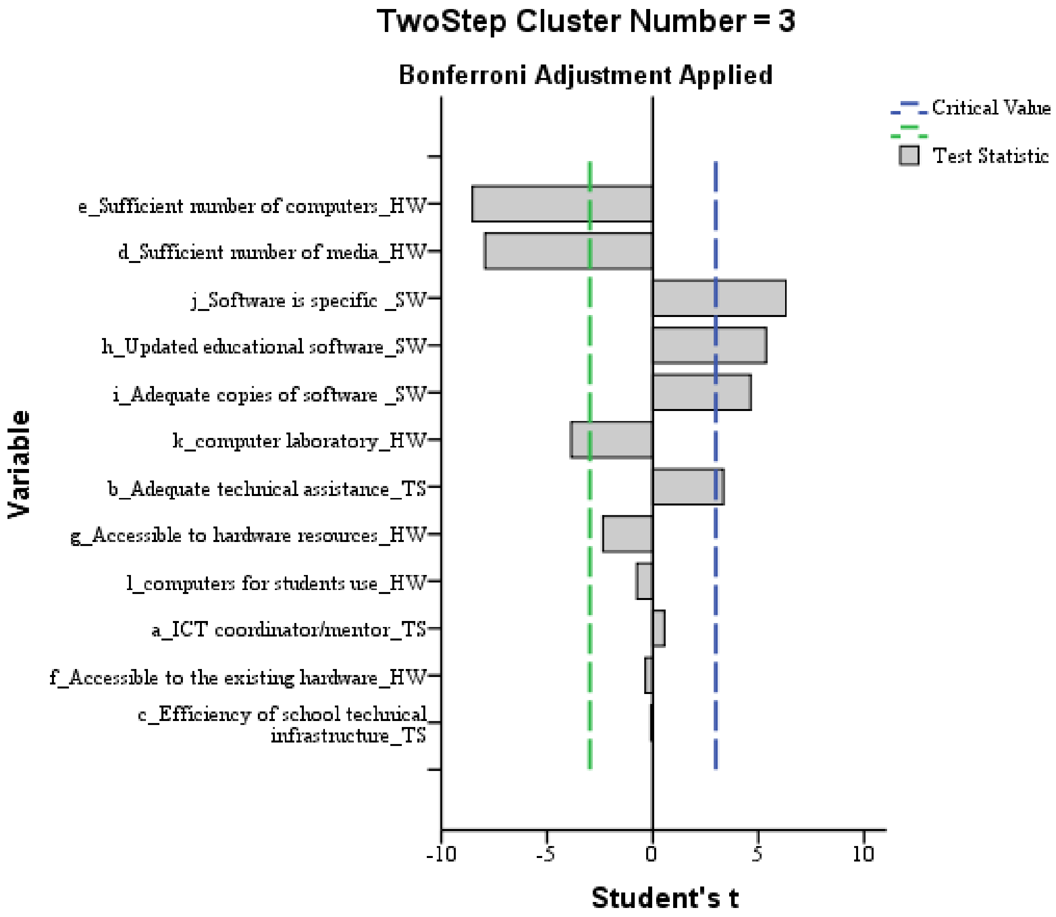
The first cluster or typology shown in Figure 60, contains 105 participants which is 28.5 percent of the total. This cluster is composed of five items, specifically from technical support and hardware. It is noticed that hardware items were sufficient number of computers and sufficient number of media, which can also be related to technical support. This cluster is labelled as **Technical support (infrastructure).**

Figure 61: Cluster 2 technical support and resources



The second cluster or typology (Figure 61) composed of 203 participants which was 55.2 percent of the total. This cluster is composed of three significant items. However two of the items shows a high level of significance (value Student t greater than 5). All the significant items in this cluster belong to hardware. Therefore, this cluster is labelled as **hardware**.

Figure 62: Cluster 3 technical support and resources



This cluster is composed of 60 participants which is 16.3 percent of the total. The cluster contains only four items of both software and technical support. However, it is noticed that software is more significant in this cluster. Thus, this cluster is labelled as **Software**.

After identifying the clusters, CROSSTABS was computed between the clusters of affiliation and perceived use and gender and age groups to analyse its distribution among the gender and age groups.

Table 26: Distribution of gender and age to use of technology clusters

			Cluster 1	Cluster 2	Cluster 3	Total
Gender	Male	Count	28	79	23	130
		% within Clusters	**26.7**	**38.9**	38.3	35.3
	Female	Count	77	124	37	238
		% within Clusters	**73.3**	61.1	61.7	64.7
Total		Count	105	203	60	368
		% within Clusters	100	100	100	100
Age groups	under 30	Count	41	73	15	129
		% within Clusters	**39.0**	36.0	**25.0**	35.1
	30 - 39	Count	37	78	26	141
		% within Clusters	**35.2**	38.4	**43.3**	38.3
	40 and above	Count	27	52	19	98
		% within Clusters	25.7	25.6	**31.7**	26.6
Total		Count	105	203	60	368
		% within Clusters	100	100	100	100

Cluster 1= Technical Support Cluster 2= Hardware Cluster 3= Software

Table 26 above shows that male participants has a major profile to Cluster 2 on hardware and noted a smaller attachment to cluster 1 on technical support. As for female participants, a significant margin to cluster 1 on technical support. Age group below 30, has a major profile to cluster 1 which is on technical support and has a less involvement to cluster 3 on software. Participants in the age group of 30 to 39 showed opposite results, have a high profile to cluster 3 on software and less attached to technical support. Similarly, participants in the age group of above 40 shows a high profile to cluster 3 on software.

Chi-square test (see Table 54 in Appendix B) for association between clusters of technical support and resources and gender and age groups shows that there was a statistically insignificant association between the groups.

8.06 Question 1: Pedagogical belief and use of technology

1) What is the relationship between pedagogical belief and use of technology?

This question was focused to find the relationship between the pedagogical belief clusters and use of technology clusters. CROSSTAB was conducted to analyse the inter-correlations between the clusters.

Table 27: Use of technology and pedagogical belief

		Technology Use					
		Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Total
Pedagogical Beliefs	Traditional (emphasis on delivery for remembering)	18	8	8	6	4	44
		19.8	**21.6**	**7.3**	8.1	7.7	12.1
	Mixed (delivery for understanding)	33	11	41	24	20	129
		36.3	**29.7**	37.3	32.4	**38.5**	35.4
	Traditional	22	9	28	15	15	89
		24.2	24.3	25.5	**20.3**	**28.8**	24.5
	Mixed (strong constructivist)	7	5	8	13	7	40
		7.7	13.5	**7.3**	**17.6**	13.5	11.0
	Constructivist	11	4	25	16	6	62
		12.1	**10.8**	**22.7**	21.6	11.5	17.0
Total		91	37	110	74	52	364
		100	100	100	100	100	100

Cluster 1= Constructivist (innovative learning environment)
Cluster 2= Constructivist (emphasis on collaborative tools)
Cluster 3= Mixed (emphasis on individual learning) Cluster 4= Mixed (emphasis on delivery)
Cluster 5= Traditional (emphasis on supporting work performance)

Table 27 above shows that the participants who have pedagogical traditional belief (emphasis on delivery for remembering) has a major profile to constructivist (emphasis on collaborative tools) and noted to have a less profile to mixed (emphasis on individual learning) of use of technology. For the typology with mixed (delivery for understanding) pedagogical belief tend to have a high profile to traditional (emphasis on supporting work performance) and lower profile to constructivist (emphasis on collaborative tools). Typology of traditional pedagogical belief have a high profile to traditional (emphasis on supporting work performance) and low profile to mixed (emphasis of delivery). Typology with mixed (strong constructivist) pedagogical belief have a high profile to mixed (emphasis of delivery) of use of technology and low profile to mixed emphasis on individual learning) of the use of technology. The typology on constructivist pedagogical belief have strong profile to mixed (emphasis on individual learning) use of technology and low profile to constructivist (emphasis on collaborative tools).

Chi-square test (see Table 55 in Appendix B) for association between pedagogical belief and use of technology shows that there was an insignificant association between pedagogical belief and use of technology, $\chi^2(16) = 24.699$, $p < 0.01$. Similarly, from Phi and Cramer’s V values shows that there isn’t any association.

8.07 Question 2: Affiliation, perceived use, perceived ease of use and use of technology

2) What is the relationship between teachers' affiliation towards the use of technology, perceived use and perceived ease of use and use of technology in teaching practice?

To find the relationship between affiliation towards the use of technology, perceived use and perceived ease of use the use of technology and use of technology in teaching practice clusters, CROSSTAB was conducted.

Table 28: Use of technology and affiliation toward the use of technology and perceived ease of use and perceived usefulness

		Technology Use					
		Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Total
Affiliation and usefulness	Perceived competence	51	10	39	31	13	144
		56.0	**23.8**	34.8	41.9	25.0	38.8
	Utility	15	13	33	13	13	87
		16.5	**31.0**	29.5	**17.6**	25.0	23.5
	Facilitate	7	3	18	12	5	45
		7.7	7.1	**16.1**	**16.2**	9.6	12.1
	Affiliation	8	7	8	10	5	38
		8.8	**16.7**	7.1	13.5	9.6	10.2
	Mixed (utility & facilitate)	10	9	14	8	16	57
		11.0	21.4	12.5	**10.8**	**30.8**	15.4
Total		91	42	112	74	52	371
		100	100	100	100	100	100

Cluster 1= Innovative learning environment Cluster 2= Constructivist (emphasis on collaborative tools) Cluster 3= Mixed (emphasis on individual learning) Cluster 4= Mixed (emphasis on delivery) Cluster 5= Traditional (emphasis on supporting work performance)

The participants who were in the typology in perceived competence have a high profile to constructivist (innovative learning environment) and low profile to constructivist (emphasis on collaborative tools) use of technology. For the typology on utility tend to have a high profile to constructivist (emphasis on collaborative tools) and mixed (emphasis on delivery). Typology on facilitate have a high profile mixed (emphasis on individual learning) and mixed (emphasis on delivery). This typology has a lower profile to constructivist (innovative learning environment). The typology on affiliation tend to have high profile to constructivist (emphasis on collaborative tools) use of technology and low profile to constructivist (innovative learning environment). The mixed typology on utility and facilitate have a low profile to mixed (emphasis on delivery) and high profile to traditional (emphasis on supporting work performance).

Chi-square test (Table 56) for association between affiliation and perceived clusters and use of technology clusters shows that there was a statistically significant association, $\chi^2(16) = 38.911$, $p = 0.001$. From the symmetric measures, between the clusters shows a moderate association.

8.08 Question 3: Training programs and use of technology

3) Explore the relationship between training programs and the use of technology.

Analysis was conducted to analyse the inter-correlations between the clusters of training programs and use of technology clusters in teaching practice. The training programs selected were teacher training programs and professional development programs.

8.08.01 Teacher training program and use of technology

The teacher training programs analysed carried were;

a) participants who completed teacher education program and their use of technology in teaching practice
b) teaching qualification and use of technology in teaching practice
c) teacher training programs (traditional and constructivist) to the use of technology in teaching practice

a) Completed teacher education program, teaching qualification and use of technology

CROSSTAB analysis was conducted to find the relationship between participants' completion of teacher education program and teaching qualification to the use of technology in teaching practice.

<u>Table 29: Use of technology in teaching practice and completion of teaching program</u>

		Technology Use					
		Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Total
Completed teacher	No	17	12	5	15	3	52
		18.7	**10.7**	11.9	**20.3**	5.8	14.0
	Yes	74	100	37	59	49	319
		81.3	89.3	88.1	**79.7**	**94.2**	86.0
Total		91	91	42	112	74	52
		100	100	100	100	100	100
Teaching qualification	Certificate	6	2	6	2	3	19
		8.2	3.4	6.1	5.4	6.1	6.0
	Diploma	17	6	27	10	12	72
		23.3	**10.2**	**27.3**	27.0	24.5	22.7
	Degree	44	42	65	19	28	198
		60.3	**71.2**	65.7	**51.4**	57.1	62.5
	Masters	6	9	1	6	6	28
		8.2	**15.3**	1.0	16.2	12.2	8.8
Total		73	59	59	37	37	317
		100	100	100	100	100	100
Institute of teacher education	Local	35	18	69	29	38	189
		38.5	42.9	**61.6**	39.2	**73.1**	50.9
	Overseas	38	19	30	30	11	128
		41.8	**45.2**	26.8	40.5	**21.2**	34.5
	Missing	18	5	13	15	3	54
		19.8	11.9	11.6	20.3	5.8	14.6
Total		91	42	112	74	52	371
		100	100	100	100	100	100

Cluster 1= Constructivist (innovative learning environment)
Cluster 2= Constructivist (emphasis on collaborative tools)
Cluster 3= Mixed (emphasis on individual learning) Cluster 4= Mixed (emphasis on delivery)
Cluster 5= Traditional (emphasis on supporting work performance)

The participants who have not attended any teacher training program to the technology use in teaching practice shows a high profile to mixed (emphasis on delivery) use of technology and low profile to teachers' perspective and educational software on use of technology. On the other hand, the participants who have attended teacher training program and the technology use in teaching practice shows a high profile to traditional (emphasis on supporting work performance) and low profile to mixed (emphasis on delivery) on use of technology. For the typology with teaching certificate and use of technology typology tend to have a high profile to constructivist (innovative learning environment) on use of technology. With teaching diploma and use of technology shows a high profile to mixed (emphasis on individual learning) and low profile to constructivist (emphasis on collaborative tools). On the other hand, teaching degree qualification and use of technology shows a low profile to mixed (emphasis on delivery) and high profile to constructivist (emphasis on collaborative tools) on use of technology. Master qualification and use of technology shows a low profile to constructivist (innovative learning environment) but high profile to constructivist (emphasis on collaborative tools) as in Table 29. Regarding the teacher training institute of where participants had completed their teacher training program and the use of technology in teaching practice, it shows that the participants who had completed teacher training in a local teacher training institute (in Maldives) shows to have a high profile to traditional (emphasis on supporting work performance) such as teacher planning and preparation and low profile to constructivist (innovative learning environment). On the hand, completed teacher training in overseas institute of teacher training tend to show a high profile to constructivist (emphasis on collaborative tools) and low profile to traditional (emphasis on supporting work performance) such as teacher planning and preparation.

Chi-square test (Table 57 in appendix B) for association between completion of teacher training program and use of technology typologies shows that there wasn't any statistically significant association, $\chi^2(4) = 8.184$, $p < 0.01$. From the symmetric measures, between the clusters shows a moderate association. Similarly, association between teaching qualification and use of technology typologies shows that there wasn't any statistically significant association, $\chi^2(12) = 21.133$, $p < 0.05$. From the symmetric measures, between the clusters shows a moderate association. Association between teacher training institute and use of technology typologies shows that there is a statistically significant association, $\chi^2(8) = 28.019$, $p < 0.001$. From the symmetric measures, between the clusters shows a moderate association.

c) Teacher training and use of technology in teaching practice

To explore the relationship between teacher training clusters and use of technology clusters, CROSSTAB was conducted.

Table 30: Use of technology and teacher training programs

		Technology Use					
		Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Total
Teacher Training	Traditional (adapted to context)	10	4	18	10	6	48
		13.5	10.8	**18.2**	17.2	**12.2**	15.1
	Constructivist (emphasis to technology activities)	7	5	8	10	6	36
		9.5	13.5	**8.1**	**17.2**	12.2	11.4
	Mixed (variety of learning styles)	19	3	13	9	4	48
		25.7	8.1	13.1	15.5	**8.2**	15.1
	Mixed (emphasis to preparation and delivery)	12	13	40	19	25	109
		16.2	35.1	40.4	32.8	**51.0**	34.4
	Constructivist (innovative learning environment)	26	12	20	10	8	76
		35.1	32.4	20.2	17.2	**16.3**	24.0
Total		74	37	99	58	49	317
		100	100	100	100	100	100

Cluster 1= Constructivist (innovative learning environment)
Cluster 2= Constructivist (emphasis on collaborative tools)
Cluster 3= Mixed (emphasis on individual learning) Cluster 4= Mixed (emphasis on delivery)
Cluster 5= Traditional (emphasis on supporting work performance)

Table 30 above shows that the participants use of technology in teacher training and use of technology in teaching practice clusters. The first typology was traditional (adapted to context) on use of technology in teacher training shows a high profile to mixed (emphasis on individual learning) in use of technology in teaching practice and low profile to traditional (emphasis on supporting work performance). The typology on constructivist (emphasis to technology activities) on use of technology in teacher training shows a high profile to mixed (emphasis on delivery) and low profile to mixed (emphasis on individual learning). The typology on mixed (variety of learning styles) on use of technology in teacher training have a high profile to constructivist (innovative learning environment) and low profile to traditional (emphasis on supporting work performance). Typology of mixed (emphasis to preparation and delivery) on use of technology in teacher training have a high profile to traditional (emphasis on supporting work performance) and low profile to constructivist (innovative learning environment) on use of technology. Typology on constructivist (innovative learning environment) use of technology have a high profile to constructivist (innovative learning environment) on use of technology and low profile to traditional (emphasis on supporting work performance).

Chi-square test (see Table 58 in appendix B) for association between teacher training and use of technology shows that there was a statistically significant association, $\chi^2(16) = 33.204$, $p < 0.05$. Similarly, from Phi and Cramer's V values shows that there was a moderate association.

8.08.02 Professional Development Program and use of technology in teaching practice

The analysis carried from professional development programs were;

a) participants who had attended any professional development program and the use of technology in teaching practice
b) reason on why participants could not attend any professional development program
c) the programs participated and its impact on their development as a teacher
d) opinion of the participants regarding their preferences in future professional development programs

The following presents the analysis of the professional development program focused to the questions given above.

a) Participants who had attended professional development program and the use of technology in teaching practice

CROSSTAB analysis was conducted to find the relationship between participation of professional development program and use of technology in teaching practice.

Table 31: Use of technology in teaching practice and professional development program

		Technology Use					
		Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Total
Professional development program	No	56	19	33	27	33	168
		50.5	45.2	**36.3**	**36.5**	**63.5**	45.4
	Yes	55	23	58	47	19	202
		49.5	54.8	**63.7**	63.5	**36.5**	54.6
Total		91	42	111	74	52	370
		100	100	100	100	100	100

Cluster 1= Constructivist (innovative learning environment)
Cluster 2= Constructivist (emphasis on collaborative tools)
Cluster 3= Mixed (emphasis on individual learning) Cluster 4= Mixed (emphasis on delivery)
Cluster 5= Traditional (emphasis on supporting work performance)

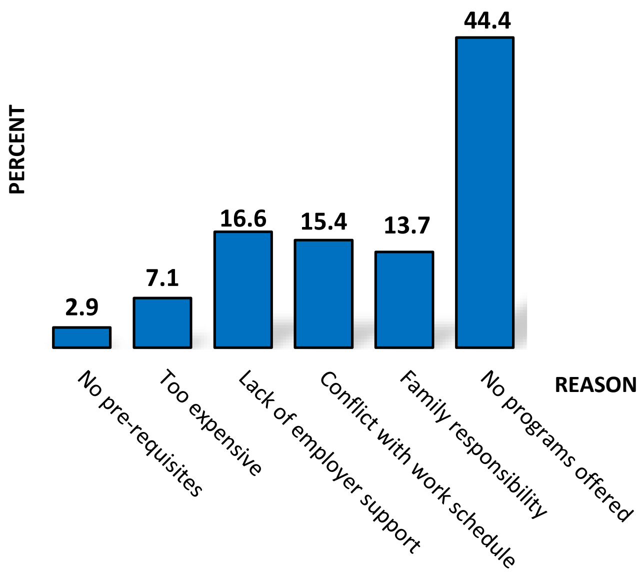
Participants who have not attended any professional development program shows a high profile to traditional (emphasis on supporting work performance) and low profile to mixed (emphasis on individual learning) and mixed (emphasis on delivery). On the other hand, participants who have attended professional development program show low profile to traditional (emphasis on supporting work performance) and high profile to mixed (emphasis on individual learning).

Chi-square test (see Table 59 in appendix B) for association between participants who have attended professional development program and use of technology clusters shows that there was a statistically significant association, $\chi^2(4) = 13.422$, $p < 0.05$. The symmetric measures, between the clusters shows a moderate association.

b) Reason on why participants could not attend any professional development program

Participants were asked on why they could not attend professional development programs. The participants' responses were given below in Figure 63.

Figure 63: Reasons on why participants could not attend professional development programs



From Figure 63, 44.4 percent of the participants responded that no professional development programs (PDP) were offered while 16.6 percent stated they could not attend because of lack of employment support. 15.4 percent replied as due to conflict with work schedule that they could not attend PDP, as 13.7 percent reported due to family responsibility. A total of 168 out of 371 reported that they did not attend any PDP programs in the last two years.

c) The programs that respondents had participated and its impact on their development as a teacher

Participants were asked whether they had participated from the given of professional development programs/activities. If they had participated, they were asked to indicate the impact of it to their teaching. Likert scale of 1 as no impact to 4 as high impact.

Table 32: Professional Development Programs participated and its impact

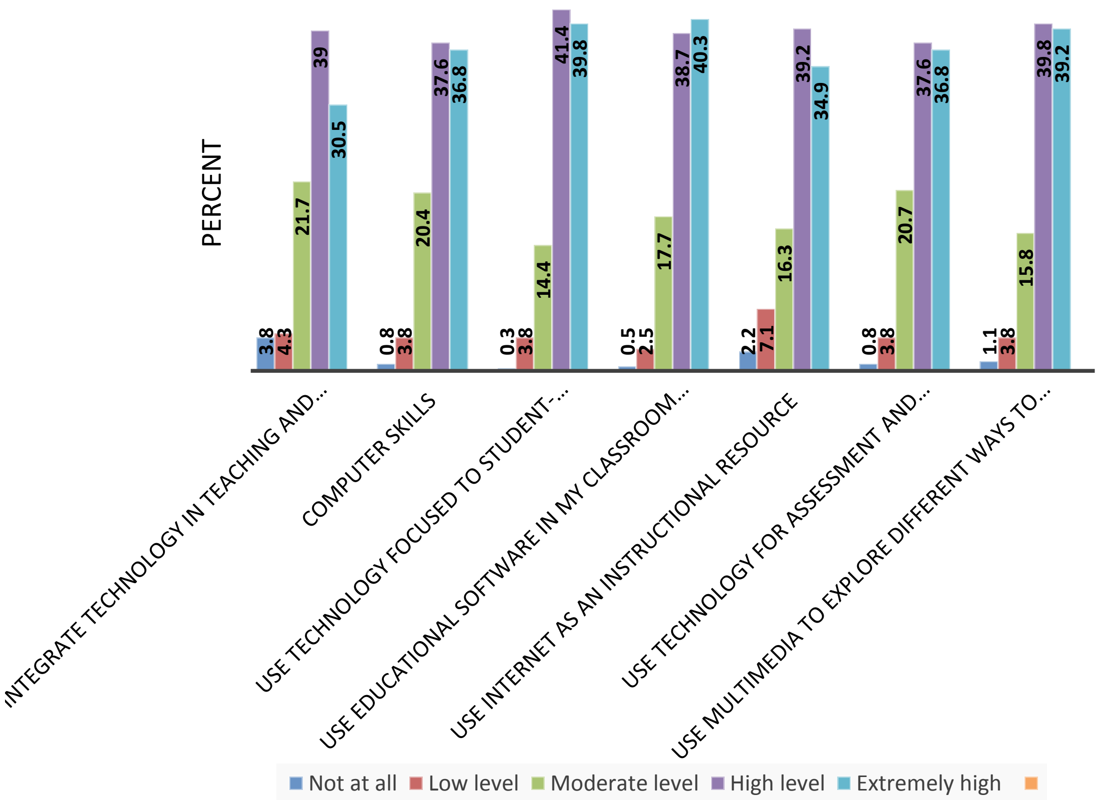
	Have you undertaken it? (percent)				
	Y	N	Missing	mean	Missing
Courses/workshops/training on the use of computer.	**56**	4	39	**2.85**	0
Education conferences or seminars on use of technology in teaching and learning (where teachers and/or researchers present their research results and discuss educational problems).	**34**	27	39	**2.90**	0
Training on the use of ICT in teaching and learning	**46**	14	39	**2.92**	0
Equipment-specific training (interactive whiteboard, laptop, projector, etc.).	**36**	25	39	**2.95**	0
Participate on online communities (e.g. Mailing, twitter, blogs etc.) for professional discussions with other teachers.	22	38	39	1.88	0
Subject-specific training on learning applications (tutorials, simulations, etc.).	20	40	39	2.07	0
Other professional development opportunities related to ICT.	21	40	39	1.07	3

From Table 32, 56 percent of the participants stated that they had participated on courses and workshops focused on the use of computers. Out of that 46 percent reported that it had moderate impact on their teaching. 46 percent of the participants indicated that they had attended training on the use of technology for teaching and learning, out of that 49 percent indicated that it had moderate impact while stated it had large impact for their teaching and learning. Only 20 percent of the participants reported that they had attended subject-specific training on learning application. From the participants who attended 37 percent had indicated that it had moderate impact while 32 percent stated large impact. From Table 32, Majority of the participants who had attended the listed training programs indicated that it had moderate impact for the teaching and learning.

d) Participants perspectives regarding the components in future professional development programs

Participants were asked regarding their needed areas or components in the future professional development programs. From the listed seven components participants had to indicate their level of need from not at all to extremely high level. Figure 64 shows participants response in percentage.

Figure 64: Perspectives regarding future professional development programs



From Figure 64, most of the participants (81.2 percent) reported as high level and extremely high level need of a training program focused on “use of technology focused to student centred learning”. The second most (about 79 percent) reported on the use multi-media to explore different ways to teach specific concepts. More than 60 percent of the participants reported that they need training of all the listed components.

8.09 Question 4: Internal and external factors and use of technology

4) What is the relationship between use of technology for teaching practice and other internal and external factors?

The internal factors explored in this study were age, gender, teaching experience and competence. The external factors were technical support and accessibility and availability to resources.

8.09.01 Participants demographic characteristics and use of technology

Participants demographic characteristics selected for analysis were gender and age.

Table 33: Use of technology in teaching practice and demographic characteristics

		Technology Use					
		Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Total
Gender	Male	41	20	33	30	7	131
		45.1	**47.6**	29.5	40.5	**13.5**	35.3
	Female	50	22	79	44	45	240
		54.9	**52.4**	70.5	59.5	**86.5**	64.7
Total		91	42	112	74	52	371
		100	100	100	100	100	100
Age groups	below 30	33	14	40	26	19	132
		36.3	**33.3**	35.7	35.1	**36.5**	35.6
	30 - 39	35	12	48	26	20	141
		38.5	**28.6**	**42.9**	35.1	38.5	38.0
	40 and above	23	16	24	22	13	98
		25.3	38.1	**21.4**	29.7	25.0	26.4
Total 3.1		91	42	112	74	52	371
		100	100	100	100	100	100

Cluster 1= Constructivist (innovative learning environment)
Cluster 2= Constructivist (emphasis on collaborative tools)
Cluster 3= Mixed (emphasis on individual learning) Cluster 4= Mixed (emphasis on delivery)
Cluster 5= Traditional (emphasis on supporting work performance)

Male participants showed a high profile to teachers' constructivist (emphasis on collaborative tools) on use of technology and low profile to traditional (emphasis on supporting work performance). On the other hand, female participants' shows low profile constructivist (emphasis on collaborative tools) on use of technology and high profile to traditional (emphasis on supporting work performance).

Looking at the age groups, participants below 30 years shows a low profile to constructivist (emphasis on collaborative tools) on use of technology and high profile to traditional (emphasis on supporting work performance). Participants who were between 30 and 40 shows a low profile to constructivist (emphasis on collaborative tools) on use of technology and high profile to mixed (emphasis on individual learning). Participants of age above 40 years shows a low profile to mixed (emphasis on individual learning) use of technology and high profile to constructivist (innovative learning environment).

Chi-square test (see Table 60 in appendix B) for association between gender and use of technology clusters shows that there was a statistically significant association, $\chi^2(4) = 19.998$, $p < 0.001$. From the symmetric measures, between the clusters shows a moderate association. Chi-square test (see Table 60 in appendix B) for association between age groups and use of technology clusters shows that there wasn't a statistically significant association, $\chi^2(8) = 5.551$, $p < 0.1$. From the symmetric measures, between the clusters shows a moderate association.

8.09.02 Other internal factors and use of technology

The other internal factors selected for analysis were teaching experience and computer competence of the participants.

Table 34: Use of technology in teaching practice and other internal factors

		Technology Use					
		Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Total
Teaching experience	1 - 5 yrs	32	14	36	25	20	127
		32.1	33.3	35.1	33.8	**38.5**	34.2
	6 - 10 yrs	25	5	41	18	17	106
		30.5	**11.9**	33.6	24.3	**32.7**	28.6
	Over 11 yrs	34	23	35	31	15	138
		37.4	**54.8**	31.3	41.9	**28.8**	37.2
Total		91	42	112	74	52	371
		100	100	100	100	100	100
Competence	Not prepared	18	14	42	5	17	96
		24.3	37.8	**42.4**	**8.6**	34.7	30.3
	Adequately prepared	22	14	39	36	24	135
		29.7	37.8	39.4	**62.1**	49.0	42.6
	Well prepared	34	9	18	17	8	86
		45.9	24.3	18.2	29.3	**16.3**	27.1
Total		74	37	99	58	49	317
		100	100	100	100	100	100

Cluster 1= Constructivist (innovative learning environment)
Cluster 2= Constructivist (emphasis on collaborative tools)
Cluster 3= Mixed (emphasis on individual learning)
Cluster 4= Mixed (emphasis on delivery)
Cluster 5= Traditional (emphasis on supporting work performance)

Participants with teaching experience of between 1 to 5 years shows a high profile to traditional (emphasis on supporting work performance) and low profile to constructivist (innovative learning environment). Participants with teaching experience of 6 to 10 years shows low profile to constructivist (emphasis on collaborative tools) on use of technology and high profile to traditional (emphasis on supporting work performance). Participants with more than 10 years of teaching experience shows a high profile to constructivist (emphasis on collaborative tools) on use of technology and low profile to traditional (emphasis on supporting work performance). Looking at the participants self-evaluate technology competence, participants who were not prepared tend to show a high profile to mixed (emphasis on individual learning) on use of technology and low profile to mixed (emphasis on delivery). Participants who were adequately prepared shows a low profile to constructivist (innovative learning environment) on use of technology and high profile to mixed (emphasis on delivery). Participants who were well prepared shows a high profile to constructivist (innovative learning environment) on use of technology and low profile to traditional (emphasis on supporting work performance).

Chi-square test (see Table 61 in appendix B) for association between teaching experience and use of technology shows that there wasn't statistically significant association, $\chi^2(8) = 13.844$, $p < 0.01$. Similarly, from Phi and Cramer's V values shows that there was a moderate association. Chi-square test for association between competence and use of technology (see Table 60 in appendix B) shows that there was a statistically significant association, $\chi^2(8) = 39.527$, $p < 0.001$. Similarly, from Phi and Cramer's V values shows that there was a moderate association.

8.09.03 Other external factors and use of technology

The other external factors selected for this study were technical support and resources (availability and accessibility). CROSSTAB analysis was conducted to analyse the inter-correlations between the clusters of use of technology in teaching practice and technical support and resources.

Table 35: Use of technology in teaching practice and other external factors

	Technology Use					
	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Total
Technical Support	25	17	25	16	22	105
	22.9	23.0	27.8	38.1	**42.3**	28.6
Hardware	68	43	48	21	22	202
	62.4	58.1	53.3	50.0	**42.3**	55.0
Software	16	14	17	5	8	60
	14.7	**18.9**	**18.9**	**11.9**	15.4	16.3
Total	109	74	90	42	52	367
	100	100	100	100	100	100

Cluster 1= Constructivist (innovative learning environment)
Cluster 2= Constructivist (emphasis on collaborative tools)
Cluster 3= Mixed (emphasis on individual learning) Cluster 4= Mixed (emphasis on delivery)
Cluster 5= Traditional (emphasis on supporting work performance)

The technical support typology shows a high profile to traditional (emphasis on supporting work performance) in use of technology and low profile to constructivist (innovative learning environment). Hardware typology shows a low profile to traditional (emphasis on supporting work performance) and high profile to constructivist (innovative learning environment). The typology on software shows a high profile mixed (emphasis on individual learning) and to constructivist (emphasis on collaborative tools) on use of technology. This typology shows a low profile to mixed (emphasis on delivery) on use of technology.

Chi-square test (see Table 62 in appendix B) for association between technical support and resources and use of technology shows that there wasn't statistically significant association, $\chi^2(8) = 11.146$, $p < 0.1$. Similarly, from Phi and Cramer's V values shows that there was a moderate association.

CHAPTER 9

Discussion and Conclusion

CHAPTER 9

DISCUSSION AND CONCLUSION

9.01 Introduction

The purpose of this research study was to reach a deeper understanding of the factors that facilitates the use of technology among the teachers in Maldives. Specifically this study looked into the following research questions:

1. Explore the relationship between the teachers' pedagogical belief and to the use of technology for teaching practice.
2. Explore teachers' attitudes (affiliation) toward technology, perceived ease of use and perceived usefulness and to the use of technology for teaching practice.
3. Explore the relationship between training programs and the use of technology.
4. What are the internal and external factors that facilitate the use of technology for teaching practice?

This chapter presents the discussion of the findings and address the recommendations and suggestions for further studies in this area. The chapter begins with the discussions of the results, followed by recommendations for an effective use of technology in the teaching and learning environment will be proposed and suggestions for future research in this area will also be highlighted.

9.02 Discussion of Findings

This study was guided by five main research questions dealing on the use of technology in teaching practice, pedagogical belief, affiliation towards the use of technology in teaching practice, training programs, other internal factors and other external factors. Discussions for each research question will be carried out separately and interpretation will be related to the literature.

9.02.01 Question 1: Pedagogical belief and use of technology

The first research question sought to determine the relationship between pedagogical belief and use of technology in teaching practice. Two-Step clusters were carried out and five clusters were defined in each scale. CROSSTAB was used to analyze the relationship between the corresponding clusters of pedagogical belief and use of technology in teaching practice (see Table 27 and Table 55). The chi-square test showed that between pedagogical belief clusters and the clusters on the use of technology in teaching practice does not have any significant association.

By looking at the individual clusters from the CROSSTAB, showed that there is a consistency between pedagogical belief and use of technology in some clusters. For instance, the cluster on mixed (delivery for understanding) shows a high profile to the cluster on traditional (emphasis on supporting work performance). In here, the pedagogical belief cluster on mixed (delivery for understanding) includes items mostly traditional such as transmitting knowledge, drilling and practicing. However, constructivist items such as discussion also contribute a little bit to the cluster. Cluster 5 on use of technology referring to traditional (emphasis on supporting work performance) refers to use of technology for teachers preparation and planning of the lesson. Similarly, the cluster of traditional pedagogical belief and use of technology for traditional (emphasis on supporting work performance) such as planning and preparation shows a high profile. Even though a complete constructivist pedagogical belief does not show any relation to a complete constructivist use of technology, the cluster on constructivist (innovative learning environment) of pedagogical belief shows a relation to the mixed use of technology use. In here, it shows that there is a consistency between the pedagogical belief and the use of technology. The result shows that there can be a direct effect between the participants' pedagogical belief and how they use technology in their instructional practice. It is clearly seen that participants with traditional pedagogical belief inclined to use technology in traditional context. These findings concurs with the results of many previous studies (Ertmer, 2005; Teo et al., 2008, Liu, 2011). These studies revealed that there is a relationship between pedagogical belief and use of technology (Ertmer, 2005; Teo et al., 2008). They argue that teachers' beliefs influence on their teaching methods used including on how technology is used. Ertmer (2005) pointed that teachers who have constructivist pedagogical belief tend to use technology in the teaching context compared to the traditional pedagogical belief teachers. Moreover Ertmer (2005) contend that belief determines the teacher behaviour which relates to the teaching practice, instructional activities chosen and also the decisions made during the process.

This study clearly shows that many of the teachers tend to have traditional pedagogical belief are inclined to use technology in traditional context such as planning and preparation rather than constructivist learning environment for students learning. This could be the influence of the teachers' own learning experiences. Many of the Maldivians early learning begins by rote, drilling and practicing style which starts at an early age of around 2 years. As the learning of Quran is mostly through rote learning which could be existed in teachers' pedagogical practices and unconsciously believed and practiced in their own teaching and learning context. To overcome the traditional pedagogical belief, Ertmer and Ottenbreit-Leftwich (2010) emphasized that teachers need to be provided continuous support in order for teachers to accept the benefits of using technology for students centered learning. Similarly, Inan and Lowther (2010) elaborated the significance of professional development programs to alter the pedagogical beliefs. Thus, it is critical to alter teachers' pedagogical belief in order to effectively use technology in instructional practice as it is a significant factor. However, to change teacher pedagogical belief it is essential to look at the other interrelated factors.

On the other hand, in some clusters of this study showed that there is an inconsistency between pedagogical belief and the use of technology in teaching practice. For instance, participants with mixed (strong constructivist beliefs) had a high profile to mixed (emphasis on delivery) in using technology. Similarly, the traditional pedagogical belief cluster on traditional (emphasis on delivery for remembering) shows a high profile to constructivist (emphasis on collaborative tools) of use of technology. These results concurs with the results of the study conducted by Liu (2010) and Chen (2008).

Liu (2010) studied concluded that regardless of the pedagogical belief teachers tend to use lecture based teaching activities. Likewise in this study also showed teachers with constructivist pedagogical belief inclined to use technology for delivery purposes or for individual learning. On the other hand, with traditional pedagogical belief inclined to use more constructivist technology use for teaching. Mishra and Koehler (2006) reported that many of the teachers sought to look at technology but not on how to use it effectively in teaching and learning. Teo et al., (2008), Chen, (2008) and Ertmer (2005) indicated that teachers who have constructivist teaching beliefs tend to use technology for traditional teaching. This conflicting results is because teachers had to concentrate more on completing syllabus in a short period and prepare for exam rather than construction of knowledge (Liu, 2010; Becker, 2001). Liu (2010) analysis found that in spite of the pedagogical belief, teachers were tended to use lecture based teaching activities. Chen (2008) believes that the inconsistency between teachers' pedagogical belief and use of technology could be due to the influence of external and internal factors. Likewise, many of the Asian research studies have revealed that a number of the teachers had constructivist pedagogical belief, however, it is disinclined to constructivist use of technology (Chai et al., 2009; Sang et al., 2009; Chen, 2008).

Chen (2008) argued that when incorporating technology effectively into instructional practice it does not always behave according to teachers beliefs. Even though teaching is considered as an intentional activity, not all of the teaching activities are based on teachers' beliefs or intentions. In fact, teachers surrounding environment also has an influence on their decision making. For instance, pressure from parents and school management for better examination results, content coverage, written notes and end of unit tests are failing teachers to use technology effectively in teaching. Like in many Asian countries, Maldives education system do have a high emphasis to the examination results. Both the school management and parents focus on the students' examination results. This could be because Maldives does not have many tertiary educational opportunities and many students after completing their secondary education seek educational opportunities from the universities in the neighboring countries. Mostly the top-graded students get the opportunity to study in these universities as there is a huge demand especially in some areas such as medicine.

9.02.02 Question 2: Affiliation, perceived use, perceived ease of use and use of technology

This question sought to determine the relationship between affiliation towards the use of technology, perceived usefulness and perceived ease of use to the use of technology in teaching practice. CROSSTAB analysis was carried out among the clusters of the scales (see Table 28 and Table 56). Chi-square test for association between affiliation and perceived clusters and use of technology clusters shows that there was a statistically significant association, $\chi^2(16) = 38.911$, $p < 0.05$.

By looking at the clusters relationships, it shows that affiliation have a high profile to constructivist (emphasis on collaborative tools). Research suggests similarity to the finding of Jumiaan et al. (2012) and Gibbone, Rukavina and Silverman (2010) research study. The authors argued that the moderate correlation shown in their study could mean that use of technology effectively in teaching and learning environment is limited. In this study shows that affiliation had a profile to constructivist (emphasis to collaborative tools) but does not show any reasonable relation with the advanced use of technology such as games and simulations for an innovative learning environment. Gibbone, Rukavina and Silverman (2010) emphasized that if participants were given proper training and provided sufficient facilities they are very likely to learn and infuse technology effectively in their professional practice.

Similarly this study also shows that a moderate profile with affiliation to mixed (emphasis on delivery) on use of technology. On the other hand, a low profile with affiliation and constructivist (innovative learning environment) on use of technology. Al-Zaidiyeen et al. (2010) study revealed a positive attitude toward the use of technology, however, the actual use of technology in constructivist learning environment among teachers were low. The use of internet were high, but then again, use of simulations and games were low among teachers as seen in this study. Al- Zaidiyeen et al. (2010) argued that by having a positive attitude toward the use of technology does not guarantee that teachers tend to use it effectively in the learning environment. Many of the researchers emphasized that teachers with a positive attitude towards the use of technology is an essential condition in infusing successfully in teaching and learning (Albirini, 2006; Huang & Liaw, 2005; Sabzian & Gilakjani, 2013; Yusuf et al., 2012). However, authors have also underlined that teachers with positive attitudes may disincline the use of technology in instructional practice (Sa'ari, Wong & Roslan, 2005). For instance, class size, parents and school management pressure for better grades, time constraints, content coverage etc. may not allow teachers to use technology effectively in the instructional practice.

By looking at the perceived usefulness, perceived ease of use and the use of technology in teaching practice, the utility (perceived use) tend to have a high profile to mixed (emphasis on collaborative tools) on use of technology. This result is similar to the findings of Teo and Schaik (2009) study. Teo and Schiak (2009) study also showed that if teachers tend to understand the usefulness of the technology in teaching and learning it is very likely they would use it in actual teaching environment. This could be because teachers do understand the usefulness of technology for students learning through a training program such as teacher training or professional development program and seeing that technology could be used easily in their own teaching practice. This is also seen from this study as perceived competence (perceived ease of use) tend to have a high profile to constructivist (innovative learning environment) use of technology. This reveals that participants need to be exposed with training programs in order to understand how technology could be used effectively in the teaching and learning environment. These should be shown practically with relevant examples to ensure that teachers would be able to use technology in their instructional practice easily.

The relationship between affiliation and perceived usefulness and perceived ease of use could not be analysed as these three clusters were from the same scale. Many of the studies have shown that there is a significant relation between attitude and perceived usefulness and perceived ease of use (Teo & van Schaik, 2009; Teo, 2011). It is necessary for teachers to understand that by using certain technology would enhance their job performance. In addition, teachers should also realize that to use a certain technology is free from physical and mental efforts. In fact, this is crucial because of the rapid advance technologies developed and targeted to the educational context. Thus, by conducting training programs or workshops could guide teachers to use recent technologies in instructional practice.

9.02.03 Question 3: Training programs and use of technology

To explore the relationship between training programs and use of technology, CROSSTAB was carried out between the clusters of these two scales. The training programs selected were teacher training and professional development programs.

a) Teacher Training Program and use of technology

This question was focused to determine the relationship between teacher training programs and the use of technology in teaching practice (see Table 29 and Table 57). CROSSTAB analysis was carried out. Chi-square test for association between teacher training and use of technology shows that there was a statistically significant association, $\chi^2(16) = 33.204$, $p < 0.05$. However, regarding the participants who had or had not completed teacher training and use of technology does not show any significant association, , $\chi^2(4) = 8.184$, $p < 0.01$. Similarly, association between teaching qualification and use of technology does not show any statistical significant association, $\chi^2(12) = 21.133$, $p < 0.05$. However, the place of teacher education institute and use of technology shows a statistically significant association, $\chi^2(8) = 28.019$, $p < 0.001$.

By looking at the cluster relationships of teacher training and use of technology, the traditional use of technology in teacher training program have a high profile to the traditional use of technology in teaching practice (see Table 30 and Table 58). For instance, the mixed (emphasis to preparation and delivery) in teacher training is related to traditional (emphasis on supporting work performance) such as preparation and planning on use of technology in teaching practice. On the other hand, the constructivist use of technology in teacher training (use of games and simulations) inclined to use it in the same way in instructional practice. It is also noted that this cluster shows a low profile to the use of technology for traditional (emphasis on supporting work performance) such as planning and preparation.

This results concurs with many other studies (Rakes et al., 2006). Rakes et al. (2006) study revealed that teachers who were trained to use technology in instructional practice, also employed technology in professional practice compared to the untrained teachers. On the other hand, Spiegel (2002) reported conflicting results that teachers who were trained to infuse technology in teaching and learning did not integrate technology effectively as was anticipated. This could be due to the quality of teacher training, hand-on experience gained in using technology in teaching practice, in-service professional development programs, availability of resources etc. OECD (2012) report highlighted the importance of a quality initial teacher training program. This report emphasized to ensure that teachers are supplied with subject-content knowledge as well as the knowledge of how to teach the subject. Furthermore, the report also emphasized that teachers without proper training or guidance, they often use technology for traditional teaching rather than implementing it into constructivist teaching (UNESCO, 2012). Foulger et al. (2013) highlighted three benchmarks to focus on teacher training programs which were; technology skills, technology access in the field and orientation of class content and accessibility to relevant resources. This is to ensure that during the training period, teachers do get sufficient practical experience before their professional practice. Similarly, Oberlander and Talbert-Johnson (2007) the importance of teacher training program and acquiring technology-enhanced field experiences. On the other hand, Adreas (2012) remarked that the teacher education programs cannot focus on all the challenges that teachers may face in their careers. These challenge could be addressed in professional development programs by the coordinators.

A recent research paper focused on teacher educators' use of technology in Maldives teacher training institute revealed that they used technology in traditional context such as PowerPoint for delivery, uploading lesson notes in drop-box or student server etc. The first teacher training institute is faculty of education of Maldives National University which was established in 1984. However, till very recently the institute conducts mostly certificate and diploma level teacher training programs. The Bachelor of Teaching and Bachelor of Education program was started in early 2000 and Master of education program was launched in 2013. The quality of teaching programs is very much dependent on the trained professionals and availability of resource in the faculties. The teacher training institutes in Maldives are not so very experienced and do lack skilled resources and trained professionals. In addition, the additional support provided to the staff such as professional training programs will ensure that teacher educators are up-to-date to the recent technology tools and how it could be applied into their teaching. Without doubt, effective use of technology would require teachers' understanding of how to use it appropriately in pedagogy to enhance students' learning (Adam, 2015). Adam (2015) research was focused on professional development programs and teacher educators use of technology in teacher education programs. In her research, it was clearly revealed that teacher educators hardly use any technology tools that enhance students learning. As a result, the teachers who were trained in these institutes tend to use similar type of technology in their instructional practice such as PowerPoint for delivery, use of internet to seek information for lesson preparation, use of computer for lesson plan and worksheets for students.

Numerous studies revealed that by employing miscellanea of technological tool and applications in teacher training programs could have a direct effect in student teachers' use of technology in their future teaching (Alper, 2012; Kobat & Taskin, 2013; Goktas & Demirel, 2012; Gotkas et al., 2009). Tondeur et al. (2012) emphasized the importance of alignment of theory and practice. For instance, simply explaining how to use a specific technology, it is important to present it and involve teachers to use it in an actual situation and to provide teachers with a solid understanding on use of technology. Lambert, Gong and Cuper (2008) argue that the technology training and integration need to be embedded in all the courses offered in the teacher training program instead of let alone technology course. Groce et al. (2012) raised concern regarding the teacher preparing programs by stressing many of the teachers felt "ill-prepared" by the teacher education program (p.1). Likewise, Chesley and Jordan (2012) indicated that many teacher education programs were disconnected to the needs of today's teaching and learning.

Thus, initial teacher training programs should focus on employing technology in every day teaching. Furthermore, teacher education programs need to adapt teacher educators teaching practices by employing technology integrated methods in training teachers. This need to be consistent to the needs of the society, curriculum and today's teaching and learning. Rakes et al. (2006) confirmed in their study that when teachers were provided with adequate technology employed teacher training, they are more likely to infuse technology in their professional instruction in a more constructivist pedagogy. Hartnell-Young (2006) argued that technology focused teacher training is essential, however, teachers need more than just training, for instance, accessibility to adequate technology resources and equipment and support from school management are also crucial for implementing technology in instructional practice. Therefore, in Maldives teacher training institutions need to be focused in employing technology tools effectively in their lesson and student teachers need to get required experience in using these tools for effectively implement it in their future lessons.

b) Professional Development Program and use of technology

To explore the relationship between professional development programs (PDP) for in-service teachers and the use of technology in teaching practice CROSSTAB was carried out (see Table 31 and Table 59). The descriptive statistics shows that 54 percent of the respondents have attended PDP in the last 2 years while 45 percent stated they had not. Chi-square test for association between participants who have attended professional development program and use of technology clusters shows that there was a statistically significant association, $\chi^2(4) = 13.422$, $p < 0.05$. By looking at the clusters, the participants who have not attended any professional development program shows a high profile to traditional (emphasis on supporting work performance) such as planning and delivering in use of the technology. However, the participants who had attended professional development programs tend to shows a high profile to mixed (emphasis to individual learning) in use of technology in instructional practice. It is noted that compared to the participants who had not attended any of PPD, the participants who had were seen to use a little bit of technology for students learning.

The outcomes of this study concurs to the results of many previous studies which has revealed that the continuous professional development programs for teachers is a vital component for effective and efficient use of technology in teaching and learning (Overbaugh & Lu, 2008; Levin & Rock, 2003; Guskey, 2002; Potter & Rockinson-Szapkiw, 2000). NEA report emphasized that at least 33 percent of the budget should be reserved to conduct programs for school staff to prepare them to be proficient in using technology into their professional practice (NEA, 2013).

For effective use of technology in teaching practice, certainly PDP plays a vital role. However, it is also noted that the quality of the program decides its successfulness. Like as observed in this study, the participants who had attended PDP shows that they use technology in teaching and learning environment to a certain extent. Kraft and Blazar, (2013) pointed that many of the PDP fail to produce the required results to successfully use technology in teaching and learning. There are number of reason for not been productive. This could be because PDP are set programs without considering individual necessities (OFSTED, 2001). Furthermore OFSTED (2001) reported that professional development programs focused "rarely to the pedagogic expertise to help [teachers] make the most effective use of ICT in their lessons" (p.4). In fact, design of the PD programs plays a crucial role for an effective outcome. In the designing phase, the providers should acquire knowledge and experience of the attendees on order to understand what is required and their prior knowledge. Moreover, the programs should focus on the direct relation to the available technology and the actual use of the specific technology to the instructional practice (Kopcha, 2012). Furthermore, Supovitz and Turner (2000) accentuated that attendees should get the opportunity for “inquiry, questioning and experimentation” (p. 964). In developed countries, teachers are entitled 100 hours of professional development in a year (Andreas, 2012) to ensure that teachers are up-to-date due to rapid and constant changes in the technology (Noorani, 2011; Hendriks et al., 2010). However, in Maldives only 15 hours (3 days) of PDP in a year is mandatory (Guerrero, 2013). The question certainly is, is this enough? Compared to many developed countries, this is 85 percent less than the required hours.

In this study, respondents were asked to specify the reasons on why they could not attend the program. Majority of the respondents (about 44 percent) posited that no programs were offered. Among other reasons were lack of employment support (17 percent), conflict with the work schedule (15 percent) and family responsibility (14 percent). OFSTED (2001) report emphasized that the professional development programs providers discern teachers’ needs. For instance, the availability of time for teachers. Some teachers struggle to cope with training schedule with their work and home (OFSTED, 2001). Thus, it is important for PDP providers to concentrate on teachers schedule when organizing these programs to assure many able to participate. According to Adam (2015) research report based on professional development programs to teachers in Maldives reveals that PD programs carried out does not help teachers to use technology in their teaching practice. She further highlighted “[s]ome PD sessions, which introduced GEM, IQWeb, Self-service, and

Moodle, did not help teacher educators use them in teaching" (Adam, 2015, p.23). This discloses that the programs carried were not appropriate or were ineffective.

In this study participants were also asked to indicate the components of the PDP and its impact. Majority of the participants had participated on basic use of computers (56 percent). 46 percent responded that they had attended training on the use of ICT on teaching and learning, however, only 20 percent attended on subject specific training on learning application. 36 percent responded that they had attended training on specific equipment (interactive whiteboard, laptop, projector etc.) while only 22 percent had attended on training on online communities such as mailing, twitter, blogs etc. A numerous studies have confirmed that the expertise of technology use among teachers have not increased by participating in PDP (Overbaugh & Lu, 2008; Potter & Rockinson-Szapkiw, 2000). William at al. (2000) indicated that the software that are available is schools were not appropriately used in teaching. This is because teachers do not understand how to properly utilize these into their teaching (William et al., 2000). Potter and Rockinson-Szapkiw (2000) pointed out that the most effective form of professional development activities are the on-going activities rather than short term workshops. In fact, training programs obviously could help teachers to understand how to employ these software and other applications effectively in instructional practice. Mouza (2011) emphasized that professional development programs need to focus on the three components; technology, pedagogy and content. Moreover he stressed on the usefulness in developing reflections which felicitates practical learning (Mouza, 2011).

Professional development program is indeed a vital component for an effective use of technology in teaching and learning. However, these programs need to be designed according to the teachers needs and teachers need to be guided and provide hands-on-experience on how to use it effectively in their professional practice. Furthermore, Uslu and Bümen (2012) emphasized that these programs need to be continuous programs in order to maintain the level of technology use. The goal of a technology focused professional development program is to induce changes to the teachers' instructional practice in order to employ technology effectively in the learning environment. Effective professional development program is a combination of factors that is based on individual needs focused to each learning environment rather than pointing to a single factor or a clichéd program (Guskey, 2002).

9.02.04 Question 4: Other internal and external factors and use of technology

This question was focused to investigate the relationship between the use of technology in teaching practice and other internal and external factors.

a) Demographic characteristics and use of technology

Participants demographic characteristics selected for this study were gender and age. Participants' age was categorized into three groups; under 30 years, between 29 and 41 years and above 40 years. CROSSTAB was carried out to find the relationship between us of technology and demographic characteristics.

i) Gender and use of technology

Chi-square test (Table 38 and Table 60) for association between gender and use of technology clusters shows that there was a statistically significant association, $\chi^2(4)$ =

19.998, $p < 0.001$. From the symmetric measures, between the clusters shows a moderate association. Looking at the profiles of the clusters, male participants shows a high profile to teachers' constructivist (emphasis on collaborative tools) on use of technology and low profile to traditional (emphasis on supporting work performance). On the other hand, female participants' shows low profile constructivist (emphasis on collaborative tools) on use of technology and high profile to traditional (emphasis on supporting work performance). In general, male tend to constructivist use technology compared to female counterparts. This result accord to the many of the recent research studies (Gorder, 2008; Hamman et al, 2008; Ogan et al., 2009). Gorder (2008) research indicated insignificance among male and female use of technology in instructional practice. However, he noted that teachers use of technology were traditional pedagogical practice. On the other hand, Haman et al. (2008) revealed that gender had an impact on the use of technology, indicating male teachers inclined to use technology more. In addition, the authors emphasized that constructivist teachers tend to employ technology effectively in professional practice more than traditional teachers. Ogan et al. (2009) pointed that males were expected to succeed in activities that were challenging or difficult and were rewarded for doing so. However, females were expected to be less ambitious and concern themselves with work that is necessary.

In this study shows that there is a disparity in technology use for students learning among men and women. This could be because of the Maldives tradition and culture. Although in Maldives does not have any official gender discrimination, females have less job and educational opportunities especially in some areas such as law-making areas (Asian Development Bank Report, 2014). Maldives following Islamic tradition, men are responsible with the protection and looking of their families and are regarded as the head of the household, financial supporter and primary decision maker. In contrast, women are responsible for child care and household chores. Education sector is one of the area where a large number of women are working in Maldives. However, after their job working hours they tend to take care of their children and household responsibilities. As a result, women may not have much time to expand or learn on how to use technology or do preparation on using technology in constructivist learning environment. This gender digital divide is also seen in other Asian countries (Looker, 2008) as well as in other Arab regions where the accessibility and utilisation of technology among women fall behind that of men (Elnaggar, 2008).

ii) Age and use of technology

Chi-square test (Table 33 and Table 60) for association between age groups and use of technology clusters shows that there wasn't a statistically significant association, $\chi^2(8) = 5.551$, $p < 0.1$. From the symmetric measures, between the clusters shows a moderate association. Looking at the age groups and use of technology clusters, participants below 30 years shows a low profile to constructivist (emphasis on collaborative tools) on use of technology and high profile to traditional (emphasis on supporting work performance). Participants who were between 30 and 40 shows a low profile to constructivist (emphasis on collaborative tools) on use of technology and high profile to mixed (emphasis on individual learning) in use of technology. Participants of age above 40 years shows a low profile to mixed (emphasis on individual learning) in use of technology and high profile to constructivist (innovative learning environment) such as games and simulations.

These findings corroborated those of many other studies (Mahdi & Al-Dera, 2013; Youssef et al., 2013; Inan & Lowther, 2010; Brunk, 2008; Hermans et al., 2008; Guo et al., 2008). Many studies revealed that old teachers tend to employ technology more in professional practice than young teachers (Rana, 2013; Lau & Sim, 2008). This is because as old teachers tend to be more thorough in the subject content area and have experience in pedagogy, they can spend more time in learning and preparing technology implemented lessons. Likewise, young teachers need more time in lesson preparation and learning techniques of class management which limits the time in use of technology in students learning. On the other hand, Guo et al. (2008) accentuated that young teachers were expected to use technology more in instructional practice. This is because of their exposure to technology in teacher training and from schools. In Maldives, it expected that experienced teachers tend to spend more time in learning and preparing lesson that implements use of technology in students learning. Older teachers tend to be more experienced in managing and disciplining students and familiar with the content and teaching strategies. However, novice teachers or young teachers are new to the teaching environment which they are at the learning stage of classroom management as well of teaching strategies. Furthermore the content and more relevant pedagogies for the lesson had to be explored. As a result, it could mean that young teachers do not have much time in focusing the use of technology in constructivist learning environment as stated and shown by other researchers.

b) Other internal factors and use of technology

The other internal factors selected in this study were teaching experience and self-competence of the teachers. CROSSTAB was carried out to find the relationship between teaching experience and competency with the use of technology.

i) Teaching experience and use of technology

Chi-square test for association between teaching experience and use of technology shows that there wasn't any statistically significant association, $\chi^2(8) = 13.844$, $p < 0.01$ (see Table 34 and Table 61). Similarly, from Phi and Cramer's V values shows that there was a moderate association. Looking at the cluster associations participants with teaching experience of between 1 to 5 years shows a high profile to traditional (emphasis on supporting work performance) such as planning and preparation and low profile to constructivist (innovative learning environment) such as games and simulations. Participants with teaching experience of 6 to 10 years shows low profile to constructivist (emphasis on collaborative tools) on use of technology and high profile to traditional (emphasis on supporting work performance) like for preparation and planning. Participants with more than 10 years of teaching experience shows a high profile to constructivist (emphasis on collaborative tools) on use of technology and low profile to traditional (emphasis on supporting work performance). The cluster association shows that the experienced teachers tend to accommodate constructivist use of technology in instructional practice. Less experienced or novice teachers tend to employ traditional use of technology such as for their preparation and planning phase.

This results mirrored many other studies (Tweed, 2013; McConnel, 2011; Gorder, 2008). McConnel (2011) indicated that the reason for the insignificance between teaching experience and use of technology could be the effect of training programs especially to novice teachers. Many research studies showed similar results (Inan & Lowther, 2010; Lau & Sim, 2008; Russel et al., 2007; Baek et al., 2008). For instance, Lau and Sim (2008) revealed that teachers with more teaching experience tend to use technology more in instructional practice compared to younger teachers. However, authors indicated that though newly qualified teachers had higher technology skills, they did not display it in instructional practice (Lau & Sim, 2008). This could be because novice teachers had to spend more time and energy in getting acquainted with curriculum and classroom management. On the other hand, as experienced teachers are more thorough with subject content and variety of teaching strategies, they are more confident and acknowledge the use of technology in enhancing students' learning (Lau & Sim, 2008). In contrast, Baek et al (2008) contended that more experienced teachers does not take the full advantage of "using the enhanced functions of technology" (p. 233). Authors indicated that experienced teachers tend to be more unprepared in employing technology, and teachers' decision in employing technology is due to the external pressure. Ritzhaupt et al. (2012) suggested the importance providing guidance and training programs.

ii) Competence and use of technology

Chi-square test for association between competence and use of technology shows that there was a statistically significant association, $\chi^2(8) = 39.527$, $p < 0.001$ (see Table 34 and Table 61). Similarly, from Phi and Cramer's V values shows that there was a moderate association.

Looking at the cluster associations participants self-evaluate technology competence and use of technology in teaching practice, participants who were not prepared tend to show a high profile to mixed (emphasis on individual learning) on use of technology and low profile to mixed (emphasis on delivery). Participants who were adequately prepared shows a low profile to constructivist (innovative learning environment) on use of technology and high profile to mixed (emphasis on delivery). Participants who were well prepared shows a high profile to constructivist (innovative learning environment) on use of technology and low profile to traditional (emphasis on supporting work performance).

The results were similar to study of Yeung et al. (2012). The authors posited that one of the influential factors for teachers' use of technology was self-perception of competence in using certain technology. Yeung et al. (2012) accentuated that teachers who were competent in using technology tend to use it more often compared to incompetent counterparts. This could be because the competent teachers are more confident and probably have a thorough knowledge in use of technology in pedagogy. As a result they are not scared to experience it in the instructional practice. Tezci (2009) affirmed that teachers with high level of technology knowledge inclined to use technology in educational setting. In order for teachers to be more competent in use of technology in teaching and learning, Kirschener and Davis (2003) argued that teacher education programs need to provide necessary requirement for use of technology. In addition, continuous training is crucial for teachers to become comfortable and for an effective use of the available technology in instructional practice (Enochsson & Rizza, 2009).

c) Other external factors and use of technology

External factors selected in this study were technical support and resources. CROSSTAB was carried to find the relation between external factors and use of technology in teaching practice.

Chi-square test for association between external factors (technical support and resources) and use of technology in teaching practice shows that there wasn't statistically significant association, $\chi^2(8) = 11.146$, $p < 0.1$ (see Table 35 and Table 62). Similarly, from Phi and

Cramer's V values shows that there was a moderate association. Regarding the cluster relations, the technical support typology shows a high profile to traditional (emphasis on supporting work performance) in use of technology and low profile to constructivist (innovative learning environment). Hardware typology shows a low profile to traditional (emphasis on supporting work performance) and high profile to constructivist (innovative learning environment). The typology on software shows a high profile mixed (emphasis on individual learning) and to constructivist (emphasis on collaborative tools) on use of technology. This typology shows a low profile to mixed (emphasis on delivery) on use of technology. As from the cluster associations, it is clear that many of the participants do not use technology in constructivist (innovative learning environment) such as games and simulations.

i) Resources and use of technology

Previous research has revealed that lack of resources and accessibility to resources as one of the main barriers that influence the use of technology in teaching and learning (Hew & Brush, 2007). Obviously, if teachers do not have an easy access to resources, they will not be able to use it. Moreover, the knowledge of how to use technology also effects on using. Therefore, access to technology tools and updated applications are requirement for teachers to employ it in teaching and learning.

Many studies have disclosed that accessibility to both hardware and software is essential for use of technology in teaching and learning (Martin et al., 2011; Bauer & Kenton, 2005; Norris et al., 2003; Zhao et al., 2002). Becker et al. (1999) argued that teachers' use of computers for instructional practice tend to be more when it is available in classroom rather than in the computer lab. NEA (2008) posited that computers should also be available to students if it is to be integrated to instructional purposes. Norris et al. (2003) study revealed a strong a relationship between technology access and technology use. Bauer and Kenton (2005) emphasized on the accessibility of resources and stated that hardware should always be more. In addition, software, internet, reliable servers, storage capacity and a complete school wiring network are requirements.

On the other hand, NEA report (2008) accentuated that insufficient and outdated software and equipment's prevents teachers using it successfully in instructional practice. Ozen (2012) study revealed similar findings which were 72.2 percent of the participants stated old versions of computers and poor internet facilities were barriers that prevent then use technology in classrooms. Similarly, Richards and Skolits (2009) remarked that teachers cannot employ new instructional strategies if they are not supplied with resources and necessary guidance. On the hand, by furnishing with latest technology tools, does not mean that teachers will use it effectively in instructional practice. Potter and Rockinson-Szapkiw (2012) posited that teachers need assistance and guidance in effectively employ in students learning environment.

In Maldives, the school management and parents have made an effort of changing classroom blackboards to smart-boards. However, the necessary up-dated software's and students' use of it have been limited in many of the school. This could be a hindering factor that effects the use of technology fully. In addition, the lack of training opportunities for teachers.

ii) Technical support and use of technology in teaching practice

Even though the present study reveals that there isn't any significant association between technical support and use of technology for instructional practice, many of the previous researchers revealed that technical support is also a main barrier in teachers' use of technology (Cox et al., 2000; Gotkas et al., 2013; Kala, 2013;Liu et al., 2013; Tondeur et al., 2013). Hammond et al. (2011) posited technical support as an intervening or mediating factor than a causal factor in employing technology in teaching and learning. Li and Walsh (2010) remarked that teachers' willingness in employing new technology is associated to the level of support provided from the school such as technical support, management support and fillip provided by the colleagues. Kessler and Plakans (2008) argued that by providing appropriate technical support for teachers facilitates in developing their confidence and comfortableness in using technology effectively in teaching context. Moreover, by getting technical support ensure the technical problems are addressed promptly and ensure that the technological tools are operating smoothly. However, to assure that teachers employ technology successfully in instructional practice, Hofer et al. (2004) contended that they also do need pedagogical support. As many of the research have revealed that technical support is significant in use of technology effectively in teaching and learning environment.

9.03 Conclusion

This study sought to explore the factors that impede the use of technology among teachers in teaching practice. Both internal and external factors were looked upon to see its relationship with the use of technology in instructional practice. This research analysis has shown significant results and contributions to understand the factors for a successful use of technology in teaching practice.

1. This study was designed to understand the use of technology among secondary teachers in teaching practice. As this is the first of this kind of study in this field to investigate the factors to successfully use technology in teaching practice in Maldives context, it serves to understand the situation and internal and external factors that facilitates the use technology in a constructivist way in teaching and learning. Even though the study was focused only to the secondary teachers working in the schools located in the capital city, Male', the findings were informative, enlightening and advocating.

2. The sample of teachers in this study appear to be a diverse group consisting of both local and foreign teachers and of different age groups. Even though the sample is dominated mostly by females, it is observed that male teachers tend to employ technology in a more constructivist way in contrast to female counterparts.

3. Considering age groups, old teachers tend to employ constructivist use technology more compared to young teachers. In addition, from the results it was also noticed that participants between age group 30 to 39 have a high profile to the cluster mixed

(emphasis on individual learning) and low profile to constructivist (emphasis on collaborative learning). The group below 30 years have a high profile to the cluster on mixed (emphasis on delivery) and low profile constructivist (emphasis on collaborative learning). This result corroborated to those of many research studies which disclosed that old teachers inclined to use technology in a more constructivist manner compared to younger teachers, despite to the younger teachers greater level of exposure to the technology (Mahdi & Al-Dera, 2013; Youssef et al., 2013; Inan & Lowther, 2010; Brunk, 2008; Hermans et al., 2008; Guo et al., 2008) (refer section 9.02.04). Similarly, in the Maldivian context, it was believed that younger teachers were more constructivist and be familiar with collaborative ways of use of technology in teaching and learning environment. However, the findings of this study disinclined this belief, showing that older teachers associated more in constructivist use of technology in the professional setting.

4. Five clusters were identified in the use of technology which belong to the two broad categories; constructivist and traditional use of technology. The most dominant or biggest cluster was mixed (emphasis on individual learning). This cluster includes items on teachers use of technology as a resource tool (get information from internet), as a workstation (use of word processor and PowerPoint) and management tool (students grading) and also to some extent to engage students for real world problems. Traditional use of technology items were more dominant in this cluster. The next two biggest clusters were constructivist (emphasis on innovative learning environment) and mixed (emphasis on delivery) both having very close percentage. Constructivist (emphasis on innovative learning environment) consists of items related to the advanced use of technology in teaching such as simulations and

games. Mixed (emphasis of delivery) cluster is dominated by the traditional use of technology mostly for instructional delivery. The smallest clusters were traditional (emphasis on supporting work performance) and constructivist (emphasis on collaborative tools). The cluster on traditional (emphasis on supporting work performance) consists of use of technology items related to teacher preparation such as use of word processor for preparing worksheets. Constructivist (emphasis on collaborative tools) cluster consists of constructivist items on collaboration, simulation and games, technology to facilitate to use technology to work independently and technology enhanced activities. Overall, three of the clusters associate to traditional use of technology and the remaining two clusters to constructivist use of technology. It was observed that only few of the teachers were using collaborative tools while many of the teachers employ technology for preparation and delivery. From the results it was observed that majority of the teachers tend to use technology to engage students in real world problems and technology collaborative and innovative learning environments, indicating a positive result of use of constructivist technology. However, it should also be highlighted that there are also teachers who do employ technology in traditional way.

By looking at the specific items in this cluster, majority of the teachers agreed on use of internet to get information, use of word processor for writing lesson plans and student hand-outs and use of Power-Point for lesson delivery. All these items were traditional use of technology. On the other hand, majority of participants disagree on use of technology for collaboration, technology related games and simulations and use of smart-board for delivery. Hence, it is clear that teachers tend to use technology more in a traditional way in contrast to constructivist use of technology.

Considering the participants' demographic characteristics and clusters of use of technology, it is clearly seen that male participants had a high profile to constructivist (innovative learning environment) and constructivist (emphasis on collaborative tools) technology use and a low profile to traditional use of technology (emphasis on supporting work performance). On the other hand, female participants had a profile to traditional (emphasis to work performance) and mixed (emphasis on individual learning) on technology use and low profile to constructivist (emphasis on collaborative tools) technology use. As seen from previous studies, this study shows that there is a gender disparity in the use of technology (see section 9.02.04).

Regarding participants' age groups and use of technology, participants of age 40 and above shows a high profile to constructivist (emphasis on collaborative tools) use of technology and a low profile to mixed (emphasis on individual learning) on use of technology. Participants' of age group 30 to 39 years had a high profile to mixed (emphasis on individual learning) and low profile to constructivist (emphasis on collaborative tools) use of technology. Participants age below 30 years had a high profile to traditional (emphasis on supporting work performance) of use of technology and low profile to constructivist (emphasis on collaborative tools) use of technology. Generally, older teachers tend to use technology in a more constructivist way compared to younger teachers (see section 9.02.04).

5. The analysis of pedagogical belief revealed five clusters belonging to the traditional and constructivist pedagogical belief. The most dominant or biggest cluster was traditional (emphasis on delivery for remembering). This cluster includes items focused on preparing students for examination such as presenting, explaining content and learning refers to remembering. The second biggest cluster was traditional pedagogical belief. The items in this cluster indicates teaching as transmitting information or knowledge and learning as remembering. The third biggest two clusters were mixed (strong constructivist) and mixed (emphasis for understanding). Both these clusters had a very close percentage. Mixed (strong constructivist) cluster is composed of both traditional and constructivist pedagogical belief items, however the constructivist belief items were more dominant. The constructivist items included were encouraging students to think explore, discuss and presentation, encouraging group activities, constructing knowledge from learning experiences and tailored teaching to cater individual students. In addition, a small contribution of traditional pedagogical belief item on learning is for remembering is included in this cluster. The smallest cluster was mixed (emphasis on delivery for understanding). This cluster consists of both traditional and constructivist pedagogical belief, however, it is noted that the item on teaching as transmitting knowledge was dominated in this cluster. The constructivist items included were discussion and group activities and also encouraging students to think by themselves.

   Considering the individual items in this cluster, it was observed that majority of the participants' agreed on teaching encourages students to think by themselves and as opportunities to explore, discuss and present their ideas. In contrast, participants disagreed on learning as remembering what teachers have taught and teaching as simply telling, presenting or explaining content. Generally, it shows that majority of the teachers had a constructivist pedagogical belief. Constructivist learning environments create active engagement, cater for individual learning needs, support collaborative problem solving and engage students in meaningful learning. Unlike students engagement, in traditional learning environment is more teacher dominated by strictly relying to curriculum activities and delivering it.

Regarding the demographic characteristics and pedagogical belief, female participants had a high profile to traditional (emphasis on delivery for remembering) and constructivist pedagogical belief and low profile to traditional pedagogical belief. On the other hand, male participants had a high profile to traditional pedagogical belief and low profile to constructivist pedagogical belief. It is observed that majority of the participants had traditional pedagogical belief in comparison to constructivist pedagogical belief.

Comparing individual clusters of pedagogical belief and age groups, participants' below 30 years had a high profile to constructivist pedagogical belief and low profile to mixed (strong constructivist) pedagogical belief. Participants of between 30 and 39 years showed a high profile to mixed (strong constructivist) pedagogical belief and low profile to traditional pedagogical belief. Participants of age 40 and above indicated high profile to traditional pedagogical belief and low profile to traditional (emphasis on delivery for remembering). In general, it is observed that younger teachers had a high profile to constructivist pedagogical belief while older teachers had more traditional pedagogical belief.

Considering the pedagogical belief and use of technology, this study pointed insignificant association between pedagogical belief and use of technology. This result accorded to previous studies that had shown inconsistencies between pedagogical belief and use of technology (Liu, 2010; Teo et al., 2008; Chen, 2008) (refer section 9.02.01). Likewise, looking at the individual cluster relationships, revealed that there is also an association between traditional pedagogical belief and use of technology in traditional way. For example, pedagogical cluster on delivery for understanding had a high profile to technology use on supporting work performance. In Maldivian context, teachers' traditional pedagogical belief and use of technology in traditional manner could be related to teachers own learning experience and to the influence of the practicing early learning style of the country; rote, drilling and practicing of Quran.

6. The analysis of affiliation, perceived ease of use and perceived usefulness revealed five clusters. The biggest cluster was perceived competence which was composed mainly by the item on interaction with computers is clear and understandable. In addition, the item on working with computer is fun had a small contribution. The second biggest cluster was utility which was composed of items on the productivity of computers. The remaining three clusters; facilitate, affiliation and mixed (utility and facilitate) had very close percentages. The cluster on facilitate was composed of items on the effectiveness and easiness of use of computer to the work. Cluster on affiliation was compiled of items related to the individuals liking and association of computers to the work. The last cluster mixed (utility and facilitate) was composed of items related to effectiveness and use of computers for work. From the results it was observed that local teachers tend to have a high association to

mixed (utility and facilitate) while foreign teachers have a high profile to perceived competence. Comparing these clusters to the clusters on use of technology, it was noticed that the mixed (utility and facilitate) tend to have a high profile with traditional (emphasis on supporting work performance) while perceived competence tend to have a high profile with constructivist (emphasis on innovative learning environment). This study indicated that for majority of the teachers' interaction with computers were clear and understandable. In addition, many revealed their comfortableness in using computers and also use of computers enhance effectiveness and productivity of their work. On the other hand, results also showed that few teachers believed that use of computers makes learning more interesting and fun. Regarding the competence of the teachers, previous studies revealed that teachers who are competent in use of technology tend to employ technology in their teaching and learning more compared to incompetent teachers. Thus they inclined to be more confident in use of technology. The findings revealed that affiliation, perceived use and perceived ease of use are significant predictors of use of technology in constructivist way in teaching and learning.

Regarding the demographic characteristics and the clusters on affiliation and usefulness, it was observed that male participants shows a high profile to facilitate and low profile to affiliation. In contrast, female participants had a high profile to affiliation and low profile to facilitate. In general, female participants were more pertained on the easiness on use of technology rather than the association of computer to the work. Male participants had high profile to association of computers to the work than the facilitation to the computers.

Considering the age groups, the younger participants (below 30 years) had a high profile to perceived competence and low profile to facilitate. Participants' of 30 to 39 years showed high profile to affiliation and low profile to perceived competence. On the other hand, participants above 40 years indicated a high profile to facilitate and low profile to mixed (utility and facilitate). In general, it was noticed that younger participants had a positive perception towards computers while older teachers were more concerned to the easiness on use of technology.

Looking at the participants' nationality and affiliation and usefulness clusters, it showed that local participants indicated high profile to mixed (utility and facilitate) and low profile to perceived competence. On the other hand, foreign participants showed a high profile to perceived competence and low profile to mixed (utility and facilitate). In general, majority of foreign nationals consider interaction with computers as clear and understandable while many locals relate it to enhance to the work performance. Further qualitative or mixed research studies need to be carried out to explore this relationship to acquire in-depth understanding.

7. Considering teacher training programs that participants had undergone, it is noted that teachers who were trained in local institutes tend to employ technology more traditionally compared to teachers who were trained in overseas. It is also noted that there were many foreign nationals working in the teaching sector in Maldives. In addition, it is also observed that many local teachers had completed their teacher training in overseas.

8. Five clusters were identified in use of technology in teacher training program which belong to the two main groups; traditional and constructivist use of technology. The biggest cluster keyed was mixed (emphasis on preparation and delivery). This is a traditional use of technology where technology was used for teachers' preparation and instructional delivery. The second biggest cluster identified was constructivist (emphasis on innovative learning environment). This cluster was composed of items related to advanced use of technology such as simulation and collaboration. The remaining three clusters; traditional (adapted to context), constructivist (emphasis on technology activities) and mixed (emphasis on variety of learning styles) had a very close percentages. Traditional (adapted to context) cluster was dominated by the traditional use of technology items such as stand-alone technology course, technology for instructional delivery. However, constructivist technology use item on use of technology to solve real world problems was included in this cluster. Cluster on constructivist (emphasis on technology activities) was composed of items related to variety of learning activities and collaboration. Cluster on mixed (emphasis on variety of learning styles) was composed of more traditional technology use items related to teacher preparation and delivery. In addition, stand-alone technology course and use of technology for various student learning were included in this cluster. Generally, it is observed that more traditional use of technology in teacher training were employed in comparison to constructivist use of technology. Literature underlines the importance of constructivist use of technology in teacher training courses (Rakes et al., 2006; UNESCO, 2012; Foulger et al., 2013), and teachers who were trained to use technology during the teacher training program tend to employ technology in instructional practice (see section 9.02.03).

Comparing teacher training clusters and gender, showed that male participants indicated a high profile to constructivist (emphasis to innovative learning environment) and low profile to traditional (adapted to context) on use of technology. In contrast, female had a high profile to traditional (adapted to context) and low profile to constructivist (emphasis to innovative learning environment) on use of technology. In Maldivian context mostly males continue to pursue further studies in local or overseas institutions compared to females. This give males more opportunities to acquire knowledge and necessary training such as on use of technology in constructivist way in professional practice. Thus, further research are needed on this gap between male and female participants use of technology in instructional practice.

Regarding age groups and use of technology in teacher training, younger teachers of below 30 years had a profile to mixed (emphasis to preparation and delivery) on use of technology and low profile to constructivist (emphasis to innovative learning environment). Participants of age 30 to 39 years indicated high profile to mixed (variety of learning styles) and low profile to traditional (adapted to context). Participants of 40 years and above showed a high profile to constructivist (emphasis to innovative learning environment) and low profile to constructivist (emphasis to technology activities). In general, older teachers in the teacher training program tend to employ more constructivist use of technology while younger teachers were more concerned on preparation and delivery.

9. Regarding the professional development programs (PDP) many of the participants revealed that no PDP were offered from the schools. In addition, those who had

attended PDP programs had revealed that the training was mainly on basic use of computers and were not so effective. This study further indicated that teachers who had attended PDP tend to have a high profile to use of technology on mixed (emphasis on individual learning) and low profile to use of technology for supporting work performance. On the other hand, those who have not attended any PDP had a high profile to use of technology for supporting work performance and low profile of use of technology to mixed (emphasis on individual learning) and mixed (emphasis on delivery). This indicates the significance of PDP for teachers' use of technology in instructional practice. In addition, research has revealed that in order to use technology successfully in instructional practice teachers need to be provided continuous PDP programs (Uslu & Bümen, 2012; Potter & Rockinson-Szapkiw, 2000). In addition, these programs need to be designed according to the teacher's need. Also allocating only 3 days (15 hours) per year for PDP may not be sufficient for upgrading teachers.

10. Regarding the technical support, availability of hardware and software, it was noticed that majority of the participants agreed that they had adequate technical assistance, updated educational software and efficient guidance from ICT coordinator/mentor. On the other hand, participants disagreed on accessibility to hardware resources for students, sufficient number of media (printers, scanner etc.) and sufficient number of computers for teachers use. This shows that many of the teachers were appraised by the support provided by the technical staff and ICT coordinators. In addition, participants also noted that the availability of updated software. On the other hand, participants were unhappy with the limited hardware resources for students and teachers use. Regarding this, previous studies had

revealed that there is a strong relationship between availability and accessibility of resources and technology use (Becker et al., 1999; Norris at al., 2003). Li and Walsh (2013) pointed out that teachers tendency to use technology depends on the level of technical support provided from the school.

11. Factors associated to constructivist use of technology in teaching and learning were identified in this study. Among them were, pedagogical beliefs, affiliation, perceived ease of use, perceived usefulness, teacher training, professional development programs, demographic characteristics (gender and age), teaching experience, competence, technical support and availability of resources. It is clear that all these are influential factors for constructivist use of technology in instructional practice.

9.04 Limitation of the study

The research study is bound to be faced by a number of limitations. There are obstacles in including the schools in the island in this study because of the geographical structure of the country, time and high cost of travelling to islands for survey purpose. Crawley and Fine (2004) stated that some areas within the Maldives might not be passable ostensibly due to unfavorable climatic conditions or high cost of transportation. However, if could have been included, obviously study would be more comprehensive. In fact, the findings of this study may not be a representative for all the schools. However, future research should be conducted in other locations to explore technology use in other school setting.

Another limitation of the study was that there is a dearth of literature related to technology in schools of Maldives. The research paper required relevant and adequate information so as to understand the use of technology in the educational setting of Maldives. Mostly the concerned information were from reports from Non-Government Organisation (NGO) reports. These documents does not give a clear indication about the situation. Therefore, review was depicted from outside Maldives.

Regarding the research methodology, the present study was based on self-reporting of the research questionnaire may have unverifiable information which may have affected the findings of the study. There are many limitations in self-reporting questionnaires such as social desirability, error of proximity, error of leniency, error of severity, halo effect and many more. In future research, a mixed method, both quantitative and qualitative methods suchlike surveys interviews, focus group discussions, observations could establish or strengthen the research findings.

Research instrument could also may be a limiting factor as the original set of questionnaires were developed in other educational settings. Even though pilot study was conducted, the questionnaire may not be the most suited for the Maldivian context. Maldives education system was basically based on traditional and cultural basis. So, in future a newly developed questionnaire focused to the Maldivian educational setting need to be developed.

Last but not least, this study was focused on teacher level factors. However, the successful use of technology do not only depend on teacher level factors. As this study was ex-post-facto research, generally understanding the technology use among teachers. Thus, to see the big picture of the situation it is crucial to explore other factors such as school level factors (management, culture, infrastructure, etc.) and national level factors such as policies, curriculums. Even though training programs and infrastructure was looked upon in this study, in future these need to be investigated in-depth such as the design of training programs, content, length of the program, timings. These are vital factors that influence the use of technology.

9.05 Suggestions for further research

As a general principle, teachers strive to prepare students to excel in all the fields. They have a very difficult challenge in front of them, not only must they be able to successfully implement different teaching strategies and use new instructional technologies, but they have to be able to successfully employ technology into education and the students curriculum.

To truly use technology into education, teachers not simply include an activity in the lesson or classroom. But in order for technology to employ into education successfully, the use of technology must be considered as a tool that is used throughout the curriculum.

The followings are recommendations pertain to this research:

1. Gender disparity: As there is a gender disparity in use of technology, attempts should be made to increase the level of technology use in instructional practice. Similarly, attempts should be made to change the traditional pedagogical belief of the teachers as this is a crucial variable that influence the constructivist use of technology in instructional practice. The results of this study was based on self-reporting research questionnaire, therefore further studies of mixed research method need to be used to acquire more information on why female teachers were reluctant in employing technology constructively in their teaching practice.

2. Age groups: From this study it was observed that only 16 percent of the teachers were in the age group of above 40 years, meaning that majority of the teachers were young and novice. In addition, the older teachers tend to employ technology in constructivist manner in contrast to young teachers. Why do experienced teachers depart the teaching field? Could it be due to motivational influences such as incentives, higher level posts or moving to another country for their children's education? These need to be looked upon further in future studies. Moreover, efforts should be made to increase the level of constructivist use of technology among young and novice teachers who start their careers as teachers in this sector.
3. Use of technology: By taking this exploratory analysis as a guideline, a thorough mixed methodology study such as focus group, interviews, observations extended to the other parts of the country need to be carried out to get a better understanding of how technology is used specifically focusing on individual clusters identified in this study. Specifically focusing on why do majority of the teachers tend to use technology traditionally? Could this be due to lack of knowledge, lack of support from management and parents or due to teaching belief?
4. Pedagogical belief: The findings of this study on pedagogical belief confirms that there is a tendency for further research. It is worth to study whether there is a relation between teachers' pedagogical belief and to Maldives tradition and culture. Maldivians early learning commences by rote, drilling and practicing strategies which begins at an early age of 2 years. Learning of Quran is mainly through rote learning and drilling. Could this have an influence to teachers' pedagogical belief? On the other hand, why do teachers give emphasis to delivery or transmission of instruction and also learning is considered as remembering than on constructivist teaching and learning?

5. Teacher Training: This study revealed that only 7 percent of the participants had completed master's degree. Do not teachers get the opportunity to expand educational qualification further or do teachers with higher qualification discontinue working in schools? These need to be considered in future studies. There could be a variation of teacher training program curriculum in the training institutes, it is urged to conducted in-depth studies in this area. As many of the teachers were trained in these institutes and probably more will be trained in future, how technology is employed in teacher training programs need to be explored further. Certainly, teacher training programs need to be more focused on constructivist use of technology and student teachers need to get hands on experience in using variety of technology tools.
6. Professional Development Programs (PDP): This factor need to be explored further focusing on the design and curriculum of PDP and PDP are carried out to teachers. In addition, what would be the minimum number of hours required to provide an effective training to teachers need to be considered.
7. Technical support and resources: Based on this study it is recommended that further in-depth studies need to be conducted to understand the technology tools available and accessible for teachers and students in school and how it is used in instructional practice.
8. Comprehensive study: The scope and effects of the integration of technology into education and curriculum are vast and beyond the reaches of this study alone, therefore an entire educational system or target population with a much more comprehensive study is needed to understand how technology can be used and how effective it is in modern day education.

9. School management: This research is more focused on teachers' use of technology in instructional practice, therefore, a similar kind of research with more emphasis on school managements initiative will be required to have a broader understanding on the area.
10. Rural areas: A more in-depth research on the same perspective should be conducted in the rural areas to have better understanding of the relevance and use of technology in the schools set up on those areas.
11. Regular research: The rate of technological change is rapid and fast today. Therefore, in order to provide curriculum that reflects the needs of today, researches should be conducted on regular basis to study the trends and changes of technology in the education.
12. Follow-up research: This research provides an example that can use in an effort to provide quality educational opportunities to the children with the use of technology, however, qualitative follow-up studies should be conducted in order to keep pace with the change in technology in education.

When one starts a PhD research, thinks that they are going to find clear and sound answers to different questions that were raised at the beginning of the process. However, as long as the work develops it becomes more obvious that the main results of the study raises more questions than answers. Likewise, each contribution of this thesis, partial and situational, has raised more general and important questions in the attempt to find precise answers and a deeper understanding and about the use of technology in Maldivian education.

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Appendices

Appendices

Appendix A: Research Instrument

SECTION 1: DEMOGRAHIC INFORMATION

1. i) Please state the name of your school: ________________________________
   ii) Please indicate the atoll and island that your school is in: ________________

2. Please state the subject(s) and grade(s) that you teach:
   i) Subject: ____
   ii) Grade: ____

3. What is your gender:

   Male ☐1 Female ☐2

4. In which age group do you belong?

   i) Under 20 ☐1 ii) 20 – 29 ☐2
   iii) 30 – 39 ☐3 iv) 40 – 49 ☐4
   v) 50 – 59 ☐5 vi) 60 and over ☐6

5. Including the current year, how many years have you been teaching?

   i) 1 – 5 ☐1 ii) 6 – 10 ☐2
   iii) 11 – 15 ☐3 iv) 16 – 20 ☐4
   v) Over 20 ☐5

6. Where is your school located?

   i) Urban ☐1 ii) Rural ☐2

7. What is your employment status?

   i) Permanent ☐1 ii) Permanent on probation ☐2
   iii) On contract ☐3 iv) Assistant teacher ☐4

8. What is your mode of employment?

   i) Full-time ☐1 ii) Part-time ☐2

9. What is your highest academic qualification?

   i) GCE O'level ☐1 ii) GCE A'level ☐2
   iii) Bachelor degree ☐3 iv) Master's and above ☐4

10. Are you a/an

i)	Maldivian teacher	☐1	ii)	expatriate teacher	☐2

11. Do you have any disability that affects or is affected by use of technology?

i)	Yes	☐1	ii)	No	☐2

SECTION 2: COMPUTER KNOWLEDGE AND EXPERIENCE

12. Where did you learn your computer skills?
Please check [X] all the main sources.

i)	have none	☐1	ii)	self-taught	☐1
iii)	secondary school	☐3	iv)	University/college	☐ 4
v)	friends/relatives	☐5	vi)	teacher education	☐ 6
x)	other(s)	☐7			

13. On average how many hours per day do you spend on using computers
Please check [X] only one box for each.

i)	Never	☐1	ii)	1 – 3 hours	☐2
iii)	4 – 7 hours	☐3	iv)	more than 8 hours	☐4

14. How often do you use a computer for activities other than work (e.g. Shopping, organizing photos, socializing, entertainment, contacting family and friends)?
Please check [X] only one box for each.

i)	Never	☐1	ii)	A few times a year	☐2
iii)	Almost monthly	☐3	iv)	Weekly	☐4
v)	Daily	☐5			

SECTION 3: TEACHER EDUCATION PROGRAM

15. Have you completed any Teacher Education Program?
    i) Yes ☐1 ii) No ☐2
    If "No", please go to Question 22.

16. What is your highest teacher education program completed?
    i) Teacher Certificate ☐1 ii) Teacher Diploma ☐2
    iii) Bachelor of Education/Teaching ☐3 iv) Master of Education ☐4

17. In which year did you complete your teacher training program? ________________

18. Have you completed teacher education program in a
    i) local institution ☐1 ii) overseas institution ☐2

19. To what extent has the use of technology described below been present in the teacher education program you have undertaken?
    Please check [X] all that applies.

		Not at all	A little	Somewhat	Very much	Always
a)	From teacher education program, I learnt to use technology to support various student learning styles and to personalize learning.	☐1	☐2	☐3	☐4	☐5
b)	Teacher educators/lecturers use different kinds of technology enhanced activities in the teaching to inquire, discuss and communicate ideas.	☐1	☐2	☐3	☐4	☐5
c)	Teacher educators encouraged student teachers to use technology to find information on their own and work independently.	☐1	☐2	☐3	☐4	☐5
d)	In the teacher education programs, I used technology to collaborate with each other.	☐1	☐2	☐3	☐4	☐5
e)	In teacher education programs, I used technology related games and simulations in teaching.	☐1	☐2	☐3	☐4	☐5
f)	Teacher educators/lecturers used technology in teaching to engage students in solving real world problems.	☐1	☐2	☐3	☐4	☐5
g)	Teacher educators used internet only to get information for reading or lecture preparation.	☐1	☐2	☐3	☐4	☐5
h)	Teacher educators/lecturers use PowerPoint for instructional delivery.	☐1	☐2	☐3	☐4	☐5
i)	Teacher educators/lecturers use computer/smart-board for instructional delivery.	☐1	☐2	☐3	☐4	☐5
j)	Technology course/unit	☐1	☐2	☐3	☐4	☐5

20. How well were you prepared for using computer-based technologies in your teaching from the teacher education program(s) that you have undertaken? Please check [X] only one box.

i)	Not prepared	☐ 1	ii)	Not very well prepared	☐ 2
iii)	Adequately prepared	☐ 3	iv)	Well prepared	☐ 4
v)	Very well prepared	☐ 5			

21. Which of the following services/lessons do you feel the Teacher Education Institute/faculty/college should provide ready access to students?
Please check [X] all that applies.

i)	computer access	☐ 1	ii)	email	☐ 2
iii)	basic software	☐ 3	iv)	basic computer lessons	☐ 4
v)	printers	☐ 5	vi)	web access	☐ 6
ix)	technical assistance	☐ 7	x)	specialist software	☐ 8

SECTION 4: INTERNET ACCESSIBILITY

22. Do you have a working computer in your classroom(s)

i)	Yes, one computer	☐ 1	ii)	Yes, more than one	☐ 2
iii)	No	☐ 3			

If “No”, please go to Question 24.

23. Is the working computer connected to the internet?

i)	Yes	☐ 1	ii)	No	☐ 2

24. Do you have a smart-board in your classroom(s)?

i)	Yes, one computer	☐ 1	ii)	Yes, more than one	☐ 2
iii)	No	☐ 3			

If “No”, please go to Question 26.

25. Is the smart-board connected to the internet?

i)	Yes	☐ 1	ii)	No	☐ 2

26. How many computer lab(s) is/are there in your school? _______________

27. How many computers on average are there in the lab? _______________

28. Is WIFI connection available on school premises?

i)	Yes	☐ 1	ii)	No	☐ 2

If “No”, please go to Question 31.

29. How would you describe the average speed of your school's internet connection?
Please check (X) only one box.

i)	Very slow	☐1	ii)	Slow	☐2
iii)	Average	☐3	iv)	Fast	☐4
v)	Very fast	☐5			

30. How would you describe the reliability of your school's internet connection?
Please check (X) only one box.

i)	never reliable	☐1	ii)	sometimes reliable	☐2
iii)	usually reliable	☐3	iv)	always reliable	☐4

31. Is there a Teacher Resource Center (TRC) in your school located island?

i)	Yes	☐1	ii)	No	☐2

If "No", please go to Question 33.

32. How frequently do you use Teacher Resource Center (TRC)?
Please check (X) only one box.

i)	Never	☐1	ii)	A few times a year	☐2
iii)	Almost monthly	☐3	iv)	Weekly	☐4
v)	Daily	☐5			

SECTION 5: TEACHING PRACTICE AND PEDAGOGICAL ORIENTATION

33. For the following statements, please indicate the level of agreement.
Please check [X] only one box for each statement.

		Strongly disagree	Disagree	Partly Disagree	Partly Agree	Agree	Strongly Agree
a)	The main role of teacher is to transmit knowledge	☐1	☐2	☐3	☐4	☐5	☐6
b)	Mostly learning occurs by drilling and practicing	☐1	☐2	☐3	☐4	☐5	☐6
c)	Teaching is simply telling, presenting or explaining the subject matter.	☐1	☐2	☐3	☐4	☐5	☐6
d)	Teaching is to provide students opportunity to do research to establish facts and knowledge.	☐1	☐2	☐3	☐4	☐5	☐6
e)	Learning means remembering what the teaches has taught	☐1	☐2	☐3	☐4	☐5	☐6
f)	Students have really learned something when they can remember it later.	☐1	☐2	☐3	☐4	☐5	☐6

g)	Effective teaching encourages more class discussion and group activities for students.	☐1	☐2	☐3	☐4	☐5	☐6
h)	Students should be given many opportunities to explore, discuss and present their ideas.	☐1	☐2	☐3	☐4	☐5	☐6
i)	Teaching should be designed in such a way to help students to construct knowledge from their learning experiences.	☐1	☐2	☐3	☐4	☐5	☐6
j)	Every child is unique or special and deserves an education tailored to his/her particular needs.	☐1	☐2	☐3	☐4	☐5	☐6
k)	Good teaching encourages students to think for answers by themselves.	☐1	☐2	☐3	☐4	☐5	☐6

34. For the following statements, please indicate the level of agreement on how technology is used in teaching and learning.
Please check [X] only one box for each statement.

		Strongly disagree	Disagree	Partly Disagree	Partly Agree	Agree	Strongly Agree
a)	I use word processor to writing lesson plans/notes and making handouts	☐1	☐2	☐3	☐4	☐5	☐6
b)	Computers are used for students' grades	☐1	☐2	☐3	☐4	☐5	☐6
c)	I use internet to get information from internet for lessons	☐1	☐2	☐3	☐4	☐5	☐6
d)	I use PowerPoint to present information to students	☐1	☐2	☐3	☐4	☐5	☐6
e)	By using technology, I believe that I can engage students in solving real world problems.	☐1	☐2	☐3	☐4	☐5	☐6
f)	I use different kind of technology enhanced activities in my teaching to inquire, discuss and communicate their ideas.	☐1	☐2	☐3	☐4	☐5	☐6
g)	I am able to facilitate my students to use technology to find more information on their own and work independently.	☐1	☐2	☐3	☐4	☐5	☐6
h)	I facilitate my students to use technology to collaborate with each other.	☐1	☐2	☐3	☐4	☐5	☐6
i)	I use technology related games and simulations in teaching.	☐1	☐2	☐3	☐4	☐5	☐6
j)	I use computer/ smart board for instructional delivery.	☐1	☐2	☐3	☐4	☐5	☐6

SECTION 6: ATTITUDE TOWARDS THE USE OF TECHNOLOGY

35. For the following statements, please indicate the level of agreement.
Please check [X] only one box for each statement.

		Strongly disagree	Disagree	Partly Disagree	Partly Agree	Agree	Strongly Agree
a)	Using computers will improve my performance in work.	☐1	☐2	☐3	☐4	☐5	☐6
b)	Using computers will enhance my effectiveness.	☐1	☐2	☐3	☐4	☐5	☐6
c)	Using computers will increase my productivity.	☐1	☐2	☐3	☐4	☐5	☐6
d)	My interaction with computers is clear and understandable.	☐1	☐2	☐3	☐4	☐5	☐6
e)	I find it easy to do work by using computers.	☐1	☐2	☐3	☐4	☐5	☐6
f)	I find computers easy to use.	☐1	☐2	☐3	☐4	☐5	☐6
g)	Computers make learning more interesting.	☐1	☐2	☐3	☐4	☐5	☐6
h)	Working with computers is fun.	☐1	☐2	☐3	☐4	☐5	☐6
i)	I look forward to the jobs that require me to use computers.	☐1	☐2	☐3	☐4	☐5	☐6

SECTION 7: PROFESSIONAL DEVELOPMENT PROGRAMS

36. Have you attended any training course, workshop, or seminar on using computers in the past two years?

i) Yes ☐1 ii) No ☐2

If "Yes", please go to Question 38.

37. If 'No in the previous question, which of the following reason(s) best explain what prevented you from participating in the above mentioned programs?
Please mark as many choices as appropriate

i) I did not have the pre-requisites (e.g. qualification, experience, seniority) ☐1

ii) Because it is too expensive/ I could not afford it. ☐2

iii) There was lack of employer support. ☐3

iv) Programs conflicted with my work schedule. ☐4

v) I did not have time because of family responsibilities. ☐5

vi) No programs offered. ☐6

Now please go to Question 39.

38. This question is based on the professional development activity that you have participated in the last two years and the impact of it to your teaching?
For each statement below, please check [X] to one box in part A.
If your answer is **"YES" in part (A)** then please check [X] in part (B) to indicate how much impact it had upon your development as a teacher.
If your answer to **Part (A) is "NO",** then move to the next statement.

		A Have you undertaken it?		**B** Impact			
		YES	NO	No impact	A small impact	A moderate impact	A large impact
a)	Courses/workshops/training on the use of computer	☐1	☐2	☐1	☐2	☐3	☐4
b)	Education conferences or seminars on use of technology in teaching and learning (where teachers and/or researchers present their research results and discuss educational problems)	☐1	☐2	☐1	☐2	☐3	☐4
c)	Training on the use of ICT in teaching and learning	☐1	☐2	☐1	☐2	☐3	☐4
d)	Equipment-specific training (interactive whiteboard, laptop, projector, etc.)	☐1	☐2	☐1	☐2	☐3	☐4
e)	Participate on online communities (e.g. Mailing, twitter, blogs) for professional discussions with other teachers	☐1	☐2	☐1	☐2	☐3	☐4
f)	Subject-specific training on learning applications (tutorials, simulations, etc)	☐1	☐2	☐1	☐2	☐3	☐4
g)	Other professional development opportunities related to ICT	☐1	☐2	☐1	☐2	☐3	☐4

39. Imagine yourself given the opportunity to participate in a professional development program. Please indicate the extent to which you have such needs.
Please check [X] only one box to each statement.

		Not at all	Low level of need	Moderate level of need	High level of need	Extremely high level
a)	I am interested to learn more on how to integrate technology in teaching and learning process	☐1	☐2	☐3	☐4	☐5
b)	I would like to learn computer skills	☐1	☐2	☐3	☐4	☐5
c)	I would like to learn on how to use technology that can promote student-centered learning	☐1	☐2	☐3	☐4	☐5
d)	I would like to learn how to use educational software in my classroom teaching	☐1	☐2	☐3	☐4	☐5
e)	I would like to learn on how to use internet as an instructional resource	☐1	☐2	☐3	☐4	☐5
f)	I would like to learn on how to use technology for assessment and evaluation in my classroom	☐1	☐2	☐3	☐4	☐5
g)	I would like to learn on how to use multimedia to explore different ways to teach some concepts	☐1	☐2	☐3	☐4	☐5

SECTION 8: TECHNICAL SUPPORT AND RESOURCES

40. To what extent do you agree or disagree to the following statements about the availability of resources and support.
Please check [X] only one box for each statement.

		Strongly disagree	Disagree	Partly disagree	Partly Agree	Agree	Strongly agree
a)	Efficiency of guidance by ICT coordinator/mentor.	☐1	☐2	☐3	☐4	☐5	☐6
b)	Adequate technical assistance for operating and maintenance of technical problems.	☐1	☐2	☐3	☐4	☐5	☐6
c)	Efficiency of school technical infrastructure about instructional technology	☐1	☐2	☐3	☐4	☐5	☐6
d)	Sufficient number of media (printer, scanner etc.) for effective use of computers	☐1	☐2	☐3	☐4	☐5	☐6
e)	Sufficient number of computers teachers use.	☐1	☐2	☐3	☐4	☐5	☐6

f)	Accessible to the existing hardware (computer, overhead projector etc.)	☐1	☐2	☐3	☐4	☐5	☐6
g)	Accessible to hardware resources for students (printer, scanners etc.).	☐1	☐2	☐3	☐4	☐5	☐6
h)	Updated educational software and CD-ROMS	☐1	☐2	☐3	☐4	☐5	☐6
i)	Adequate copies of software for instructional purposes	☐1	☐2	☐3	☐4	☐5	☐6
j)	Software is specific and/or adaptable for use.	☐1	☐2	☐3	☐4	☐5	☐6
k)	Sufficient number of school computer laboratory.	☐1	☐2	☐3	☐4	☐5	☐6
l)	Sufficient number of computers for students use.	☐1	☐2	☐3	☐4	☐5	☐6

Appendix B: Additional Tables

Table 36: Univariate ANOVA results (technology use in teaching practice)

Tests of Between-Subjects Effects

Source	ITEM	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
IT03_SEX	IT34aM	use word processor to writing lesson plans and making hand-outs	17.667	1	17.667	15.500	0.000	**0.041**
	IT34bM	Computers are used for students' grades	4.667	1	4.667	3.349	0.068	0.009
	IT34cM	I use internet to get information from internet for lessons	5.612	1	5.612	7.121	0.008	0.019
	IT34dM	I use PowerPoint to present information to students	0.438	1	0.438	0.552	0.458	0.002
	IT34eM	Using technology, can engage in solving real world problems.	1.928	1	1.928	1.562	0.212	0.004
	IT34fM	I use different kind of technology enhanced activities in my teaching to inquire, discuss and communicate their ideas.	0.498	1	0.498	0.624	0.430	0.002
	IT34gM	I am able to facilitate my students to use technology to find more information on their own and work independently.	0.633	1	0.633	0.759	0.384	0.002
	IT34hM	I facilitate my students to use technology to collaborate	13.731	1	13.731	13.337	0.000	**0.035**
	IT34iM	I use technology related games and simulations in teaching.	10.221	1	10.221	8.421	0.004	**0.023**
	IT34jM	I use computer/ smart board for instructional delivery.	2.964	1	2.964	1.434	0.232	0.004

	IT34aM	use word processor to writing lesson plans and making hand-outs	3.515	2	1.757	1.542	0.215	0.008
	IT34bM	Computers are used for students' grades	7.028	2	3.514	2.522	0.082	0.014
	IT34cM	I use internet to get information from internet for lessons	1.548	2	0.774	0.982	0.376	0.005
	IT34dM	I use PowerPoint to present information to students	0.484	2	0.242	0.305	0.737	0.002
	IT34eM	Using technology, can engage in solving real world problems.	7.178	2	3.589	2.908	0.056	0.016
IT04_AGE	IT34fM	I use different kind of technology enhanced activities in my teaching to inquire, discuss and communicate their ideas.	2.515	2	1.258	1.577	0.208	0.009
	IT34gM	I am able to facilitate my students to use technology to find more information on their own and work independently.	0.750	2	0.375	0.449	0.638	0.002
	IT34hM	I facilitate my students to use technology to collaborate	2.632	2	1.316	1.278	0.280	0.007
	IT34iM	I use technology related games and simulations in teaching.	1.381	2	0.691	0.569	0.567	0.003
	IT34jM	I use computer/ smart board for instructional delivery.	2.371	2	1.185	0.573	0.564	0.003

IT03_SEX * IT04_AGE	IT34aM	use word processor to writing lesson plans and making hand-outs	2.749	2	1.374	1.206	0.301	0.007
	IT34bM	Computers are used for students' grades	1.954	2	0.977	0.701	0.497	0.004
	IT34cM	I use internet to get information from internet for lessons	0.039	2	0.019	0.025	0.976	0.000
	IT34dM	I use PowerPoint to present information to students	5.461	2	2.731	3.444	0.033	0.019
	IT34eM	Using technology, can engage in solving real world problems.	2.361	2	1.181	0.957	0.385	0.005
	IT34fM	I use different kind of technology enhanced activities in my teaching to inquire, discuss and communicate their ideas.	0.099	2	0.049	0.062	0.940	0.000
	IT34gM	I am able to facilitate my students to use technology to find more information on their own and work independently.	3.029	2	1.515	1.814	0.165	0.010
	IT34hM	I facilitate my students to use technology to collaborate	2.486	2	1.243	1.207	0.300	0.007
	IT34iM	I use technology related games and simulations in teaching.	4.451	2	2.225	1.833	0.161	0.010
	IT34jM	I use computer/ smart board for instructional delivery.	10.824	2	5.412	2.618	0.074	0.014

<u>Table 37: Estimated Marginal Means (technology use in teaching practice)</u>

	Dependent Variable	Gender	Age groups	Mean	Std. Error	95% Confidence Interval	
						Lower Bound	Upper Bound
IT34aM	use word processor to writing lesson plans and making hand-outs	Male	under 30	4.344	0.171	4.007	4.680
			30 - 39	4.592	0.153	4.292	4.892
			40 and above	4.242	0.163	3.922	4.562
		Female	under 30	4.681	0.111	4.463	4.898
			30 - 39	4.914	0.111	4.695	5.133
			40 and above	4.971	0.144	4.688	5.254
IT34bM	Computers are used for students' grades	Male	under 30	4.318	0.189	3.946	4.690
			30 - 39	4.245	0.169	3.913	4.577
			40 and above	3.800	0.180	3.446	4.154
		Female	under 30	4.455	0.122	4.214	4.696
			30 - 39	4.360	0.123	4.118	4.602
			40 and above	4.262	0.159	3.949	4.575
IT34cM	I use internet to get information from internet for lessons	Male	under 30	4.677	0.142	4.397	4.956
			30 - 39	4.816	0.127	4.567	5.066
			40 and above	4.660	0.135	4.394	4.927
		Female	under 30	4.917	0.092	4.736	5.098
			30 - 39	5.066	0.093	4.884	5.248
			40 and above	4.953	0.120	4.717	5.188

IT34dM	I use PowerPoint to present information to students	Male	under 30	4.677	0.143	4.397	4.957
			30 - 39	4.510	0.127	4.260	4.760
			40 and above	4.288	0.136	4.021	4.555
		Female	under 30	4.261	0.092	4.080	4.443
			30 - 39	4.479	0.093	4.297	4.662
			40 and above	4.516	0.120	4.280	4.752
IT34eM	Using technology, can engage in solving real world problems.	Male	under 30	4.395	0.178	4.045	4.745
			30 - 39	3.939	0.159	3.627	4.251
			40 and above	3.893	0.169	3.560	4.226
		Female	under 30	4.014	0.115	3.787	4.241
			30 - 39	3.947	0.116	3.719	4.174
			40 and above	3.807	0.150	3.513	4.102
IT34fM	I use different kind of technology enhanced activities in my teaching to inquire, discuss and communicate their ideas.	Male	under 30	4.190	0.143	3.909	4.471
			30 - 39	4.082	0.128	3.831	4.333
			40 and above	4.335	0.136	4.067	4.603
		Female	under 30	4.132	0.093	3.950	4.314
			30 - 39	4.034	0.093	3.851	4.217
			40 and above	4.207	0.120	3.970	4.444
IT34gM	I am able to facilitate my students to use technology to find more information on their own and work independently.	Male	under 30	3.831	0.146	3.543	4.119
			30 - 39	4.041	0.131	3.784	4.298
			40 and above	4.149	0.139	3.875	4.423
		Female	under 30	4.014	0.095	3.828	4.200
			30 - 39	3.827	0.095	3.640	4.015
			40 and above	3.916	0.123	3.674	4.159

IT34hM	I facilitate my students to use technology to collaborate	Male	under 30	3.959	0.162	3.639	4.278
			30 - 39	3.816	0.145	3.531	4.101
			40 and above	4.242	0.155	3.938	4.546
		Female	under 30	3.627	0.105	3.420	3.834
			30 - 39	3.577	0.106	3.369	3.785
			40 and above	3.589	0.137	3.320	3.858
IT34iM	I use technology related games and simulations in teaching.	Male	under 30	3.600	0.176	3.253	3.947
			30 - 39	3.551	0.157	3.242	3.861
			40 and above	3.847	0.168	3.516	4.177
		Female	under 30	3.197	0.114	2.972	3.421
			30 - 39	3.501	0.115	3.275	3.727
			40 and above	3.244	0.149	2.952	3.536
IT34jM	I use computer/ smart board for instructional delivery.	Male	under 30	2.010	0.230	1.558	2.463
			30 - 39	2.408	0.205	2.004	2.812
			40 and above	2.544	0.219	2.113	2.975
		Female	under 30	2.702	0.149	2.409	2.995
			30 - 39	2.295	0.150	2.000	2.589
			40 and above	2.535	0.194	2.153	2.916

Table 38: Chi square test for gender and age with technology use clusters

Chi-Square Tests

		Value	df	Asymp. Sig. (2-sided)
Gender	Pearson Chi-Square	19.998[a]	4	0.000
	Likelihood Ratio	21.614	4	0.000
	Linear-by-Linear Association	11.158	1	0.001
	N of Valid Cases	371		
Age groups	Pearson Chi-Square	33.204[a]	16	0.007
	Likelihood Ratio	33.620	16	0.006
	Linear-by-Linear Association	0.894	1	0.344
	N of Valid Cases	317		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 14.83.
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.09.

Symmetric Measures

			Value	Approx. Sig.
Gender	Nominal by Nominal	Phi	0.232	0.000
		Cramer's V	0.232	0.000
		Contingency Coefficient	0.226	0.000
		N of Valid Cases	371	
Age groups	Nominal by Nominal	Phi	0.122	0.697
		Cramer's V	0.086	0.697
		Contingency Coefficient	0.121	0.697
		N of Valid Cases	371	

Table 39: Univariate ANOVA results of pedagogical belief

Tests of Between-Subjects Effects

Source	ITEM	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
IT03_SEX	IT33aM	The main role of teacher is to transmit knowledge	7.148	1	7.148	5.973	0.015	0.016
	IT33bM	Mostly learning occurs by drilling and practicing	0.851	1	0.851	0.787	0.376	0.002
	IT33cM	Teaching is simply telling, presenting or explaining content.	8.062	1	8.062	4.585	0.033	0.013
	IT33dM	Teaching is to provide students opportunity to do research	1.383	1	1.383	2.477	0.116	0.007
	IT33eM	Learning means remembering what the teaches has taught	0.094	1	0.094	0.068	0.794	0.000
	IT33fM	Students have really learned something when they can remember it.	0.082	1	0.082	0.093	0.761	0.000
	IT33gM	Teaching encourages more class discussion and group activities	0.160	1	0.160	0.330	0.566	0.001
	IT33hM	… many opportunities to explore, discuss and present their ideas.	0.010	1	0.010	0.024	0.876	0.000
	IT33iM	… for students to construct knowledge from learning experiences.	0.827	1	0.827	1.944	0.164	0.005
	IT33jM	… need to be tailored to his/her particular needs.	0.107	1	0.107	0.182	0.670	0.001
	IT33kM	Good teaching encourages students to think by themselves.	0.067	1	0.067	0.143	0.705	0.000
IT04_AGE	IT33aM	The main role of teacher is to transmit knowledge	0.432	2	0.216	0.180	0.835	0.001
	IT33bM	Mostly learning occurs by drilling and practicing	6.920	2	3.460	3.198	0.042	0.018
	IT33cM	Teaching is simply telling, presenting or explaining content.	2.589	2	1.294	0.736	0.480	0.004
	IT33dM	Teaching is to provide students opportunity to do research	2.364	2	1.182	2.117	0.122	0.012
	IT33eM	Learning means remembering what the teaches has taught	6.636	2	3.318	2.418	0.091	0.013

	IT33fM	Students have really learned something when they can remember it.	5.585	2	2.793	3.171	0.043	0.017
	IT33gM	Teaching encourages more class discussion and group activities	0.241	2	0.120	0.248	0.781	0.001
	IT33hM	… many opportunities to explore, discuss and present their ideas.	0.969	2	0.485	1.208	0.300	0.007
	IT33iM	… for students to construct knowledge from learning experiences.	0.378	2	0.189	0.444	0.642	0.002
	IT33jM	… need to be tailored to his/her particular needs.	1.844	2	0.922	1.569	0.210	0.009
	IT33kM	Good teaching encourages students to think by themselves.	0.255	2	0.128	0.275	0.760	0.002
IT03_SEX * IT04_AGE	IT33aM	The main role of teacher is to transmit knowledge	0.429	2	0.215	0.179	0.836	0.001
	IT33bM	Mostly learning occurs by drilling and practicing	3.909	2	1.955	1.807	0.166	0.010
	IT33cM	Teaching is simply telling, presenting or explaining content.	0.301	2	0.151	0.086	0.918	0.000
	IT33dM	Teaching is to provide students opportunity to do research	0.504	2	0.252	0.451	0.637	0.003
	IT33eM	Learning means remembering what the teaches has taught	6.780	2	3.390	2.470	0.086	0.014
	IT33fM	Students have really learned something when they can remember it.	1.851	2	0.926	1.051	0.351	0.006
	IT33gM	Teaching encourages more class discussion and group activities	3.468	2	1.734	3.573	0.029	0.020
	IT33hM	… many opportunities to explore, discuss and present their ideas.	1.335	2	0.667	1.664	0.191	0.009
	IT33iM	… for students to construct knowledge from learning experiences.	0.332	2	0.166	0.390	0.677	0.002
	IT33jM	… need to be tailored to his/her particular needs.	0.566	2	0.283	0.481	0.618	0.003
	IT33kM	Good teaching encourages students to think by themselves.	0.362	2	0.181	0.390	0.677	0.002

<u>Table 40: Estimated Marginal Means of pedagogical belief</u>

Dependent Variable		Gender	Age groups	Mean	Std. Error	95% Confidence Interval Lower Bound	Upper Bound
IT33aM	The main role of teacher is to transmit knowledge	Male	under 30	4.033	.175	3.688	4.377
			30 - 39	4.091	.156	3.784	4.398
			40 and above	4.162	.169	3.830	4.494
		Female	under 30	3.836	.117	3.606	4.065
			30 - 39	3.729	.114	3.505	3.954
			40 and above	3.833	.148	3.543	4.123
IT33bM	Mostly learning occurs by drilling and practicing	Male	under 30	3.853	.167	3.526	4.181
			30 - 39	4.050	.149	3.758	4.342
			40 and above	3.543	.160	3.228	3.859
		Female	under 30	3.927	.111	3.709	4.145
			30 - 39	3.653	.108	3.440	3.866
			40 and above	3.560	.140	3.285	3.836
IT33cM	Teaching is simply telling, presenting or explaining content.	Male	under 30	2.212	.212	1.795	2.630
			30 - 39	2.152	.189	1.780	2.525
			40 and above	1.924	.205	1.522	2.327
		Female	under 30	2.461	.141	2.183	2.739
			30 - 39	2.447	.138	2.175	2.719
			40 and above	2.324	.179	1.972	2.676

IT33dM	Teaching is to provide students opportunity to do research	Male	under 30	4.545	.120	4.310	4.781
			30 - 39	4.275	.107	4.065	4.485
			40 and above	4.377	.115	4.150	4.603
		Female	under 30	4.358	.080	4.202	4.515
			30 - 39	4.251	.078	4.098	4.404
			40 and above	4.197	.101	3.999	4.395
IT33eM	Learning means remembering what the teaches has taught	Male	under 30	2.443	.188	2.074	2.812
			30 - 39	2.581	.167	2.252	2.910
			40 and above	2.972	.181	2.616	3.327
		Female	under 30	2.518	.125	2.272	2.763
			30 - 39	2.947	.122	2.706	3.187
			40 and above	2.633	.158	2.322	2.944
IT33fM	Students have really learned something when they can remember it.	Male	under 30	3.802	.150	3.506	4.097
			30 - 39	3.397	.134	3.133	3.661
			40 and above	3.829	.145	3.544	4.114
		Female	under 30	3.768	.100	3.571	3.964
			30 - 39	3.631	.098	3.439	3.824
			40 and above	3.724	.127	3.475	3.973
IT33gM	Teaching encourages more class discussion and group activities	Male	under 30	4.674	.112	4.454	4.893
			30 - 39	4.662	.100	4.467	4.858
			40 and above	4.400	.107	4.189	4.612
		Female	under 30	4.518	.074	4.372	4.664
			30 - 39	4.610	.073	4.467	4.753
			40 and above	4.742	.094	4.557	4.927

IT33dM	Teaching is to provide students opportunity to do research	Male	under 30	4.545	.120	4.310	4.781
			30 - 39	4.275	.107	4.065	4.485
			40 and above	4.377	.115	4.150	4.603
		Female	under 30	4.358	.080	4.202	4.515
			30 - 39	4.251	.078	4.098	4.404
			40 and above	4.197	.101	3.999	4.395
IT33eM	Learning means remembering what the teaches has taught	Male	under 30	2.443	.188	2.074	2.812
			30 - 39	2.581	.167	2.252	2.910
			40 and above	2.972	.181	2.616	3.327
		Female	under 30	2.518	.125	2.272	2.763
			30 - 39	2.947	.122	2.706	3.187
			40 and above	2.633	.158	2.322	2.944
IT33fM	Students have really learned something when they can remember it.	Male	under 30	3.802	.150	3.506	4.097
			30 - 39	3.397	.134	3.133	3.661
			40 and above	3.829	.145	3.544	4.114
		Female	under 30	3.768	.100	3.571	3.964
			30 - 39	3.631	.098	3.439	3.824
			40 and above	3.724	.127	3.475	3.973
IT33gM	Teaching encourages more class discussion and group activities	Male	under 30	4.674	.112	4.454	4.893
			30 - 39	4.662	.100	4.467	4.858
			40 and above	4.400	.107	4.189	4.612
		Female	under 30	4.518	.074	4.372	4.664
			30 - 39	4.610	.073	4.467	4.753
			40 and above	4.742	.094	4.557	4.927

IT33hM	… many opportunities to explore, discuss and present their ideas.	Male	under 30	4.545	.101	4.346	4.745
			30 - 39	4.805	.090	4.627	4.983
			40 and above	4.781	.098	4.589	4.974
		Female	under 30	4.733	.068	4.601	4.866
			30 - 39	4.708	.066	4.578	4.837
			40 and above	4.724	.085	4.556	4.892
IT33iM	… for students to construct knowledge from learning experiences.	Male	under 30	4.545	.104	4.340	4.751
			30 - 39	4.683	.093	4.499	4.866
			40 and above	4.615	.101	4.417	4.813
		Female	under 30	4.688	.070	4.551	4.825
			30 - 39	4.697	.068	4.563	4.830
			40 and above	4.760	.088	4.587	4.933
IT33iM	… for students to construct knowledge from learning experiences.	Male	under 30	4.545	.123	4.304	4.787
			30 - 39	4.642	.110	4.427	4.857
			40 and above	4.639	.118	4.406	4.871
		Female	under 30	4.438	.082	4.277	4.599
			30 - 39	4.555	.080	4.398	4.712
			40 and above	4.724	.103	4.521	4.927
IT33kM	Good teaching encourages students to think by themselves.	Male	under 30	4.802	.109	4.587	5.016
			30 - 39	4.662	.097	4.471	4.854
			40 and above	4.758	.105	4.551	4.964
		Female	under 30	4.756	.073	4.613	4.899
			30 - 39	4.773	.071	4.633	4.912
			40 and above	4.779	.092	4.598	4.959

Table 41: Chi square test for gender and age with pedagogical belief clusters

Chi-Square Tests

		Value	df	Asymp. Sig. (2-sided)
Gender	Pearson Chi-Square	8.820[a]	4	0.066
	Likelihood Ratio	8.949	4	0.062
	Linear-by-Linear Association	0.866	1	0.352
	N of Valid Cases	365		
Age groups	Pearson Chi-Square	10.760[a]	8	0.216
	Likelihood Ratio	10.652	8	0.222
	Linear-by-Linear Association	0.187	1	0.665
	N of Valid Cases	365		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 14.83.
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.09.

Symmetric Measures

			Value	Approx. Sig.
Gender	Nominal by Nominal	Phi	0.155	0.066
		Cramer's V	0.155	0.066
		Contingency Coefficient	0.154	0.066
		N of Valid Cases	365	
Age groups	Nominal by Nominal	Phi	0.172	0.216
		Cramer's V	0.121	0.216
		Contingency Coefficient	0.169	0.216
		N of Valid Cases	365	

Table 42: Univariate ANOVA results of teacher training

Tests of Between-Subjects Effects

Source	ITEM	Dependent Variable	Type III Sum of Squares	Mean Square	F	Sig.	Partial Eta Squared
IT03_SEX	IT19aM	learnt to use technology to support various learning styles	2.455	2.455	3.349	0.068	0.011
	IT19bM	use different kinds of technology enhanced activities	0.042	0.042	0.111	0.740	0.000
	IT19cM	technology to find information on their own and work independently.	0.031	0.031	0.045	0.833	0.000
	IT19dM	technology to collaborate with each other.	1.788	1.788	3.417	0.065	0.011
	IT19eM	technology related games and simulations in teaching.	0.266	0.266	0.457	0.500	0.001
	IT19fM	technology used to engage students in solving real world problems.	0.000	0.000	0.001	0.980	0.000
	IT19gM	used internet only to get information for preparation.	0.114	0.114	0.100	0.752	0.000
	IT19hM	use PowerPoint for instructional delivery.	0.933	0.933	1.382	0.241	0.004
	IT19iM	use computer/smart-board for instructional delivery.	0.108	0.108	0.121	0.728	0.000
	IT19jM	Technology course/unit	0.155	0.155	0.371	0.543	0.001
IT04_AGE	IT19aM	learnt to use technology to support various learning styles	0.592	0.296	0.404	0.668	0.003
	IT19bM	use different kinds of technology enhanced activities	0.754	0.377	1.000	0.369	0.006
	IT19cM	technology to find information on their own and work independently.	1.438	0.719	1.034	0.357	0.007
	IT19dM	technology to collaborate with each other.	0.511	0.256	0.488	0.614	0.003
	IT19eM	technology related games and simulations in teaching.	0.187	0.093	0.160	0.852	0.001
	IT19fM	technology used to engage students in solving real world problems.	1.267	0.634	1.244	0.290	0.008
	IT19gM	used internet only to get information for preparation.	4.229	2.115	1.864	0.157	0.012
	IT19hM	use PowerPoint for instructional delivery.	14.362	7.181	10.63	0.000	**0.064**
	IT19iM	use computer/smart-board for instructional delivery.	0.876	0.438	0.492	0.612	0.003
	IT19jM	Technology course/unit	1.353	0.676	1.615	0.201	0.010

IT03_SEX * IT04_AGE	IT19aM	learnt to use technology to support various learning styles	0.134	0.067	0.091	0.913	0.001
	IT19bM	use different kinds of technology enhanced activities	0.376	0.188	0.499	0.608	0.003
	IT19cM	technology to find information on their own and work independently.	0.292	0.146	0.210	0.811	0.001
	IT19dM	technology to collaborate with each other.	0.360	0.180	0.344	0.709	0.002
	IT19eM	technology related games and simulations in teaching.	0.985	0.492	0.844	0.431	0.005
	IT19fM	technology used to engage students in solving real world problems.	2.805	1.403	2.755	0.065	0.017
	IT19gM	used internet only to get information for preparation.	2.487	1.244	1.096	0.336	0.007
	IT19hM	use PowerPoint for instructional delivery.	0.117	0.058	0.086	0.917	0.001
	IT19iM	use computer/smart-board for instructional delivery.	3.397	1.698	1.906	0.150	0.012
	IT19jM	Technology course/unit	0.425	0.212	0.507	0.603	0.003

Table 43: Estimated Marginal Means of teacher training

	Dependent Variable	Gender	Age groups	Mean	Std. Error	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
IT19aM	learnt to use technology to support various learning styles	Male	under 30	3.808	.168	3.477	4.138
			30 - 39	3.898	.131	3.641	4.155
			40 and above	3.951	.145	3.667	4.236
		Female	under 30	3.635	.098	3.443	3.827
			30 - 39	3.749	.093	3.565	3.933
			40 and above	3.700	.117	3.471	3.929
IT19bM	use different kinds of technology enhanced activities	Male	under 30	4.115	.120	3.878	4.352
			30 - 39	4.060	.094	3.876	4.245
			40 and above	4.094	.104	3.890	4.299
		Female	under 30	4.116	.070	3.978	4.253
			30 - 39	4.011	.067	3.879	4.143
			40 and above	4.219	.084	4.054	4.383
IT19cM	technology to find information on their own and work independently.	Male	under 30	4.231	.163	3.909	4.552
			30 - 39	4.409	.127	4.159	4.659
			40 and above	4.466	.141	4.188	4.743
		Female	under 30	4.336	.095	4.149	4.523
			30 - 39	4.356	.091	4.177	4.535
			40 and above	4.478	.113	4.255	4.701

IT19dM	technology to collaborate with each other.	Male	under 30	4.231	.142	3.952	4.510
			30 - 39	4.153	.110	3.936	4.371
			40 and above	4.209	.122	3.968	4.449
		Female	under 30	4.129	.082	3.966	4.291
			30 - 39	4.035	.079	3.879	4.190
			40 and above	3.941	.098	3.747	4.134
IT19eM	technology related games and simulations in teaching.	Male	under 30	3.692	.150	3.397	3.987
			30 - 39	3.549	.117	3.320	3.778
			40 and above	3.637	.129	3.383	3.891
		Female	under 30	3.687	.087	3.516	3.858
			30 - 39	3.773	.083	3.609	3.937
			40 and above	3.607	.104	3.403	3.812
IT19fM	technology used to engage students in solving real world problems.	Male	under 30	4.038	.140	3.763	4.314
			30 - 39	3.781	.109	3.567	3.995
			40 and above	3.894	.121	3.657	4.132
		Female	under 30	3.739	.081	3.579	3.899
			30 - 39	3.880	.078	3.727	4.033
			40 and above	4.089	.097	3.898	4.280
IT19gM	used internet only to get information for preparation.	Male	under 30	3.500	.209	3.089	3.911
			30 - 39	3.781	.162	3.462	4.101
			40 and above	4.009	.180	3.654	4.363
		Female	under 30	3.700	.121	3.461	3.939
			30 - 39	3.939	.116	3.711	4.168
			40 and above	3.774	.145	3.489	4.059

IT19hM	use PowerPoint for instructional delivery.	Male	under 30	4.808	.161	4.491	5.125
			30 - 39	4.409	.125	4.163	4.656
			40 and above	4.180	.139	3.907	4.453
		Female	under 30	4.869	.094	4.685	5.053
			30 - 39	4.570	.090	4.394	4.747
			40 and above	4.311	.112	4.091	4.531
IT19iM	use computer/smart-board for instructional delivery.	Male	under 30	3.692	.185	3.328	4.057
			30 - 39	3.921	.144	3.638	4.204
			40 and above	3.723	.160	3.409	4.037
		Female	under 30	3.752	.108	3.540	3.964
			30 - 39	3.689	.103	3.487	3.892
			40 and above	4.015	.128	3.762	4.268
IT19jM	Technology course/unit	Male	under 30	3.885	.127	3.635	4.134
			30 - 39	4.037	.099	3.843	4.231
			40 and above	3.837	.109	3.622	4.052
		Female	under 30	4.038	.074	3.893	4.183
			30 - 39	3.999	.071	3.860	4.138
			40 and above	3.867	.088	3.693	4.040

Table 44: Univariate ANOVA results of teacher training (local and foreigners to age groups)

Tests of Between-Subjects Effects

Source	ITEM	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
IT03_L/F	IT19aM	learnt to use technology to support various learning styles	0.433	1	0.433	0.586	0.445	0.002
	IT19bM	use different kinds of technology enhanced activities	0.006	1	0.006	0.016	0.899	0.000
	IT19cM	to find information on their own and work independently.	0.191	1	0.191	0.275	0.600	0.001
	IT19dM	technology to collaborate with each other.	1.714	1	1.714	3.314	0.070	0.010
	IT19eM	technology related games and simulations in teaching.	1.593	1	1.593	2.764	0.097	0.009
	IT19fM	used to engage students in solving real world problems.	0.290	1	0.290	0.568	0.451	0.002
	IT19gM	used internet only to get information for preparation.	2.948	1	2.948	2.633	0.106	0.008
	IT19hM	use PowerPoint for instructional delivery.	6.117	1	6.117	9.301	0.002	**0.029**
	IT19iM	use computer/smart-board for instructional delivery.	0.727	1	0.727	0.834	0.362	0.003
	IT19jM	Technology course/unit	1.351	1	1.351	3.276	0.071	0.010
IT04_AGE	IT19aM	learnt to use technology to support various learning styles	0.138	2	0.069	0.093	0.911	0.001
	IT19bM	use different kinds of technology enhanced activities	1.034	2	0.517	1.377	0.254	0.009
	IT19cM	to find information on their own and work independently.	1.559	2	0.779	1.122	0.327	0.007
	IT19dM	technology to collaborate with each other.	1.176	2	0.588	1.137	0.322	0.007
	IT19eM	technology related games and simulations in teaching.	1.141	2	0.571	0.990	0.373	0.006
	IT19fM	used to engage students in solving real world problems.	2.177	2	1.088	2.135	0.120	0.013
	IT19gM	used internet only to get information for preparation.	7.527	2	3.763	3.361	0.036	0.021
	IT19hM	use PowerPoint for instructional delivery.	6.290	2	3.145	4.782	0.009	**0.030**
	IT19iM	use computer/smart-board for instructional delivery.	0.976	2	0.488	0.560	0.572	0.004
	IT19jM	Technology course/unit	2.212	2	1.106	2.683	0.070	**0.017**

IT03_L/F * IT04_AGE	IT19aM	learnt to use technology to support various learning styles	0.689	2	0.345	0.467	0.627	0.003
	IT19bM	use different kinds of technology enhanced activities	0.943	2	0.471	1.255	0.287	0.008
	IT19cM	technology to find information on their own and work independently.	0.191	2	0.096	0.138	0.871	0.001
	IT19dM	technology to collaborate with each other.	2.595	2	1.298	2.509	0.083	0.016
	IT19eM	technology related games and simulations in teaching.	2.705	2	1.353	2.347	0.097	0.015
	IT19fM	technology used to engage students in solving real world problems.	2.091	2	1.045	2.051	0.130	0.013
	IT19gM	used internet only to get information for preparation.	5.343	2	2.672	2.386	0.094	0.015
	IT19hM	use PowerPoint for instructional delivery.	0.673	2	0.337	0.512	0.600	0.003
	IT19iM	use computer/smart-board for instructional delivery.	8.832	2	4.416	5.066	0.007	**0.031**
	IT19jM	Technology course/unit	0.551	2	0.276	0.668	0.513	0.004

<u>Table 45: Estimated Marginal Means of teacher training (local and foreigners to age groups)</u>

	Dependent Variable	Gender	Age groups	Mean	Std. Error	95% Confidence Interval Lower Bound	Upper Bound
IT19aM	learnt to use technology to support various learning styles	Maldivian	under 30	3.654	.092	3.473	3.835
			30 - 39	3.819	.097	3.629	4.009
			40 and above	3.708	.143	3.427	3.990
		Foreigner	under 30	3.812	.215	3.390	4.235
			30 - 39	3.767	.124	3.523	4.011
			40 and above	3.860	.118	3.628	4.093
IT19bM	use different kinds of technology enhanced activities	Maldivian	under 30	4.114	.066	3.985	4.243
			30 - 39	3.984	.069	3.848	4.119
			40 and above	4.264	.102	4.063	4.465
		Foreigner	under 30	4.125	.153	3.824	4.426
			30 - 39	4.100	.088	3.926	4.274
			40 and above	4.106	.084	3.940	4.271
IT19cM	technology to find information on their own and work independently.	Maldivian	under 30	4.332	.089	4.156	4.508
			30 - 39	4.376	.094	4.191	4.560
			40 and above	4.486	.139	4.213	4.759
		Foreigner	under 30	4.188	.208	3.777	4.598
			30 - 39	4.371	.120	4.134	4.608
			40 and above	4.464	.114	4.239	4.689

IT19dM	technology to collaborate with each other.	Maldivian	under 30	4.137	.077	3.985	4.288
			30 - 39	4.085	.081	3.926	4.244
			40 and above	3.792	.120	3.556	4.027
		Foreigner	under 30	4.250	.180	3.896	4.604
			30 - 39	4.058	.104	3.854	4.263
			40 and above	4.219	.099	4.025	4.413
IT19eM	technology related games and simulations in teaching.	Maldivian	under 30	3.654	.081	3.494	3.814
			30 - 39	3.730	.085	3.562	3.898
			40 and above	3.403	.127	3.154	3.652
		Foreigner	under 30	3.875	.190	3.502	4.248
			30 - 39	3.642	.110	3.426	3.857
			40 and above	3.766	.104	3.561	3.971
IT19fM	technology used to engage students in solving real world problems.	Maldivian	under 30	3.792	.077	3.641	3.943
			30 - 39	3.857	.080	3.699	4.015
			40 and above	4.208	.119	3.974	4.442
		Foreigner	under 30	3.937	.178	3.586	4.289
			30 - 39	3.829	.103	3.626	4.032
			40 and above	3.879	.098	3.686	4.072
IT19gM	used internet only to get information for preparation.	Maldivian	under 30	3.746	.113	3.523	3.969
			30 - 39	3.971	.119	3.737	4.205
			40 and above	3.764	.176	3.417	4.111
		Foreigner	under 30	3.125	.265	2.604	3.646
			30 - 39	3.746	.153	3.445	4.046
			40 and above	3.936	.145	3.650	4.222

IT19hM	use PowerPoint for instructional delivery.	Maldivian	under 30	4.907	.087	4.736	5.078
			30 - 39	4.591	.091	4.412	4.771
			40 and above	4.514	.135	4.248	4.780
		Foreigner	under 30	4.562	.203	4.164	4.961
			30 - 39	4.392	.117	4.161	4.622
			40 and above	4.087	.111	3.868	4.306
IT19iM	use computer/smart-board for instructional delivery.	Maldivian	under 30	3.666	.100	3.469	3.862
			30 - 39	3.654	.105	3.448	3.861
			40 and above	4.153	.156	3.847	4.459
		Foreigner	under 30	4.125	.233	3.666	4.584
			30 - 39	3.954	.135	3.689	4.219
			40 and above	3.728	.128	3.476	3.981
IT19jM	Technology course/unit	Maldivian	under 30	3.999	.069	3.863	4.134
			30 - 39	3.933	.072	3.791	4.075
			40 and above	3.708	.107	3.498	3.919
		Foreigner	under 30	4.000	.161	3.684	4.316
			30 - 39	4.142	.093	3.959	4.324
			40 and above	3.955	.088	3.781	4.128

Table 46: Chi square test for gender, age and nationality with technology use clusters of teacher training

Chi-Square Tests

		Value	df	Asymp. Sig. (2-sided)
Gender	Pearson Chi-Square	2.333[a]	4	0.675
	Likelihood Ratio	2.294	4	0.682
	Linear-by-Linear Association	1.211	1	0.271
	N of Valid Cases	319		
Age groups	Pearson Chi-Square	10.381[a]	8	0.239
	Likelihood Ratio	10.346	8	0.242
	Linear-by-Linear Association	0.594	1	0.441
	N of Valid Cases	319		
Nationality	Pearson Chi-Square	10.955[a]	4	0.027
	Likelihood Ratio	10.931	4	0.027
	Linear-by-Linear Association	1.717	1	0.190
	N of Valid Cases	319		

Symmetric Measures

			Value	Approx. Sig.
Gender	Nominal by Nominal	Phi	0.086	0.675
		Cramer's V	0.086	0.675
		Contingency Coefficient	0.085	0.675
		N of Valid Cases	319	
Age groups	Nominal by Nominal	Phi	0.180	0.239
		Cramer's V	0.128	0.239
		Contingency Coefficient	0.178	0.239
		N of Valid Cases	319	
Nationality	Nominal by Nominal	Phi	0.185	0.027
		Cramer's V	0.185	0.027
		Contingency Coefficient	0.184	0.027
		N of Valid Cases	319	

<u>Table 47: Univariate ANOVA results of attitude, usefulness and perceived ease of use</u>

Source	ITEM	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
IT03_SEX	IT35aM	Using computers will improve my performance in work.	0.086	1	0.086	0.340	0.560	0.001
	IT35bM	Using computers will enhance my effectiveness.	0.111	1	0.111	0.625	0.430	0.002
	IT35cM	Using computers will increase my productivity.	0.073	1	0.073	0.270	0.604	0.001
	IT35dM	My interaction with computers is clear and understandable.	1.473	1	1.473	4.928	0.027	**0.013**
	IT35eM	I find it easy to do work by using computers.	0.011	1	0.011	0.040	0.841	0.000
	IT35fM	I find computers easy to use.	0.727	1	0.727	3.208	0.074	0.009
	IT35gM	Computers make learning more interesting.	0.557	1	0.557	2.427	0.120	0.007
	IT35hM	Working with computers is fun.	0.460	1	0.460	1.113	0.292	0.003
	IT35iM	I look forward to the jobs that require me to use computers.	7.281	1	7.281	15.905	0.000	**0.042**
IT04_AGE	IT35aM	Using computers will improve my performance in work.	0.102	2	0.051	0.201	0.818	0.001
	IT35bM	Using computers will enhance my effectiveness.	0.133	2	0.066	0.375	0.688	0.002
	IT35cM	Using computers will increase my productivity.	1.514	2	0.757	2.787	0.063	0.015
	IT35dM	My interaction with computers is clear and understandable.	0.177	2	0.089	0.296	0.744	0.002
	IT35eM	I find it easy to do work by using computers.	0.411	2	0.205	0.761	0.468	0.004
	IT35fM	I find computers easy to use.	0.470	2	0.235	1.038	0.355	0.006
	IT35gM	Computers make learning more interesting.	0.412	2	0.206	0.897	0.409	0.005
	IT35hM	Working with computers is fun.	0.158	2	0.079	0.191	0.826	0.001
	IT35iM	I look forward to the jobs that require me to use computers.	0.956	2	0.478	1.045	0.353	0.006

Tests of Between-Subjects Effects

IT03_SEX * IT04_AGE	IT35aM	Using computers will improve my performance in work.	0.862	2	0.431	1.703	0.184	0.009
	IT35bM	Using computers will enhance my effectiveness.	0.385	2	0.192	1.087	0.338	0.006
	IT35cM	Using computers will increase my productivity.	1.129	2	0.564	2.077	0.127	0.011
	IT35dM	My interaction with computers is clear and understandable.	0.399	2	0.200	0.668	0.513	0.004
	IT35eM	I find it easy to do work by using computers.	1.405	2	0.702	2.603	0.075	0.014
	IT35fM	I find computers easy to use.	0.007	2	0.004	0.016	0.984	0.000
	IT35gM	Computers make learning more interesting.	0.455	2	0.228	0.991	0.372	0.005
	IT35hM	Working with computers is fun.	1.337	2	0.669	1.619	0.200	0.009
	IT35iM	I look forward to the jobs that require me to use computers.	0.107	2	0.053	0.117	0.890	0.001

Table 48: Estimated Marginal Means of attitude, perceived use and perceived ease of use

	Dependent Variable	Gender	Age groups	Mean	Std. Error	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
IT35aM	Using computers will improve my performance in work.	Male	under 30	3.937	.081	3.779	4.096
			30 - 39	4.041	.072	3.899	4.182
			40 and above	4.080	.077	3.929	4.231
		Female	under 30	4.098	.052	3.995	4.201
			30 - 39	4.075	.052	3.973	4.178
			40 and above	3.982	.068	3.848	4.115
IT35bM	Using computers will enhance my effectiveness.	Male	under 30	4.040	.067	3.907	4.172
			30 - 39	4.020	.060	3.902	4.139
			40 and above	4.057	.064	3.931	4.183
		Female	under 30	4.098	.044	4.012	4.184
			30 - 39	4.129	.044	4.043	4.215
			40 and above	4.000	.057	3.888	4.112
IT35cM	Using computers will increase my productivity.	Male	under 30	4.091	.083	3.927	4.255
			30 - 39	3.898	.074	3.752	4.044
			40 and above	4.196	.079	4.040	4.353
		Female	under 30	4.109	.054	4.002	4.215
			30 - 39	4.075	.054	3.969	4.182
			40 and above	4.091	.070	3.953	4.229

IT35dM	My interaction with computers is clear and understandable.	Male	under 30	3.937	.088	3.765	4.109
			30 - 39	3.939	.078	3.785	4.092
			40 and above	3.871	.083	3.707	4.035
		Female	under 30	3.711	.057	3.599	3.822
			30 - 39	3.817	.057	3.706	3.929
			40 and above	3.818	.074	3.673	3.963
IT35eM	I find it easy to do work by using computers.	Male	under 30	4.271	.083	4.107	4.434
			30 - 39	4.061	.074	3.915	4.207
			40 and above	4.057	.079	3.901	4.213
		Female	under 30	4.076	.054	3.971	4.182
			30 - 39	4.151	.054	4.045	4.256
			40 and above	4.127	.070	3.990	4.265
IT35fM	I find computers easy to use.	Male	under 30	4.194	.076	4.044	4.344
			30 - 39	4.224	.068	4.091	4.358
			40 and above	4.127	.073	3.984	4.269
		Female	under 30	4.109	.049	4.012	4.206
			30 - 39	4.118	.049	4.021	4.215
			40 and above	4.036	.064	3.910	4.163
IT35gM	Computers make learning more interesting.	Male	under 30	4.014	.077	3.863	4.165
			30 - 39	4.000	.068	3.865	4.135
			40 and above	3.964	.073	3.820	4.108
		Female	under 30	3.969	.050	3.871	4.067
			30 - 39	3.817	.050	3.719	3.915
			40 and above	3.945	.065	3.818	4.073

IT35hM	Working with computers is fun.	Male	under 30	3.860	.103	3.658	4.063
			30 - 39	4.000	.092	3.819	4.181
			40 and above	3.894	.098	3.701	4.087
		Female	under 30	3.851	.067	3.720	3.982
			30 - 39	3.753	.067	3.622	3.884
			40 and above	3.927	.087	3.757	4.098
IT35iM	I look forward to the jobs that require me to use computers.	Male	under 30	3.655	.108	3.442	3.868
			30 - 39	3.816	.097	3.626	4.006
			40 and above	3.755	.103	3.552	3.957
		Female	under 30	3.980	.070	3.842	4.118
			30 - 39	4.065	.070	3.927	4.202
			40 and above	4.073	.091	3.893	4.252

Table 49: Univariate ANOVA results of attitude and perceived use and perceived ease of use to nationality

Tests of Between-Subjects Effects

Source	ITEM	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
IT03_L/F	IT35aM	Using computers will improve my performance in work.	0.492	1	0.492	1.948	0.164	0.005
	IT35bM	Using computers will enhance my effectiveness.	0.028	1	0.028	.158	0.691	0.000
	IT35cM	Using computers will increase my productivity.	1.950	1	1.950	7.269	0.007	**0.019**
	IT35dM	My interaction with computers is clear and understandable.	2.449	1	2.449	8.238	0.004	**0.022**
	IT35eM	I find it easy to do work by using computers.	0.168	1	0.168	0.617	0.433	0.002
	IT35fM	I find computers easy to use.	0.909	1	0.909	4.116	0.043	0.011
	IT35gM	Computers make learning more interesting.	0.600	1	0.600	2.599	0.108	0.007
	IT35hM	Working with computers is fun.	0.847	1	0.847	2.041	0.154	0.006
	IT35iM	I look forward to the jobs that require me to use computers.	5.559	1	5.559	12.092	0.001	**0.032**
IT04_AGE	IT35aM	Using computers will improve my performance in work.	0.254	2	0.127	.503	0.605	0.003
	IT35bM	Using computers will enhance my effectiveness.	0.252	2	0.126	.707	0.494	0.004
	IT35cM	Using computers will increase my productivity.	1.260	2	0.630	2.348	0.097	0.013
	IT35dM	My interaction with computers is clear and understandable.	0.138	2	0.069	.232	0.793	0.001
	IT35eM	I find it easy to do work by using computers.	0.256	2	0.128	.470	0.626	0.003
	IT35fM	I find computers easy to use.	0.661	2	0.331	1.497	0.225	0.008
	IT35gM	Computers make learning more interesting.	0.934	2	0.467	2.023	0.134	0.011
	IT35hM	Working with computers is fun.	0.208	2	0.104	.251	0.778	0.001
	IT35iM	I look forward to the jobs that require me to use computers.	0.951	2	0.476	1.034	0.356	0.006

IT03_L/F * IT04_AGE	IT35aM	Using computers will improve my performance in work.	0.751	2	0.376	1.488	0.227	0.008
	IT35bM	Using computers will enhance my effectiveness.	0.093	2	0.047	.262	0.769	0.001
	IT35cM	Using computers will increase my productivity.	0.275	2	0.138	.513	0.599	0.003
	IT35dM	My interaction with computers is clear and understandable.	0.269	2	0.134	.452	0.637	0.002
	IT35eM	I find it easy to do work by using computers.	0.336	2	0.168	.617	0.540	0.003
	IT35fM	I find computers easy to use.	1.465	2	0.732	3.317	0.037	**0.018**
	IT35gM	Computers make learning more interesting.	0.081	2	0.041	0.176	0.839	0.001
	IT35hM	Working with computers is fun.	0.300	2	0.150	0.361	0.697	0.002
	IT35iM	I look forward to the jobs that require me to use computers.	0.424	2	0.212	0.461	0.631	0.003

Table 50: Estimated Marginal Means of attitude, perceived use and perceived ease of use

	Dependent Variable	Nationality	Age groups	Mean	Std. Error	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
IT35aM	Using computers will improve my performance in work.	Local	under 30	4.101	0.050	4.003	4.200
			30 - 39	4.085	0.055	3.976	4.194
			40 and above	4.006	0.082	3.846	4.166
		Foreign	under 30	3.885	0.090	3.708	4.063
			30 - 39	4.033	0.065	3.906	4.161
			40 and above	4.037	0.065	3.909	4.165
IT35bM	Using computers will enhance my effectiveness.	Local	under 30	4.091	0.042	4.009	4.174
			30 - 39	4.110	0.047	4.018	4.201
			40 and above	4.006	0.068	3.871	4.141
		Foreign	under 30	4.047	0.076	3.898	4.196
			30 - 39	4.067	0.054	3.959	4.174
			40 and above	4.037	0.054	3.930	4.144
IT35cM	Using computers will increase my productivity.	Local	under 30	4.141	0.052	4.039	4.242
			30 - 39	4.110	0.057	3.997	4.222
			40 and above	4.190	0.084	4.025	4.355
		Foreign	under 30	3.982	0.093	3.799	4.165
			30 - 39	3.883	0.067	3.752	4.015
			40 and above	4.104	0.067	3.972	4.235

IT35dM	My interaction with computers is clear and understandable.	Local	under 30	3.725	0.054	3.618	3.832
			30 - 39	3.817	0.060	3.699	3.935
			40 and above	3.716	0.088	3.542	3.890
		Foreign	under 30	3.950	0.098	3.757	4.142
			30 - 39	3.917	0.070	3.778	4.055
			40 and above	3.920	0.070	3.782	4.059
IT35eM	I find it easy to do work by using computers.	Local	under 30	4.101	0.052	3.999	4.203
			30 - 39	4.110	0.058	3.996	4.223
			40 and above	4.111	0.085	3.945	4.278
		Foreign	under 30	4.240	0.094	4.056	4.424
			30 - 39	4.133	0.067	4.001	4.266
			40 and above	4.087	0.067	3.955	4.220
IT35fM	I find computers easy to use.	Local	under 30	4.141	0.047	4.049	4.233
			30 - 39	4.037	0.052	3.935	4.139
			40 and above	4.032	0.076	3.882	4.182
		Foreign	under 30	4.111	0.084	3.945	4.277
			30 - 39	4.317	0.061	4.197	4.436
			40 and above	4.104	0.061	3.984	4.223
IT35gM	Computers make learning more interesting.	Local	under 30	3.953	0.048	3.859	4.047
			30 - 39	3.841	0.053	3.737	3.946
			40 and above	3.927	0.078	3.774	4.080
		Foreign	under 30	4.079	0.086	3.909	4.249
			30 - 39	3.933	0.062	3.811	4.055
			40 and above	3.970	0.062	3.848	4.092

IT35hM	Working with computers is fun.	Local	under 30	3.824	0.064	3.698	3.950
			30 - 39	3.768	0.071	3.628	3.908
			40 and above	3.901	0.104	3.695	4.106
		Foreign	under 30	3.950	0.116	3.722	4.177
			30 - 39	3.933	0.083	3.770	4.097
			40 and above	3.920	0.083	3.757	4.084
IT35iM	I look forward to the jobs that require me to use computers.	Local	under 30	3.923	0.067	3.790	4.056
			30 - 39	4.122	0.075	3.975	4.269
			40 and above	4.111	0.110	3.895	4.327
		Foreign	under 30	3.756	0.122	3.517	3.996
			30 - 39	3.783	0.088	3.611	3.955
			40 and above	3.820	0.088	3.648	3.992

Table 51: Chi square test for gender and age with attitude and perceived

Chi-Square Tests

		Value	df	Asymp. Sig. (2-sided)
Gender	Pearson Chi-Square	7.085[a]	4	0.131
	Likelihood Ratio	6.927	4	0.140
	Linear-by-Linear Association	0.078	1	0.780
	N of Valid Cases	372		
Age groups	Pearson Chi-Square	5.829[a]	8	0.666
	Likelihood Ratio	5.785	8	0.671
	Linear-by-Linear Association	0.113	1	0.736
	N of Valid Cases	372		
Nationality	Pearson Chi-Square	50.595[a]	4	0.000
	Likelihood Ratio	53.366	4	0.000
	Linear-by-Linear Association	26.603	1	0.000
	N of Valid Cases	371		

Symmetric Measures

			Value	Approx. Sig.
Gender	Nominal by Nominal	Phi	0.138	0.131
		Cramer's V	0.138	0.131
		Contingency Coefficient	0.137	0.131
		N of Valid Cases	372	
Age groups	Nominal by Nominal	Phi	0.125	0.666
		Cramer's V	0.089	0.666
		Contingency Coefficient	0.124	0.666
		N of Valid Cases	372	
Nationality	Nominal by Nominal	Phi	0.369	0.000
		Cramer's V	0.369	0.000
		Contingency Coefficient	0.331	0.000
		N of Valid Cases	371	

Table 52: Univariate ANOVA results of technical support and resources

Tests of Between-Subjects Effects

Source	ITEM	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
IT03_SEX	IT40aM	Efficiency of guidance by ICT coordinator/mentor.	0.743	1	0.743	0.511	0.475	0.001
	IT40bM	Adequate technical assistance for operating and maintenance	0.025	1	0.025	0.028	0.868	0.000
	IT40cM	Efficiency of school technical infrastructure	1.090	1	1.090	1.818	0.178	0.005
	IT40dM	Sufficient number of media (printer, scanner etc.)	1.401	1	1.401	1.920	0.167	0.005
	IT40eM	Sufficient number of computers teachers use.	0.852	1	0.852	1.027	0.311	0.003
	IT40fM	Accessible to the existing hardware (computer, projector etc.)	1.184	1	1.184	1.930	0.166	0.005
	IT40gM	Accessible to hardware resources for students (printer, scanners).	1.476	1	1.476	3.454	0.064	0.009
	IT40hM	Updated educational software and CD-ROMS	0.169	1	0.169	0.222	0.638	0.001
	IT40iM	Adequate copies of software for instructional purposes	0.042	1	0.042	0.068	0.795	0.000
	IT40jM	Software is specific and/or adaptable for use.	0.006	1	0.006	0.008	0.930	0.000
	IT40kM	Sufficient number of school computer laboratory.	1.660	1	1.660	3.240	0.073	0.009
	IT40lM	Sufficient number of computers for students use.	0.202	1	0.202	0.187	0.666	0.001
IT04_AGE	IT40aM	Efficiency of guidance by ICT coordinator/mentor.	0.442	2	0.221	0.152	0.859	0.001
	IT40bM	Adequate technical assistance for operating and maintenance	0.861	2	0.430	0.477	0.621	0.003
	IT40cM	Efficiency of school technical infrastructure	6.110	2	3.055	5.094	0.007	**0.027**
	IT40dM	Sufficient number of media (printer, scanner etc.)	0.986	2	0.493	.675	0.510	0.004
	IT40eM	Sufficient number of computers teachers use.	1.662	2	0.831	1.003	0.368	0.006

	IT40fM	Accessible to the existing hardware (computer, projector etc.)	2.217	2	1.109	1.807	0.166	0.010
	IT40gM	Accessible to hardware resources for students (printer, scanners).	1.664	2	0.832	1.947	0.144	0.011
	IT40hM	Updated educational software and CD-ROMS	3.217	2	1.609	2.114	0.122	0.012
	IT40iM	Adequate copies of software for instructional purposes	0.569	2	0.285	0.458	0.633	0.003
	IT40jM	Software is specific and/or adaptable for use.	4.335	2	2.167	2.951	0.054	0.016
	IT40kM	Sufficient number of school computer laboratory.	0.951	2	0.476	0.928	0.396	0.005
	IT40lM	Sufficient number of computers for students use.	2.267	2	1.133	1.048	0.352	0.006
IT03_SEX * IT04_AGE	IT40aM	Efficiency of guidance by ICT coordinator/mentor.	1.724	2	0.862	0.592	0.554	0.003
	IT40bM	Adequate technical assistance for operating and maintenance	2.498	2	1.249	1.383	0.252	0.008
	IT40cM	Efficiency of school technical infrastructure	1.841	2	0.921	1.535	0.217	0.008
	IT40dM	Sufficient number of media (printer, scanner etc.)	0.242	2	0.121	0.166	0.847	0.001
	IT40eM	Sufficient number of computers teachers use.	4.616	2	2.308	2.785	0.063	0.015
	IT40fM	Accessible to the existing hardware (computer, projector etc.)	0.941	2	0.470	0.767	0.465	0.004
	IT40gM	Accessible to hardware resources for students (printer, scanners).	2.712	2	1.356	3.173	0.043	**0.017**
	IT40hM	Updated educational software and CD-ROMS	0.049	2	0.024	0.032	0.968	0.000
	IT40iM	Adequate copies of software for instructional purposes	1.023	2	0.512	0.824	0.440	0.005
	IT40jM	Software is specific and/or adaptable for use.	0.178	2	0.089	0.121	0.886	0.001
	IT40kM	Sufficient number of school computer laboratory.	0.049	2	0.025	0.048	0.953	0.000
	IT40lM	Sufficient number of computers for students use.	0.047	2	0.024	0.022	0.978	0.000

Table 53: Estimated Marginal Means of technical support and resources

	Dependent Variable	Gender	Age groups	Mean	Std. Error	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
IT40aM	Efficiency of guidance by ICT coordinator/mentor.	Male	under 30	4.195	.196	3.810	4.580
			30 - 39	3.963	.172	3.624	4.302
			40 and above	4.134	.184	3.772	4.496
		Female	under 30	4.193	.126	3.944	4.442
			30 - 39	4.255	.126	4.008	4.503
			40 and above	4.129	.163	3.809	4.449
IT40bM	Adequate technical assistance for operating and maintenance	Male	under 30	4.221	.154	3.918	4.525
			30 - 39	4.310	.136	4.043	4.576
			40 and above	4.529	.145	4.244	4.814
		Female	under 30	4.358	.100	4.162	4.554
			30 - 39	4.462	.099	4.267	4.657
			40 and above	4.292	.128	4.040	4.544
IT40cM	Efficiency of school technical infrastructure of technology	Male	under 30	4.064	.126	3.817	4.311
			30 - 39	3.759	.111	3.541	3.976
			40 and above	4.250	.118	4.018	4.482
		Female	under 30	4.215	.081	4.056	4.375
			30 - 39	4.038	.081	3.879	4.197
			40 and above	4.165	.104	3.960	4.370

IT40dM	Sufficient number of media for effective use of computers	Male	under 30	3.721	.139	3.449	3.994
			30 - 39	3.677	.122	3.437	3.917
			40 and above	3.808	.130	3.552	4.064
		Female	under 30	3.929	.090	3.753	4.106
			30 - 39	3.777	.089	3.602	3.952
			40 and above	3.892	.115	3.666	4.119
IT40eM	Sufficient number of computers teachers use.	Male	under 30	3.590	.148	3.299	3.880
			30 - 39	3.861	.130	3.605	4.116
			40 and above	3.413	.139	3.140	3.686
		Female	under 30	3.776	.095	3.588	3.963
			30 - 39	3.647	.095	3.460	3.833
			40 and above	3.747	.123	3.506	3.988
IT40fM	Accessible to the existing hardware (computers etc.)	Male	under 30	3.985	.127	3.735	4.235
			30 - 39	4.105	.112	3.885	4.325
			40 and above	3.785	.119	3.550	4.020
		Female	under 30	3.798	.082	3.636	3.959
			30 - 39	3.897	.082	3.736	4.057
			40 and above	3.820	.106	3.612	4.027
IT40gM	Accessible to hardware resources for students (printers etc.)	Male	under 30	4.011	.106	3.802	4.220
			30 - 39	4.044	.093	3.861	4.228
			40 and above	3.692	.100	3.496	3.888
		Female	under 30	3.831	.069	3.696	3.965
			30 - 39	3.712	.068	3.578	3.846
			40 and above	3.802	.088	3.628	3.975

IT40hM	Updated educational software and CD-ROMS	Male	under 30	4.143	.142	3.864	4.421
			30 - 39	4.330	.125	4.085	4.575
			40 and above	4.390	.133	4.128	4.651
		Female	under 30	4.105	.091	3.925	4.285
			30 - 39	4.310	.091	4.131	4.489
			40 and above	4.311	.118	4.079	4.542
IT40iM	Adequate copies of software for instructional purposes	Male	under 30	4.064	.128	3.812	4.315
			30 - 39	4.024	.113	3.802	4.245
			40 and above	3.948	.120	3.711	4.184
		Female	under 30	3.929	.083	3.767	4.092
			30 - 39	4.136	.082	3.974	4.297
			40 and above	4.038	.106	3.829	4.247
IT40jM	Software is specific and/or adaptable for use.	Male	under 30	3.879	.139	3.606	4.153
			30 - 39	4.085	.122	3.844	4.326
			40 and above	4.227	.131	3.970	4.484
		Female	under 30	3.951	.090	3.775	4.128
			30 - 39	4.082	.089	3.906	4.257
			40 and above	4.183	.116	3.956	4.411
IT40kM	Sufficient number of school computer laboratory.	Male	under 30	4.037	.116	3.809	4.266
			30 - 39	3.963	.102	3.761	4.164
			40 and above	3.924	.109	3.710	4.139
		Female	under 30	3.908	.075	3.760	4.055
			30 - 39	3.842	.075	3.696	3.989
			40 and above	3.747	.097	3.557	3.937

IT40lM	Sufficient number of computers for students use.	Male	under 30	4.090	.169	3.758	4.422
			30 - 39	3.881	.149	3.589	4.173
			40 and above	3.901	.159	3.589	4.213
		Female	under 30	4.006	.109	3.792	4.221
			30 - 39	3.842	.108	3.629	4.056
			40 and above	3.874	.140	3.599	4.150

Table 54: Chi square test for gender and age with technical support and resources

Chi-Square Tests

		Value	df	Asymp. Sig. (2-sided)
Gender	Pearson Chi-Square	4.829[a]	2	0.089
	Likelihood Ratio	4.967	2	0.083
	Linear-by-Linear Association	3.250	1	0.071
	N of Valid Cases	368		
Age groups	Pearson Chi-Square	3.593[a]	4	0.464
	Likelihood Ratio	3.729	4	0.444
	Linear-by-Linear Association	2.070	1	0.150
	N of Valid Cases	368		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 14.83.
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.09.

Symmetric Measures

			Value	Approx. Sig.
Gender	Nominal by Nominal	Phi	0.115	0.089
		Cramer's V	0.115	0.089
		Contingency Coefficient	0.114	0.089
		N of Valid Cases	368	
Age groups	Nominal by Nominal	Phi	0.099	0.464
		Cramer's V	0.070	0.464
		Contingency Coefficient	0.098	0.464
		N of Valid Cases	368	

Table 55: Chi square test for pedagogical belief and technology use

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.699[a]	16	0.075
Likelihood Ratio	24.007	16	0.089
Linear-by-Linear Association	5.710	1	0.017
N of Valid Cases	364		

a. 2 cells (8.0%) have expected count less than 5. The minimum expected count is 4.07.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	0.232	0.000
	Cramer's V	0.232	0.000
	Contingency Coefficient	0.226	0.000
	N of Valid Cases	371	

Table 56: Chi square test for attitude, usefulness and technology use

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	38.911[a]	16	0.001
Likelihood Ratio	37.237	16	0.002
Linear-by-Linear Association	7.571	1	0.006
N of Valid Cases	371		

a. 1 cells (4.0%) have expected count less than 5. The minimum expected count is 4.30.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	0.324	0.001
	Cramer's V	0.162	0.001
	Contingency Coefficient	0.308	0.001
	N of Valid Cases	371	

Table 57: Chi square test for completed teacher education and teaching qualification and use of technology

Chi-Square Tests

		Value	df	Asymp. Sig. (2-sided)
Completed teacher education	Pearson Chi-Square	8.148[a]	4	0.086
	Likelihood Ratio	8.571	4	0.073
	Linear-by-Linear Association	1.619	1	0.203
	N of Valid Cases	371		
Teaching qualification	Pearson Chi-Square	21.133[a]	12	0.048
	Likelihood Ratio	25.484	12	0.013
	Linear-by-Linear Association	1.741	1	0.187
	N of Valid Cases	317		
Teacher education Institute	Pearson Chi-Square	28.019[a]	8	0.000
	Likelihood Ratio	28.603	8	0.000
	Linear-by-Linear Association	3.532	1	0.060
	N of Valid Cases	371		

Symmetric Measures

			Value	Approx. Sig.
Completed teacher education	Nominal by Nominal	Phi	0.148	0.086
		Cramer's V	0.148	0.086
		Contingency Coefficient		
		N of Valid Cases	371	
Teaching qualification	Nominal by Nominal	Phi	0.258	0.048
		Cramer's V	0.149	0.048
		Contingency Coefficient		
		N of Valid Cases	317	
Teacher education Institute	Nominal by Nominal	Phi	0.275	0.000
		Cramer's V	0.194	0.000
		Contingency Coefficient		
		N of Valid Cases	371	

Table 58: Chi square test for teacher training clusters and use of technology clusters

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	33.204[a]	16	0.007
Likelihood Ratio	33.620	16	0.006
Linear-by-Linear Association	0.894	1	0.344
N of Valid Cases	317		

a. 2 cells (8.0%) have expected count less than 5. The minimum expected count is 4.07.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	0.324	0.007
	Cramer's V	0.162	0.007
	Contingency Coefficient	0.308	0.007
	N of Valid Cases	317	

Table 59: Chi square test for professional development program clusters

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.422[a]	4	0.009
Likelihood Ratio	13.508	4	0.009
Linear-by-Linear Association	4.920	1	0.027
N of Valid Cases	370		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 19.07

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	0.190	0.009
	Cramer's V	0.190	0.009
	Contingency Coefficient	0.187	0.009
	N of Valid Cases	370	

Table 60: Chi square test for demographic characteristics and technology use

Chi-Square Tests

		Value	df	Asymp. Sig. (2-sided)
Gender	Pearson Chi-Square	19.998[a]	4	0.000
	Likelihood Ratio	21.614	4	0.000
	Linear-by-Linear Association	11.158	1	0.001
	N of Valid Cases	371		
Age	Pearson Chi-Square	5.551[a]	8	0.697
	Likelihood Ratio	5.421	8	0.712
	Linear-by-Linear Association	0.012	1	0.914
	N of Valid Cases	371		

Symmetric Measures

			Value	Approx. Sig.
Gender	Nominal by Nominal	Phi	0.232	0.000
		Cramer's V	0.232	0.000
		Contingency Coefficient	0.226	0.000
		N of Valid Cases	371	
Age	Nominal by Nominal	Phi	0.122	0.697
		Cramer's V	0.086	0.697
		Contingency Coefficient	0.121	0.697
		N of Valid Cases	371	

Table 61: Chi square test for other internal factors and use of technology

Chi-Square Tests

		Value	df	Asymp. Sig. (2-sided)
Teaching experience	Pearson Chi-Square	13.844[a]	8	0.086
	Likelihood Ratio	14.481	8	0.070
	Linear-by-Linear Association	0.501	1	0.479
	N of Valid Cases	371		
Competence	Pearson Chi-Square	39.527[a]	8	0.000
	Likelihood Ratio	41.312	8	0.000
	Linear-by-Linear Association	3.424	1	0.064
	N of Valid Cases	317		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 14.83.
a. 4 cells (16.0%) have expected count less than 5. The minimum expected count is 2.92.

Symmetric Measures

			Value	Approx. Sig.
Teaching experience	Nominal by Nominal	Phi	0.193	0.086
		Cramer's V	0.137	0.086
		Contingency Coefficient	0.190	0.086
		N of Valid Cases	371	
Competence	Nominal by Nominal	Phi	0.353	0.000
		Cramer's V	0.250	0.000
		Contingency Coefficient	0.333	0.000
		N of Valid Cases	317	

Table 62: Chi square test for other external factors and use of technology

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.146[a]	8	0.194
Likelihood Ratio	10.852	8	0.210
Linear-by-Linear Association	0.298	1	0.585
N of Valid Cases	367		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6..

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	0.174	0.194
	Cramer's V	0.123	0.194
	Contingency Coefficient	0.172	0.194
	N of Valid Cases	367	

Appendix C: Informed consent letter from University of Deusto

Deusto

Facultad de Psicología y Educación
Psikologia eta Hezkuntza Fakultatea

Dr Concepción Yániz, Director of PhD Programme in Education at University of Deusto, Faculty of Psychology and Education

INFORMS THAT:

Hawwa Neena Ali is a PhD student at Deusto University and is writing a thesis titled "Pedagogy, ICT use and perceptions of how ICT impacts their teaching among teachers in Maldives: A descriptive study" under de co-supervision of Professor María José Bezanilla and Professor Pedro Miguel Apodaca.

In Bilbao, 16th April 2013

Signed: Yániz

Psicología y Educación
Universidad de Deusto
Deustuko Unibertsitatea
Psikologia eta Hezkuntza

Universidad de Deusto
Deustuko Unibertsitatea
Apartado 1
48080 Bilbao

Deusto

Facultad de Psicología y Educación
Psikologia eta Hezkuntza Fakultatea

To whom it may concern

This is to inform that Hawwa Neena Ali is a PhD student at University of Deusto (Spain), Faculty of Psychology and Education, and is writing her PhD thesis titled: "Pedagogy, ICT use and perceptions of how ICT impacts their teaching among teachers in Maldives: A descriptive study", within the area of Educational Technology.

For research purposes she needs to collect data from teachers of different secondary education institutions in Maldives Irelands through the administration of a questionnaire designed by the student to understand the factors that influence the use of ICT in teaching and learning at Secondary School level. It is expected that from the analysis of the results proposals for improvement in the use of ICT for teaching and learning will be provided, making an important contribution to Maldives education in general and Secondary School ICT implementation and teacher training programs in particular

Data will be treated confidentially and used only for the purpose of the research.

Respectfully yours

María José Bezanilla (PhD Supervisor) Pedro Miguel Apodaca (PhD Supervisor)

Psicología y Educación
Universidad de Deusto
Deustuko Unibertsitatea
Psikologia eta Hezkuntza

Bilbao, 16th April 2013

Universidad de Deusto
Deustuko Unibertsitatea
Apartado 1
48080 Bilbao

Appendix D: Letter to Ministry of Education

[address]

29th April 2014

Dear Dr Aishath Shiham

My name is Hawwa Neena Ali and I am a Phd student at the Facultad de Psicologia y Educacion, Universidad de Deusto, Spain. As part of the Phd program, I will be completing research study that is aimed at exploring the factors that impede the use of technology among teachers in Maldives. The research study, entitled "Analysis of factors that influence teachers' use of ICT in Maldives" has been approved by the University of Deusto.

I am writing to ask for your consent to conduct the above stated research study at the secondary schools of Male', Maldives. The questionnaire developed for this study has been approved by the supervisors of the University of Deusto. The participation of this study for the teachers' is voluntary and confidentiality will be ensured and respected during all the processes involved in the study.

Listed below are some of the main information of the study.

TITLE OF RESEARCH STUDY

Analysis of factors that influence teachers use of ICT in Maldives

RESEARCHER

Hawwa Neena Ali (Phd student)
Facultad de Psicologia y Educacion
Universidad de Deusto
Email: [email]
Mobile contact: [phone]

RESEARCH SUPERVISORS

Dra María José Bezanilla Albisua
Innovacion y Organizacion Educativa
Facultad de Psicologia y Educacion
Universidad de Deusto
Email: [email]

Dr Pedro Miguel Apodaca Urquijo
Métodos de Investigación y Diagnóstico en Educación
Universidad del País Vasco
Email: [email]

OBJECTIVE OF THE RESEARCH

The main objective of the study of to investigate the situation of ICT usage among teachers' at the secondary schools in Maldives. I believe that this study will provide adequate information needed to improve the use of ICT by teachers'. In addition it is hoped that this research would contribute immensely for teachers in the Maldives towards the use of appropriate Information technology and communication in the classrooms. The literacy level of the teachers in terms of ICT usage needs to be understood so that the appropriate strategies can be used to make them more competent as professionals.

PURPOSE OF THE RESEARCH

The main purpose of the research study is to explore the situation of ICT usage among secondary teachers of Maldives. This study examine the factors that influence the use of technology in the instructional practice among the secondary teachers. Findings of this study will provide information on how technology is used in teaching and learning environment. In addition, will also explore the predictors that impede the use of technology effectively in the teaching and learning environment.

In particularly the research study seeks to:

- Explore teachers' attitudes toward the use of technology
- Describe the pedagogical orientation of teachers

- Explore endogenous and exogenous factors that impede the use of ICT in instructional practice. These include teacher educational programs, professional development programs, technical support and infrastructure.

PROCEDURES OF THIS RESEARCH

The participants for this study will be secondary school teachers working in the schools located in Male', Maldives. Teachers will be asked to volunteer in completing the questionnaire which will take about 40 to 50 minutes. The data collection will take place from June 8^{th} till 25^{th} June 2014.

RESEARCH INSTRUMENT

This study is a quantitative study and data will be collected via a questionnaire. The instrument was developed based on pool of questions that were previously developed and validated. In addition some questions were developed base on literature review. The final questionnaire was approved by the research supervisors.

The questionnaire includes 7 sections which are:

- Section 1- demographic data
- Section 2- computer knowledge and experience
- Section 3- teacher education programs
- Section 4-Infrastructure and resources:
- Section 5-Teaching practice and pedagogical orientation
- Section 6-Attitude toward the use of technology
- Section 7- professional development programs

POTENTIAL RISKS OR DISCOMFORTS

It is unlikely that the participants will experience any major discomfort as a result of this research. Participants in this study will be reminded that completing the questionnaire is voluntary. Participants will not be identified personally.

POTENTIAL BENEFITS TO PARTICIPANTS OR OTHERS

The participation in this study may not have a direct benefit to the participant. However, findings of this study are essential in the sense that teachers in lower secondary schools will find an additional research paper on ICT that critically analyses the effectiveness of incorporating technology in their teaching process. Furthermore, it will act as a guideline for educational policy makers to formulate policies that are viable and essential to institutionalize in the contemporary 21st century classrooms and schools. In fact, this research paper will be particularly critical to the policy makers in their quest for proper and viable policies for the development of Maldives ICT in education system.

In fact, with clear and feasible policies being laid down, this study will pave the way for designing of professional development programs for teachers and heads of schools. The essence and professionalism of the designs of such programs will be established for the fact that they are based on findings from the research study.

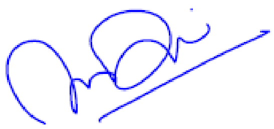
PROTECTION OF CONFIDENTIALITY

Participants' names, worksites or any other identifying information will be kept confidential at all times. No individual identification information is requested or recorded. The information provided in the questionnaire will not be provided to any other party and will be kept confidential at all times. The findings of the research will be summarized and reported in group form.

If you have any questions or concerns about the study, please contact me at [mobile number] or by email [email]. You can also contact my supervisor Dra María José Bezanilla Albisua [email:].

Thank you for considering my request to complete this research in the secondary schools of Male'.

Sincerely



Hawwa Neena Ali
Doctoral candidate
Facultad de Psicologia y Educacion
Universidad de Deusto

Appendix E: Informed consent of Ministry of Education

بسم الله الرحمن الرحيم

މިނިސްޓްރީ އޮފް އެޑިޔުކޭޝަން
މާލެ، ދިވެހިރާއްޖެ

ކަމާބެހޭ ފަރާތްތަކަށް

ރިސާރޗަށް ބޭނުންވާ މައުލޫމާތު ސުވާލުކަރުދާސް ހުށަހެޅުމަށް އެއްބަސްވުމުގެ ހުއްދަ

އަލްފާޟިލާ ރައުފާ ނިޝާ ރަޝީދު (ދ. ޑިލާ ވިލާ / މާލެ) އަކީ ސްވިންބާން ގެ ޔުނިވަރސިޓީ އޮފް ޓެކްނޮލޮޖީ ގައި ޕީ.އެޗް.ޑީ. އަށް ކިޔަވާދެއްވަމުންދާ ބޭފުޅެކެވެ. ކިޔެވުމުގެ ބައެއްގެ ގޮތުން މިނާ ތަޢުލީމީ ދާއިރާއިން ކުރައްވާ ރިސާރޗަށް ބޭނުންވާ މައުލޫމާތު މިނާއަށް ދާއިރާގެ ސުވާލުކަރުދާސް/ތަކުން ހުށަހެޅުމަށް ހުއްދަ ދެއްވުން އެދެމެވެ.

Research Topic: — ރިސާރޗްގެ ސުރުޚީ:

Analysis of factors that influence teachers' use of ICT in Maldives

Main Objectives: — މައިގަނޑު މަޤްޞަދު:

To investigate the situation of ICT usage among teachers at the secondary schools in the Maldives.

Data Needed: — ބޭނުންވާ މައުލޫމާތުގެ ބާވަތް:

Teachers' attitude toward the use of technology.

Interviewee/s: — އިންޓަވިއުކުރާ ބޭނުންވާ ފަރާތް/ތައް:

Data will be collected via a questionnaire designed for secondary school teachers located in Malé schools.

ވީމާ، މިރިސާރޗަށް ބޭނުންވާ މައުލޫމާތު ހޯދުމުގައި މިނާ ފަރާތުގެ އެހީތެރިކަމާއި އެއްބާރުލުން ދެއްވުން އެދެމެވެ.

5 މެއި 2014

Appendix F: Letter to the schools

بسم الله الرحمن الرحيم

[Address]
May 11, 2014

REQUESTING PERMISSION TO COLLECT DATA FOR A RESEARCH STUDY

Dear [principal]

My name is Hawwa Neena Ali and I am a doctoral student at the Facultad de Psicologia y Educacion, Universidad de Deusto, Spain. I am conducting a research study entitled "Analysis of factors that influence the use of technology among teachers in Maldives". The purpose of the research is to examine the predictors that impede the use of technology effectively in the learning environment. For this research I have selected secondary schools in Male' city and I would kindly ask for your permission and assistance to conduct this research in your school.

This study has been approved by the Universidad de Deusto. In addition, permission has been given by the Ministry of Education to collect data required to complete this research study from Maldivian schools. The survey questionnaire used for data collection has been finalized by the research advisors from the Universidad de Deusto.

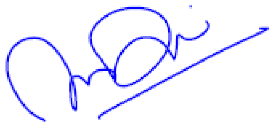
The study involves completing a self-administered paper survey by the secondary teachers and is expected to take about 40 – 50 minutes to complete. Teachers will be requested to complete the survey questionnaire which will later be collected. The survey participants will be entirely anonymous as I am only interested in the aggregate results rather than the results of individual participants or schools. Teacher's participation for the study is optional and confidentiality will be ensured and respected during all the processes involved in the study. No individual identification information of the participants will be requested or recorded. In addition the school name will not be disclosed in the report or any outside party. I will be more than happy to provide you with a copy of the questionnaire for review.

The participation of your school is essential to the success of this study and I am hopeful your contribution will assist in determining the factors that impede the use of technology in the teaching and learning environment. The participation in this study may not have a direct benefit to the participant, however, they will be contributing to the understanding of the use of technology in the learning environment. Please let me know of your decision by mail ([email]) at your earliest possible convenience.

If you have any questions or concerns about the study, please contact me at ([telephone number]) or by email ([email]).

I look forward to hear from you and thank you in advance for your support.

Sincerely



Hawwa Neena Ali
Doctoral candidate
Facultad de Psicologia y Educacion
Universidad de Deusto

Appendix G: Consent letter to participants

بسم الله الرحمن الرحيم

[Address]

June, 2014

INVITATION TO PARTICIPATE IN A RESEARCH STUDY

Dear teacher;

My name is Hawwa Neena Ali and I am a doctoral student at the Facultad de Psicologia y Educacion, Universidad de Deusto, Spain. I am conducting a research study entitled "Analysis of factors that influence the use of technology among teachers in Maldives". The purpose of the research is to examine the predictors that impede the use of technology effectively in the instructional practice. I have received permission from Ministry of Education, Maldives and from the school principal in conducting this survey. This survey is limited only to secondary school teachers working in the schools of Male' city.

This survey involves completing a self-administered paper survey which will take about 40 – 50 minutes. The questionnaire has been approved by the research advisors from the Universidad de Deusto. Your participation for this study is optional and confidentiality will be ensured and respected during all the processes involved in the study. But your input is valuable. You may refuse to participate or withdraw from participation at any time. No individual identification information will be requested or recorded. In addition the school name will not be disclosed in the report or any outside party. The study will focus only in the aggregated result not the individual participants or schools.

You will be provided invitation letter for participation explaining about the research, survey questionnaire and an envelope. If you are willing to participate please complete the questionnaire and return it in a sealed envelope to the appointed person from the school.

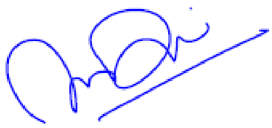
I hope I will get your full support in this educational research survey and join me in exploring the predictors that impede the use of technology efficiently in the teaching environment. I am hoping the results of this survey will assist in the development of the technology in the school environment.

If you have any questions or concerns about the study, please contact me at ([tel]) or by email ([email]).

Please consider being a part of this research study and thank you in advance for your support.

Thank you

Sincerely



Hawwa Neena Ali
Doctoral candidate
Facultad de Psicologia y Educacion
Universidad de Deusto
[email]
[tel]

Appendix H: Consent form for participants

CONSENT FORM

Dear teacher:

Please read this consent form carefully before you decide to participate or not in this study. If you have any questions or concerns about the study, please contact me at [mobile number] or by email [email].

TITLE OF RESEARCH STUDY

Analysis of factors that influence teachers use of ICT in Maldives

RESEARCHER

Hawwa Neena Ali (Phd student)
Facultad de Psicologia y Educacion
Universidad de Deusto
Email: [email]
Mobile contact: [phone]

OBJECTIVE OF THE RESEARCH

The main objective of the study of to investigate the situation of ICT usage among teachers' at the secondary schools in Maldives. I believe that this study will provide adequate information needed to improve the use of ICT by teachers'. In addition it is hoped that this research would contribute immensely for teachers in the Maldives towards the use of appropriate Information technology and communication in the classrooms. The literacy level of the teachers in terms of ICT usage needs to be understood so that the appropriate strategies can be used to make them more competent as professionals.

PURPOSE OF THE RESEARCH

The main purpose of the research study is to explore the situation of ICT usage among secondary teachers of Maldives. This study examine the factors that influence the use of technology in the instructional practice among the secondary teachers. Findings of this study will provide information on how technology is used in teaching and learning environment. In addition, will also explore the predictors that impede the use of technology effectively in the teaching and learning environment.

In particularly the research study seeks to:

- Explore teachers’ attitudes toward the use of technology
- Describe the pedagogical orientation of teachers
- Explore endogenous and exogenous factors that impede the use of ICT in instructional practice. These include teacher educational programs, professional development programs, technical support and infrastructure.

PROCEDURES OF THIS RESEARCH

The participants for this study will be secondary school teachers working in the schools located in Male’, Maldives. Teachers will be asked to volunteer in completing the questionnaire which will take about 40 to 50 minutes. The data collection will take place from June 8th till 25th June 2014.

PARTICIPANT RESPONSIBILITIES

After returning the signed consent form to participate in the study, teachers will be provided research package. The package includes;

- A copy of the consent letter of Ministry of Education, Maldives
- Notification letter from Department of Education, University of Deusto
- Cover letter stating the purpose of the research and contact details
- Research questionnaire
- Envelope

When you have completed the survey questionnaire, please place it in the envelope, seal it and handover to the selected coordinator.

RESEARCH INSTRUMENT

This study is a quantitative study and data will be collected via a questionnaire. The instrument was developed based on pool of questions that were previously developed and validated. In addition some questions were developed base on literature review. The final questionnaire was approved by the research supervisors.

POTENTIAL RISKS OR DISCOMFORTS

It is unlikely that the participants will experience any major discomfort as a result of this research. Participants in this study will be reminded that completing the questionnaire is voluntary. Participants will not be identified personally.

POTENTIAL BENEFITS TO PARTICIPANTS OR OTHERS

The participation in this study may not have a direct benefit to the participant. However, findings of this study are essential in the sense that teachers in lower secondary schools will find an additional research paper on ICT that critically analyses the effectiveness of incorporating technology in their teaching process. Furthermore, it will act as a guideline for educational policy makers to formulate policies that are viable and essential to institutionalize in the contemporary 21st century classrooms and schools. In fact, this research paper will be particularly critical to the policy makers in their quest for proper and viable policies for the development of Maldives ICT in education system.

In fact, with clear and feasible policies being laid down, this study will pave the way for designing of professional development programs for teachers and heads of schools. The essence and professionalism of the designs of such programs will be established for the fact that they are based on findings from the research study.

PROTECTION OF CONFIDENTIALITY

Participants' names, worksites or any other identifying information will be kept confidential at all times. No individual identification information is requested or recorded. The information provided in the questionnaire will not be provided to any other party and will be kept confidential at all times. The findings of the research will be summarized and reported in group form.

PARTICIPANT'S SIGNATURE

Your signature indicates that you voluntarily agree to participate in this study. You were given consent form prior to your participation in the study and were given time to read it.

If you have questions later you may call researcher. Participation in this study is voluntary and greatly appreciated. You have the right to withdraw from the study at any time without consequence.

STATEMENT OF CONSENT

I have read the above information and I understand the study, procedure and my involvement in the study. By signing, I understand that I am agreeing to the terms described above.

Participants Name: ____

Date of consent: ____

Participant's signature: _____________________________________